

**Management of food allergies in children in South Africa
– determining aspects of the knowledge and practices of
dietitians and medical doctors**

by
Georgina Isabel Jane Stear

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Supervisor: Prof Demetre Labadarios, Prof Cassim Motala, Prof Paul Potter
Co-supervisor: Prof Daan Nel

Faculty of Health Sciences
Department of Interdisciplinary Health Sciences
Division of Human Nutrition

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Declaration of work

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Date: March 2011

Abstract

Background

Adverse reactions to food are frequently suspected in daily clinical practice yet the knowledge of health care workers regarding correct diagnosis and management remains limited. This is compounded by few allergy consultants and may contribute to patient dissatisfaction and self-diagnoses.

The primary treatment modality for food hypersensitivity remains strict but nutritionally adequate elimination of offending food allergens based on accurate diagnosis. Nutritional misconceptions and incorrect diagnosis may lead to inappropriate dietary restriction resulting in nutritional deficiencies, malnutrition, growth retardation, and feeding difficulties in children. Elimination diets thus require supervision and monitoring similar to drug treatments, being reviewed regularly for possible food re-challenges.

There is limited research to assess knowledge and management approaches of food allergies by medical doctors and no research of this nature exists for Dietitians. There is also limited information as to whether current approaches conform to the most recent evidence-based recommendations, particularly with regard to dietary intervention and allergy prevention strategies.

Aim

The aim of this survey was to determine aspects of food allergy related knowledge and practices of Medical Doctors and Dietitians.

Methodology

This was an analytical cross sectional study with participants randomly selected from the three largest provinces in South Africa, Gauteng, Western Cape and Kwazulu Natal ($N=660$). A quantitative questionnaire was compiled to explore aspects of food allergy diagnosis and management. Participants were currently working in South Africa and were selected according to three categories, General Practitioners, Dietitians and Medical Specialists. Ethics approval was obtained from the University of Stellenbosch, Faculty of Health Sciences Committee of Human Research.

Results

Even though valuable insights were obtained, poor response from all three groups ($N=82$) compromised the strength of significant findings. There was limited knowledge regarding appropriate diagnosis, dietary intervention and allergy prevention strategies. 98% of respondents believed they needed more education and training in management of allergies. Approximately 50% reported use of complementary therapy by patients

prior to and while using conventional medicine. Dietitians weren't consulted for nutritional management by 72% General Practitioners and 45% Specialists. For allergy prevention, over 50% of health professionals advised extensive food avoidance for the first year in high risk infants. Dietitians recommended multiple food avoidance for the longest period of time per food in infants, pregnant and lactating women to prevent allergy. Advice for infant feeding and introduction of solid foods was not evidence-based. Goat's milk, soya formula and breast milk with maternal dietary avoidance were advised for allergy prevention. 54% of medical doctors and 31% of Dietitians provided no guidance for implementing an elimination diet. Only 15% of respondents did growth assessment of allergic patients. 99% of all participants recognised a need for South African specific 'best practice' guidelines.

Conclusion

The study highlighted a need in South Africa, at undergraduate and post graduate levels, for better education and training of food allergy, in particular diagnosis, dietary management and prevention strategies. This will create a platform for the achievement of minimum levels of competency in allergy care. It should also provide motivation for the establishment of South African specific guidelines, allergy support networks and better public awareness.

Opsomming

Agtergrond

Afwykende reaksies tot voedsel word dikwels by gesondheidsorg instellings verdag. Nieteenstaande, bestaan daar steeds beperkte kennis oor allergië. Die tekort aan allergie konsultante vererger sake en het dikwels ontevrede pasiënte en self-diagnose tot gevolg.

Die primêre modaliteit van behandeling van voedsel hipersensitiwiteit behels doelmatige verwydering van die oorsaaklike voedsel allergeene deur middel van 'n streng dog voedingswaardige dieet. Ontoepaslike bestuur van, en die verkeerde implementering van die uitskakelings dieet mag egter lei tot komplikasies by kinders soos hongersnood, groei vertraging en voedings probleme. Daar is tans beperkte navorsing om die peil van kennis van voedsel allergië en die bestuur van die probleem te meet. Geen sodanige navorsing ten opsigte van dieëtkundiges is al gedoen nie. Slegs beperkte inligting is beskikbaar tot welke mate huidige behandelings praktyk konformeer met die mees onlangse bewys-gebaseerde aanbevelings, veral met betrekking tot allergie voorkomende strategië.

Doelstelling

Die doelstelling van hierdie opname was om die kundigheid en bestuur van voedsel verwante allergië deur medici en dieëtkundiges te bepaal.

Metodologie

Dwarsprofiel analiese was gedoen met respondente wat onwillekeurig gekies was uit professionele mediese en dieëtkundige praktisyns uit die drie grootste provinsies in Suid Afrika, Gauteng, Wes-Kaap en Kwazulu Natal ($N=660$). Deelnemers was versoek om vraelyste met 'n samestelling van aspekte van voedsel allergie diagnose en bestuur te voltooi. Deelnemers is huidiglik werksaam in Suid Afrika en was verteenwoordigend van drie kategorië, naamlik Algemene Praktisyns, Dieëtkundiges en Mediese Spesialiste. Etiese goedkeuring was bekom van die Universiteit Stellenbosch se Fakulteit Gesondheidswetenskappe Navorsingsetiek komitee.

Bevindinge

Desnieteenstaande insiggewende inligting is die bevindinge gekompromitteer deur beperkte respons ($N=82$). Kennis met betrekking tot diagnose, dieëtkundige intervensie en allergie voorkomings strategië, is beperk. 88% van respondente versoek meer opleiding in die bestuur van allergië. 53% beweer dat pasiënte komplementêre terapie aanwend voor en gelyktydig met die gebruik van konvensionele medikasie. Interdisiplinêre konsultasie is beperk. Dieëtkundiges word nie geraadpleeg deur 72% van algemene praktisyns en 54% mediese spesialiste nie. Meer as 50% gesondheidsorg praktisyns beveel algemene voedsel ontwyking aan by hoë risiko kleuters

gedurende die eerste lewensjaar. Dieëtkundiges se allergie voorkomings aanbevelings aan kleuters, swanger en lakterende vrouens was vir die langste periode. Advies vir kleuter voeding was nie bewys-gebaseerd nie. Bokmelk, soya formule en borsmelk van moeders met dieëtkundige beperkinge word aanbeveel vir die voorkoming van allergië by kleuters. 54% mediese en 31% dieëtkundiges voorsien geen voorkomings dieët riglyne nie. Slegs 15% respondente takseer kleuter groei van allergie pasiënte. 99% van al die respondente ondersteun die vestiging van spesifieke 'beste praktyk' riglyne vir Suid Afrika.

Gevolgtrekking

Die bevindinge van die studie beklemtoon die behoefte in Suid Afrika vir verbeterde en doelgerigte voedsel allergie onderrig en opleiding, vir voorgraadse en nagraadse onderrig. Meer doeltreffende diagnose, dieëtkundige bestuur en allergie voorkomings strategië word aanbeveel. Daar word 'n doelwit geskep vir die bereiking van minimum vaardigheids vlakke vir allergie versorging. Die inligting motiveer ook die vestiging van doelgerigte Suid-Afrikaanse riglyne, allergie ondersteunings bronne en beter, openbare bewuswording van allergië.

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GLOSSARY OF TERMS

Adverse reactions to food - also referred to as food hypersensitivities, these include any abnormal reaction resulting from ingestion of a food and might be the result of a variety of conditions. They are classified as true food allergy; food intolerance, food toxicity and food aversion.¹

Atopy – tendency towards allergies; determined genetically.²

Allergen – substance foreign to the body which, upon interaction with the immune system, causes an allergic reaction.²

Allergic rhinitis – mostly nasal symptoms with sneezing being a prominent manifestation and may be accompanied by nasal congestion, pruritis, itchy watery eyes, itching of the soft palate and itching of the ear canals. Allergic rhinitis occurs on a seasonal (hayfever) or perennial basis, the latter form being more common in children. Both forms result from sensitivity to allergens to which the individual has developed an IgE-mediated response. Most commonly pollens of tree, grasses and weeds are associated with seasonal patterns of the disease whereas house dust mites, animal danders, fungi and work, school or hobby related allergens are associated with perennial symptoms.³

Anaphylaxis – an acute, often severe and sometimes fatal immune response that may affect one or more organ systems.²

Angioedema – an eruption similar to urticaria, but with larger oedematous areas that involve both dermis and subcutaneous structures.³

Antigen – usually a foreign substance (e.g. protein, cells, bacteria, polysaccharide) that stimulates antibody production.²

Antibodies – Immunoglobulins produced in response to an antigen or allergen.²

Asthma – A lung disease characterised by airway obstruction that is reversible (but not completely in some patients), either spontaneously or with treatment, airways inflammation, and increased airways responsiveness to a variety of stimuli. Airways obstruction may be due to a combination of factors including spasm of airways smooth muscle; oedema of airways mucosa; increased mucous secretion; cellular, especially eosinophilic, infiltration of the airways walls; and injury of the airways epithelium. Asthma is often triggered by viral infections, environmental factors and allergens.³

Atopic Dermatitis – a form of eczema that is most prevalent during infancy and childhood; a skin rash characterized by small red and white bumps that itch, often a symptom of allergy. It typically runs a chronic course with exacerbations and remissions. A variety of ‘trigger factors’ may exacerbate eczema – irritants

(soap, harsh chemicals), heat and humidity, stress and anxiety, certain foods, inhalant allergens and certain infections.²

Atopic (allergic) march – the presence of atopic characteristics, events, or conditions that develop into more permanent disease with age.²

Classes 1-6 - A laboratory method of reporting serum specific IgE levels;. Levels are measured in kU/l IgE and then categorised into different classes: Class 1 - 0.3-3.5 kU/l IgE; Class 2 - 3.5-17.5 kU/l IgE; Class 3 - 17.5-35 kU/l IgE; Class 4 - 35-50 kU/l IgE; Class 5 - 50-100 kU/l IgE; Class 6 - > 100 kU/l IgE.⁴

Cross reactivity – an allergic response to a food or substance either within a given group (i.e. crustacean, legumes) or with unrelated substances (e.g. banana, kiwi or chestnut with latex).² It occurs when two or more allergens share epitopes, or in some cases have similar epitopes, and therefore bind to the same IgE-antibodies. Patients sensitised to one of the allergens may also react to the other without previous exposure or sensitisation.⁵

Complementary and Alternative medicine/ therapy(CAM) - a group of diverse medical and health care systems, practices and products that are not generally considered part of conventional medicine. CAM encompasses a diverse array of modalities, including herbal therapies, acupuncture, homeopathy, chiropractic, naturopathy, mind-body techniques, massage, and diet-based therapies.⁶

Dermographism – a wheal-and-flare reaction seen after scratching or firmly stroking the skin; usually idiopathic.³

Double blind placebo controlled food challenge (DBPCFC) – a test of reaction to food where the food is disguised such that neither the patient nor the clinician is aware of the challenge content; the “gold standard” for establishing or diagnosing food allergy.^{2,7}

Elicitisation – Re-exposure of a sensitised individual to the same allergen produces an allergic reaction or undesired response regardless of the mechanism.²

Food allergy – an adverse reaction to a food protein which always involves an immune mechanism (whether IgE- or non IgE-mediated); the reaction occurs consistently after ingestion, inhalation or touch of a particular food, causing functional changes in target organs; results in a variety of symptoms involving skin, gastrointestinal tract and respiratory tract.^{2,5,7,8} It occurs following sensitisation and re-exposure to specific food proteins in the diet.^{1,9}

Food aversion – a non-reproducible adverse reaction to a specific food, often with behavioural origin.^{1,5,8}

Food intolerance – Also referred to as non-allergic food hypersensitivity; an adverse reaction to food caused by some unique physiologic characteristic of the host such as a specific metabolic disorder e.g. lactose intolerance due to a lactase deficiency.^{1,5,8}

Food toxicity – an adverse reaction to food due to factors inherent in a food which can affect most healthy individuals when given appropriate doses such as a pharmacologically active component e.g. caffeine, tartrazine or tyramine in aged cheese, or a toxic food component contained in contaminated foods, food additives and naturally occurring chemicals e.g. food poisoning, histamine in scombroid fish poisoning, caffeine, tartrazine or tyramine in cheese.^{1,5,8}

Food challenge – presenting a food to a patient with or without knowledge of when the food is being ingested using tolerated food vehicles to hide the food as necessary to prove or disprove a food-symptom relationship (open-, single-blind placebo-controlled, and double-blind placebo-controlled food challenges).²

Hypoallergenic formula - an infant formula that is tolerated by 90% of infants with documented cow's milk allergy (minimum of 30 patients tested) who have been exposed to the tested formula following an elimination diet and tolerated it with 95% confidence in a double blind placebo controlled food challenge.¹⁰

Open food challenge – a test of reaction to food where both the patient and the clinician/ researcher are aware of the challenge content i.e. the food to be given.^{2,7}

Oral tolerance – a specific suppression of cellular or humoral immune responses to an antigen by means of prior administration of the antigen through the oral route.¹¹ A form of peripheral tolerance in which mature lymphocytes in the peripheral lymphoid tissues are rendered non-functional or hypo-responsive by previous oral administration of an antigen.^{1,5}

Panallergens - minor allergens shown to be responsible for cross-recognition of unrelated plant species. The Greek prefix “pan” means “all”, emphasizing the ubiquitous distribution of these minor allergenic molecules throughout nature. Although originating from unrelated organisms, such functionally related molecules share highly conserved sequence regions and three-dimensional structures and hence, can fulfill the requirements for IgE cross-recognition. Known panallergens include profilins, polcalcins, and non-specific lipid transfer proteins (nsLTP). Multiple allergies to both pollen and food allergen sources seem to be determined by sensitisation to these widely spread allergens.¹²

Probiotic - microbial foods or supplements that can be used to change or reestablish the intestinal flora and improve health of the host.²

Profilins - homologous proteins found both in pollens, plants and fruits¹³; represent a family of small (12 to 15 kDa), highly conserved molecules sharing sequence identities of more than 75% even between members of distantly related organisms.¹² Profilins are ubiquitously spread and can be viewed as panallergens that are responsible for many cross-reactions between inhalant and nutritive allergen sources. Allergenic profilins are found in pollen of trees, grasses, weeds, plant derived foods, and latex. Profilin-specific IgE may cross-react with homologues from almost every plant source thus profilin sensitisation is considered a risk factor for allergic reactions to multiple pollen and food allergen sources.¹²

Radioallergosorbent test (RAST) – a test that measures specific IgE-antibodies in serum; used as an alternative to skin prick tests to help identify IgE-mediated allergic reactions.²

Sensitisation – Initial exposure to an antigen or allergen that results in the development of hypersensitivity without a clinical allergic reaction; only demonstrable IgE antibody to a food.²

Serum specific IgE – CAP RAST FEIA (Fluorescein-enzyme immunoassay) – a test, more sensitive than the RAST that provides quantitative assessment of food-specific IgE antibodies.²

Single blind food challenge – a test of reaction to food in which the patient is unaware but the clinician is aware of the challenge content.^{2,7}

Skin Prick Test (SPT) – a test in which an antigen is applied directly to the skin and then pricked or scratched through with a specifically designed lancet in order to observe the histamine response and measure IgE-mediated allergic reactions.²

Urticaria – local wheals and erythema in the dermis of the skin.³

ABBREVIATIONS

IgE	Immunoglobulin E
RAST	Radioallergosorbent test
CAP RAST FEIA	Fluorescein-enzyme immunoassay
SPT	Skin Prick Test
ISAAC	International Study of Asthma and Allergies in Children
USA	United States of America
UK	United Kingdom
CAM	Complementary and alternative medicine and/ or therapy
IFN-g	Interferon-g
PGE ₂	Prostaglandin E2
IL	Interleukin
DBPCFC	Double blind placebo controlled food challenge
PPV	Positive predictive value
NPV	Negative predictive value
APT	Atopy patch test
CAST	Cellular antigen stimulation test
ELISA	Enzyme-linked immunosorbent assay
SLIT	Sublingual immunotherapy
OIT	Oral immunotherapy
MMR	Measles, mumps and rubella vaccine
AAP	American Academy of Pediatrics
ESPACI	European Society for Pediatric Allergology and Clinical Immunology
ESPGHAN	European Society for Pediatric Gastroenterology, Hepatology and Nutrition
SP-EAACI	Section on Pediatrics, European Academy of Allergology and Clinical Immunology
NFCS	National Food Consumption Survey
RDA	Recommended Daily Allowance
TB	Tuberculosis
AIDS	Acquired immune deficiency syndrome or acquired immunodeficiency syndrome
HIV	Human immunodeficiency virus
WAO	World allergy organisation
AAAAI	The American Academy of Allergy, Asthma and Immunology
ALLSA	Allergy Society of South Africa
ALCAT	Antigen leukocyte cellular antibody test
IgG	Immunoglobulin G

HPCSA	Health Professions Council of South Africa
GP	General Practitioner
SP	Medical Specialist
DT	Dietitian
ML chi-square	Maximum Likelihood chi-square test
ADSA	Association for Dietetics in South Africa
SAMA	South African Medical Association
EAACI	European Academy of Allergology and Clinical Immunology
ACAAI	American College of Allergy, Asthma and Immunology
VEGA test	Electroacupuncture device/ probe
GIT	Gastro-Intestinal Tract
MFA	Multiple food allergy
ENT	Ear Nose and Throat specialist
PHF	Partially hydrolysed formula
EHF	Extensively hydrolysed formula
CPD	Continued Professional Development
AD	Atopic Dermatitis
FAAN	Food Allergy and Anaphylaxis Network

CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction

Food allergy is an important public health problem that affects both adults and children. The prevalence of allergies appears to have increased worldwide despite difficulties in obtaining firm population-based data.¹⁴⁻¹⁷ Although the exact incidence of childhood food allergies in South Africa remains uncertain, the perception of specialist allergy units across the country is of an overall increase in allergy patients over the last decade.¹⁸

In spite of the fact that adverse reactions to food are frequently suspected in daily clinical practice, knowledge of food allergies, the mechanisms involved, food allergens, diagnosis and dietary intervention remains poor. In the literature too, there exists a lack of standardised diagnostic procedures as well as approach to implementation of specific management.^{16,19,20} Due to these concerns, allergy organisations around the world are developing “best practice” clinical guidelines, based on the most recent scientific evidence, for the diagnosis and management of food allergy. The most current of which includes the 'Guidelines for the Diagnosis and Management of Food Allergy in the United States' developed by the National Institute of Allergy and Infectious Diseases (NIAID)-Sponsored Expert Panel.^{21,22}

Primary and secondary health care facilities, general practitioners, paediatricians or consultants in other specialities, with little or no allergy training, tend to be the first points of contact for patients suffering from food allergies.²⁰ Limited basic knowledge and expertise from these health care professionals, as well as few allergy consultants available for referral, may subsequently result in a poor intervention in managing the condition, potentially inappropriate use of medications and elimination diets as well as self-diagnoses by parents and reliance on complementary and alternative therapies.^{16,20}

The primary modality of treatment for food hypersensitivity remains appropriate avoidance of the causal food allergen/s by means of a strict but nutritionally adequate elimination diet. Success of the elimination diet is dependent upon the accurate diagnosis of causal food allergen/s followed by thorough nutritional input by a Dietitian and regular reassessment. Unnecessary or incorrectly implemented elimination diets due to misdiagnosis, may lead to a variety of complications in children including malnutrition and growth retardation; inappropriate and continued food avoidance despite negative food challenges and associated feeding difficulties.²³

We live in an environment of information excess and although one would expect patients and their parents to be better informed, incomplete and confusing messages from often unreliable sources has left many seeking answers from sources outside the consultation rooms of conventional healthcare practitioners.²⁴ Dietary misconceptions and out-dated dietary advice regarding food allergy continue to be advocated by the media, complementary medicine practitioners and health care professionals alike, often at the expense of the patient and family's quality of life.^{24,25} In South Africa poor nutritional status and financial constraints affect a large proportion of young children, including those with food allergies, which compounds the problem.²⁶

Currently in South Africa there is no specialisation for medical doctors or dietitians in the field of allergy and food allergy respectively.²⁷ Medical and dietetic students alike receive very little allergy education.²⁷ There is a paucity of information in the country to assess current allergy care and compare it to the most recent scientifically based recommendations for diagnosis, management and prevention of food allergies.

1.2 Prevalence of Childhood Food Allergy

There are currently no international surveys defining the prevalence food allergies in different populations at a global level¹ however over the past 25 years, the prevalence of allergic disease in Western industrialised countries has increased alarmingly.^{14,28} In the 1997 International Study of Asthma and Allergies in Children (ISAAC), allergic disease (specifically asthma, allergic rhinitis and atopic dermatitis) was reported as one of the most common chronic disorders affecting humankind with an ever-increasing prevalence.^{14,17} Most epidemiological literature to date has focused on the extent of the problem in Western, developed countries, specifically regarding the prevalence of egg, milk and peanut allergies. The prevalence of the common allergic diseases, asthma, hayfever and eczema has increased two- to three-fold in developed countries throughout the world.^{16,17} Available data of food allergy in children in developing countries (Asia, Latin America and Africa), strongly indicates an underlying problem with food allergy, however, robust information on the true prevalence and extent of food allergy in the developing world is limited, relying mainly on case reports from tertiary allergy clinics within the different countries.^{14,28,29}

It is estimated that up to 20% of the population in the United States of America (USA) and United Kingdom (UK) has true allergies to inhalants and other environmental allergens while relatively few have true allergies to food.^{1,5,16,30-32} An approximate prevalence of food allergies to 'any food' in the general population has been estimated at 3.5%, using prevalence studies based on incorporating oral food challenges.^{14,15,28,33} The actual incidence of true food hypersensitivity reactions in young infants (under three years of age) in the USA and UK, confirmed by history and oral food challenges, is estimated at approximately 6–8% and 5-6% respectively. It has been reported to be 3-5% in young children and up to 4% in adults.^{5,34} In the UK, 39% of children and 30% of adults have been diagnosed with one or more atopic conditions although there is no national data on the incidence of specific allergic conditions.³⁵

A recent meta-analysis examined the prevalence of specific food allergies in different countries using different criteria. It found the self-reported prevalence of food allergy varied from 1.2% to 1.7% for milk, 0.2% to 7% for egg, 0% to 2% for peanut and fish, 0% to 10% for shellfish, and 3% to 35% for any food.⁸ Lower estimates were obtained from food hypersensitivity reactions confirmed by food challenges: 0% to 3% for milk, upto 1.7% for egg, 0.2% to 1.6% for peanut, and 1% to 10.8% for any food.²⁸

The range of food allergens responsible for food-induced reactions may vary between countries although there are eight which are well recognised as the most common triggers in children – cow's milk protein, egg, peanuts, tree nuts, soya, wheat, fish and shellfish. In the USA and UK, cow's milk protein, egg, peanuts and

tree nuts have been found to be the most common allergens resulting in food-induced allergic reactions in young children.^{5,14,28,29,36}

There is very limited relevant data from Africa.²⁹ In South Africa, a prospective, descriptive study of all children attending the specialist allergy clinic at Red Cross Children's War Memorial Hospital in Cape Town, Western Cape, examined which food allergens children were reacting to. The prevalence of peanut allergy was high (35%). In children under three years, egg, peanut and cow's milk were also found to be the most common food allergens.³⁷ A study looking at peanut allergy in Xhosa children in Cape Town, found none of the children to be allergic despite a 5% rate of peanut sensitisation.³⁸ Potato was found to be an emerging allergen particularly in resistant atopic eczema.²⁹

1.3 Incidence of Childhood Food Allergy in South Africa

The exact incidence of childhood food allergies in South Africa remains uncertain. The closest estimate, obtained from a prospective study at the Red Cross Children's War Memorial Hospital in Cape Town, Western Cape, found approximately 2-3% of the patients ($N=802$) referred to the allergy clinic suffer from food allergies, as confirmed by a combination of a detailed patient history, skin prick tests, serum specific IgE tests and/ or oral food challenges.^{29,39}

The patients treated at the allergy clinic were mainly from the lower socio- economic strata but patients from middle to high socioeconomic brackets were also managed.^{37,39} Although Red Cross Children's Hospital attracts a diverse and extremely varied patient pool due to the medical expertise it provides, the data from these studies are predominantly a reflection of the greater Western Cape region and it is therefore difficult to extrapolate the information to the whole country.

1.4 Perceived Food Allergy

Self-reported and perceived food hypersensitivity reactions by parents are a well known phenomenon and a number of studies have shown these figures to overestimate those of true food hypersensitivity, as confirmed by food challenges.^{5,34,36,40}

The most recent of these, was a cohort from the UK that found over a third of parents (33.7%) believed their child had a problem associated with food hypersensitivity in the first three years of life. Of these, only 16% were shown, by means of oral food challenge and patient history, to have true food hypersensitivity. Approximately 13% were diagnosed with food allergy, confirmed by double blind placebo controlled food challenge and history. As the child grew older parental reporting of perceived food hypersensitivity decreased to 8.3% after three years of age. As many as 22% of parents avoided particular foods on mere suspicion that the food may contain an allergen.³⁶

In the USA , approximately 20 to 25% of adults believe they or their children are afflicted with a food allergy and alter their diets unnecessarily for a perceived adverse reaction to food, often with nutritional and psychological consequences.^{5,41}

In Finland, 21% of food hypersensitivities were perceived by the parents compared to the 9% identified as physician-diagnosed food allergy. What was alarming was the percentage of children with foods eliminated from their diets regardless of a presence of symptoms or perceived allergy. Approximately a fifth of children (19%) had at least one food item eliminated from the diet without any perception of symptoms. This unjustified elimination was highest in infants and tended to be less evident in older children (>2-3 years old).⁴²

Unfortunately, mixed messages and a plethora of information, often misinformation regarding alternative allergy diagnostic tests (e.g. leucocytotoxic, IgG and VEGA testing) and approaches to food elimination (e.g. broad dietary restriction during pregnancy and lactation), are advocated and readily available through a number of media sources to the general public.^{24,43} This in itself may promote and assist self diagnosis and treatment of possible food-induced reactions and a mistrust of conventional medicine. Better allergy knowledge and more confidence to implement sound allergy care from health care practitioners as well as a consistent medical 'voice' and support networks could assist in informing patients better on food allergy and improving their opinions of scientifically based medicine in managing the condition.

1.5 Current Knowledge and Practice of Food Allergies by Health Professionals

In spite of the fact that adverse reactions to food are frequently suspected in daily clinical practice, knowledge of food allergies, food allergens, the mechanisms involved, diagnosis and treatment is believed to be poor amongst health care practitioners.⁴⁴

Primary and secondary health care facilities, general practitioners, paediatricians or consultants in specialities other than immunology and allergy tend to be the first (or only) points of contact for patients suffering from food allergies.^{20,45} They are relied on by families for an initial diagnosis of food allergy, instruction in management of the food allergy and evaluation of the allergy over time. They are also expected to recognise symptoms of food allergy, play a crucial role in education of food-allergic children and their families with regards to protection against anaphylaxis and overall allergy prevention, and to refer appropriately to an allergist.^{45,46} These professionals often have limited basic allergy knowledge and training however, which would compromise an acceptable level of care for the patients and their families. In South Africa, there are also few allergy consultants available for referral, a problem also experienced in other developing and developed countries.^{16,19,47,48} This would further contribute to a poor intervention in managing the condition, potentially inappropriate use of medications and elimination diets and minimal follow-up.

Currently, there is limited data detailing the knowledge and perceptions of food allergies of medical practitioners.^{45,46} Differing medical opinions, diagnostic approaches and perceived clinical manifestations of food allergy have been documented^{24,45,49,50} as well as gaps in knowledge with regard to food-induced

anaphylaxis, its identification and treatment.^{45,51,52} Varied approaches to diagnosis of food allergy have also been reported among primary care physicians.^{46,52} This lack of expertise and conflicting approaches to medical care has been found to compound uncertainty of families regarding their child's food allergy, associated with seeking second opinions or alternative therapies.^{24,45,46}

The Chicago Food Allergy Research Survey for primary care physicians (family physicians and pediatricians) in the USA characterised current food allergy knowledge, attitudes and beliefs of these health care providers.⁴⁵ Of the respondents, 99% indicated they treated patients with food allergies. Approximately 60% of the physicians answered knowledge-based items correctly (62% paediatricians, 54% family physicians). Participants acknowledged limitations in their knowledge and several weaknesses were identified including inadequate medical training to care for food allergic children. Significant knowledge gaps were found in terms of triggers/ environmental risks, definition, diagnosis, interpreting laboratory results, signs and symptoms and severity of food allergy. Less than 25% were aware that oral food challenges could be used to diagnose food allergy; less than 30% felt comfortable interpreting lab results to diagnose food allergy; only 22% felt their medical training prepared them adequately to care for patients with food allergies. Only half correctly identified the dosage of epinephrine based on a child's weight. For diagnosing food allergy, food-specific IgE level was the preferred tool, followed by skin prick testing and in a few cases, oral food challenges. Participants were unclear on the natural progression of common food allergies and frequency with which a child will outgrow an allergy. With regards to perceptions of food allergy, promoting public awareness campaigns, and identifying the cause of food were most frequently selected. Little variation was found according to medical specialty, years in practice, practice type, location or percentage food allergic patients.⁴⁵

Another concern is the self-diagnoses made by parents with self-prescription of strict, nutritionally inadequate diets. This may arise as a result of a perceived food allergy, conflicting information and care received from different medical professionals, an inability on the part of the medical practitioner to correctly diagnose and then resolve the patient's condition or to refer to an allergist for appropriate management. Fueled also by various misconceptions, medical and nutritional misinformation available from a number of sources such as through the media, internet or relatives, and sometimes even health practitioners, parents may resort to complementary and alternative (CAM) therapies, tests and remedies, all of which have no convincing evidence to prove their validity and efficacy in diagnosing and managing food allergy.^{25,43,53} Many of these approaches also include unsupervised implementation of highly restrictive elimination diets.^{43,53}

There are recent studies that have assessed the approach of physicians and pediatricians in the United States to food allergy, specifically with regard to diagnosis, treatment, prevention and management of food-induced anaphylaxis.^{45,51,52} High rates of mistreatment and misunderstanding of anaphylaxis were reported, confirming a need for improved education on food-induced allergic reactions and anaphylaxis directed to primary care doctors who are most likely to evaluate teenagers and young adults who are at highest risk for anaphylaxis.^{51,52}

There appears to be a paucity of research in terms of appropriate nutritional intervention by dietitians, appropriate referral between health care providers, specifically medical doctors and specialists and dietitians, in caring for food allergic patients and assessing whether current evidence-based guidelines are being advocated across disciplines to ensure a consistent and scientifically sound message is being provided to food allergic families.

1.6 An Overview of Current Approaches to Diagnosis and Management of Food Allergy

1.6.1. Risk factors for the development of food allergies and oral tolerance

Knowledge regarding the risk factors for the development of food allergies remains limited and a number of possible risk factors have been identified (Figure 1.1).¹⁴ It is likely that, just as in the development of other atopic diseases (asthma, eczema), there are genetic predisposing factors towards the development of food allergies. What is unclear is whether the same genetic polymorphisms associated with asthma and eczema or other unique ones exist in patients with food allergies.¹⁴ The risk of atopy increases if a parent or sibling has atopic disease (20-40% and 25-35%, respectively), and is higher still if both parents are atopic (40-60%).⁵⁴

Recently, immune modulation and food exposure have been considered in the development of food allergies. Food allergies have continued to increase despite rigorous attempts to advocate restriction diets. It is now believed that allergen exposure is critical in the cause of food allergies.^{14,55-57} In Western industrialised societies where peanuts are avoided in pregnancy and infancy, the rate of peanut allergy is high while in countries where peanuts are consumed throughout pregnancy and early childhood (Israel, Asia, Africa), peanut allergy rates remain low.^{14,58} It is now believed that if environmental exposure to food predominates in the absence of infant consumption, allergy is more likely to occur, while if the infant is allowed to consume the food, tolerance is likely to occur.^{14,55,58}

Another possible hypothesis for the development of food allergies is the dual-allergen-exposure hypothesis, which suggests that exposure through the skin leads to sensitisation while consumption of allergenic proteins assists in inducing oral tolerance.¹⁴ It could explain the association between early development of severe eczema and the subsequent development of food allergy (due to antigen exposure through inflamed skin).^{14,59} This may partly explain the distribution of certain food allergies (e.g. peanut) in different regions of the world and the more recent increase in food allergies as a result of prolonged exclusive breastfeeding and the delayed introduction of allergens into the diet. By implication, a reduction of food allergens in the child's environment may lead to a reduction in sensitisation and early introduction of allergenic foods in the infant's diet (in the first 6 months of life) can reduce the development of food allergies through oral tolerance induction.¹⁴

Increases in allergies to peanuts and new foods such as sesame and kiwi fruit could also be attributed to both environmental and dietary factors including reduced immune stimulation from infection i.e. the hygiene hypothesis.¹⁴ The hygiene hypothesis points to the exposure to allergens in the environment early in life to reduce the risk of developing allergies by boosting immune system activity. A relatively clean environment in

early life would sway the immune system towards allergy-promoting responses. This hypothesis may explain the lower incidence of allergy in those living on farms or in rural areas (due possibly to more exposure to bacteria in barns and elsewhere in the country); the lower incidence of allergy in younger children of large families with 3 or more older siblings (due perhaps to repeated exposure to infection from older siblings); and the lower incidence of asthma and wheezing in children who go to day care centres (where they are exposed to more infections). Little evidence however, exists with respect to the hygiene hypothesis and food allergy.¹⁴

An association has been found between increased food allergy risk associated with Caesarian section as opposed to vaginal delivery, suggesting that early colonisation of the gastrointestinal tract with microflora from the mother might play an important role in establishing tolerance.^{14,60}

Changes in the components of the diet including antioxidants, fats and nutrients, such as vitamin D, have been hypothesised to contribute to the development of food allergies, although all these hypotheses currently lack sufficient evidence.¹⁴

The dietary fat hypothesis argues that reduction in consumption of animal fats and the corresponding increase in the use of margarine and vegetable oils has led to the increase in allergies.⁶¹ It has been suggested that an increase in the consumption of omega-6 polyunsaturated fatty acids, such as linoleic acid, and similarly reduced consumption of oily fish, has led to a reduction in the intake of omega-3 polyunsaturated fatty acids, such as eicosapentaenoic acid. Omega-6 fatty acids lead to the production of prostaglandin E₂ (PGE₂), whereas omega-3 fatty acids inhibit synthesis of PGE₂. PGE₂ reduces Interferon-g (IFN-g) production by T lymphocytes, thus resulting in increased IgE production by B-lymphocytes. This has been proposed to explain the increase in the prevalence of asthma, eczema, and allergic rhinitis.^{14,61}

The antioxidant hypothesis argues that the decrease in consumption of fresh fruit and vegetables in the Western diet might account for allergies, particularly asthma. The idea is that certain antioxidants, such as vitamin C and b-carotene, could have anti-inflammatory protective effects in asthma. There is no biologic explanation however as to how this could affect IgE sensitisation to foods.¹⁴

The vitamin D hypothesis takes 2 forms: the vitamin D excess hypothesis argues that increases in vitamin D levels have led to increased allergies; and the vitamin D deficiency hypothesis which argues the opposite. There are immunologic arguments that can be used to support both hypotheses.¹⁴ Vitamin D has been shown to inhibit *in vitro* T-cell proliferation and production of the Th2 cytokines IL-2, IFN-g, and IL-12.⁶² However, there is also literature showing that vitamin D promotes the development of regulatory T cells *in vitro* and *in vivo*, and this could downregulate allergic inflammation.¹⁴

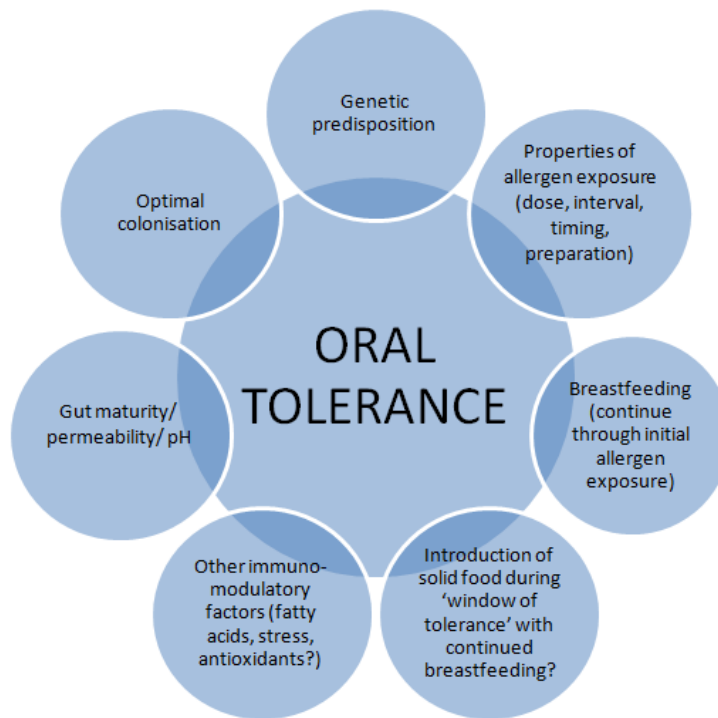


Figure 1. 1: Factors that influence the capacity for developing oral tolerance (Adapted from Prescott⁶³)

1.6.2. Understanding the food allergic reaction

The gastrointestinal tract (gut) starts at the mouth. Food moves down from the mouth via the oesophagus into the stomach and from there is processed through the small and large intestines, where it is eventually eliminated with defecation. The intestinal tract processes food to extract the nutrients and normally blocks allergens from entering the body. Many of the immunological and mechanical barriers involved in this process are immature at birth, leaving the infant at risk for allergens to enter the blood stream. Large amounts of food allergens penetrate the gut barriers in children and adults, but the body's defense, the immune system, develops a tolerance to the allergens. Thus, no symptoms occur. A failure to develop tolerance or a breakdown in tolerance results in allergen sensitisation (excessive production of food-specific IgE antibodies).¹³

The initial exposure to a foreign food protein leads to primary allergic sensitisation. This results in production of food-specific IgE antibodies with long-term T-cell memory. Clinical reaction is not evident with sensitisation.⁹

Subsequent exposure to the same protein (food allergen) and penetration of the gut lining leads to cross linking between the preformed IgE antibodies bound to mast cells, and food allergens followed by mast cell degranulation and the release of various inflammatory mediators such as histamine. This is known as the 'early phase' allergic reaction causing vasodilation and vascular leakage with erythema, oedema and excess mucous

production. The 'late phase' allergic reaction develops two to twenty-four hours after allergen exposure and is characterized by persistent tissue inflammation due to eosinophils that are released to the site of inflammation to produce and release newly formed inflammatory mediators.⁹

Recent evidence has been accumulated to suggest that allergen-reactive type 2 helper T cells (Th2) play a triggering role in the activation and/or recruitment of IgE antibody-producing B cells, mast cells and eosinophils, i.e. the cellular triad involved in the allergic inflammation. Interleukin (IL)-4 production by a still unknown cell type (T cell subset, mast cell or basophil) at the time of antigen presentation to the Th-cell is critical for the development of Th2 cells. Other cytokines, such as IL-1 and IL-10, and hormones, such as calcitriol and progesterone, also play a favouring role. In contrast, cytokines such as interferon (IFN-alpha, IFN-gamma, IL-12 and transforming growth factor (TGF)-beta, and hormones, play a negative regulatory role on the development of Th2 cells.⁶⁴

The skin, nose and lungs are most often affected by food-induced allergic reactions involving specific IgE antibodies to a food. Disorders of the gut are mostly due to non-allergic reactions.¹³

1.6.3. The types of food allergies and clinical features

Food-induced allergic disorders develop in genetically predisposed individuals due to failure to develop normal oral tolerance or from a breakdown of oral tolerance in the gastrointestinal tract.^{41,65} They result from immunologic pathways that include activation of effector cells either through development of food-specific IgE antibodies (IgE-mediated), cell-mediated reactions resulting in subacute or chronic inflammation (non IgE-mediated), or combined pathways.^{5,41,65}

Many diverse clinical features can arise from adverse reactions to foods and food ingredients. In some cases, adverse reactions may manifest by symptoms and clinical signs restricted to a single organ system, usually the gastrointestinal tract, skin or respiratory tract (Tables 1.1 - 1.3).⁴¹ Frequently more than one system is involved, regardless of the immunopathogenic mechanism responsible for the reaction. Cell-mediated hypersensitivity reactions seem to contribute to a number of gastrointestinal disorders and atopic dermatitis may develop due to a combination of the two types of mechanisms.^{41,66} Occasionally, generalised systemic reactions such as anaphylaxis may occur.^{5,32,67,68} Although the significance of non IgE-mediated food allergy may be underappreciated, it is responsible for approximately 30% of delayed immune-mediated reactions to food.⁶⁹

In the last decade, a number of conditions have been associated with food allergy pathogenesis. These include gastrointestinal complaints such as gastro-oesophageal reflux, constipation, eosinophilic gastroenteropathies, and food protein induced disorders e.g. proocolitis, enterocolitis, enteropathy.⁷⁰

The onset of food hypersensitivity reactions following ingestion or exposure to the offending food allergen may range from immediate (within thirty minutes to two hours) to delayed (more than two to three hours and up to two to three days).⁶⁸ IgE-mediated hypersensitivities are seen more commonly and reactions tend to be

more immediate or occur within a few hours of contact with the allergen. In cell mediated hypersensitivity reactions, symptoms may only appear until several hours after contact with the suspected food allergen.⁶⁵

Allergic disease follows a specific course and clinical manifestations may change or progress from affecting one organ system to another with increasing age (e.g. food allergy may be outgrown in early childhood, while respiratory symptoms and allergies to airborne allergens may develop in later childhood). This is known as the allergic march.^{68,71-77} Not all sensitised children will join the allergic march but individuals who do not join the allergic march may have a greater risk of displaying symptoms of allergic disease in adulthood.⁷⁷ Allergic diseases may also co-exist in patients and the combination of several exposures at a given time (the allergen load) is related to disease severity.⁷⁷

Table1. 1: Cutaneous food hypersensitivities

Disorder	Mechanism	Symptoms	Diagnosis
Acute urticaria and angioedema	IgE ¹ -mediated	Pruritus, hives and/ or swelling	Clinical history; positive SPT ² or RAST ³ ; +/- challenge
Chronic urticaria and angioedema	IgE ¹ -mediated	Pruritus, hives, and/ or swelling of > 6 weeks duration	Clinical history; positive SPT ² or RAST ³ ; elimination diet; challenge
Atopic dermatitis (atopic eczema dermatitis syndrome)	IgE ¹ - and cell-mediated	Marked pruritus; eczematous rash in a classic distribution	Clinical history; positive SPT ² ; CAP-System FEIA ⁴ (i.e. quantitative IgE ¹); elimination diet and food challenges
Contact dermatitis	Cell-mediated	Marked pruritus; eczematous rash	Clinical history; patch test
Dermatitis herpetiformis	Cell-mediated	Marked pruritus; papulovesicular rash over extensor surfaces and buttocks	Skin biopsy (IgA ⁵ deposition); IgA ⁵ anti-gliadin and anti-transglutaminase antibodies; +/- endoscopy

¹ IgE - immunoglobulin E² SPT - skin prick test³ RAST - radioallergosorbent test⁴ FEIA - fluorescent enzyme immunoassay⁵ IgA - immunoglobulin ASource: Sampson HA^{41,66}**Table1. 2: Respiratory food hypersensitivities**

Disorder	Mechanism	Symptoms	Diagnosis
Allergic rhinoconjunctivitis	IgE ¹ -mediated	Periocular pruritus, tearing, and conjunctival erythema, nasal congestion, rhinorrhoea, sneezing	Clinical history, SPT ² , elimination diet, food challenge
Asthma	IgE ¹ - and cell-mediated	Cough, dyspnoea, wheezing	Clinical history, SPT ² , elimination diet, food challenge
Heiner's syndrome (food-induced pulmonary haemosiderosis)	Unknown	Recurrent pneumonia, pulmonary infiltrates, haemosiderosis, iron-deficiency anaemia, failure to thrive	Clinical history, peripheral eosinophilia, milk precipitins (if due to milk), +/- lung biopsy, elimination diet

¹ IgE - immunoglobulin E² SPT - skin prick testSource: Sampson HA^{41,66}

Table1. 3: Gastrointestinal food hypersensitivities

Disorder	Mechanism	Symptoms	Diagnosis
Pollen-food allergy syndrome (oral allergy syndrome)	IgE ¹ -mediated	Mild pruritus, tingling and/or angioedema of the lips, palate, tongue or oropharynx; occasional sensation of tightness in the throat and rarely systemic symptoms	Clinical history and positive SPT ² to relevant food proteins (prick-to-prick method); +/- oral challenge (positive with fresh food, negative with cooked food)
Gastrointestinal anaphylaxis	IgE ¹ -mediated	Rapid onset of nausea, abdominal pain, cramps, vomiting, and/or diarrhoea; other target organ responses, i.e. skin, respiratory tract, often involved	Clinical history and positive SPT ² or RAST ³ ; +/- oral challenge
Allergic eosinophilic oesophagitis	IgE ¹ - and/or cell-mediated	Gastro-oesophageal reflux or excessive spitting-up or emesis, dysphagia, intermittent abdominal pain, irritability, sleep disturbance, failure to respond to conventional reflux medications	Clinical history; SPT ² ; endoscopy and biopsy; elimination diet and challenge
Allergic eosinophilic gastroenteritis	IgE ¹ - and/or cell-mediated	Recurrent abdominal pain, irritability, early satiety, intermittent vomiting, failure to thrive and/or weight loss	Clinical history; SPT ² ; endoscopy and biopsy; elimination diet and challenge
Food protein-induced proctocolitis	Cell-mediated	Gross or occult blood in stool; typically thriving; usually presents in first few months of life	SPT ² negative; elimination of food protein results in clearing of most bleeding within 72 hours; +/- endoscopy and biopsy; challenge induces bleeding within 72 hours
Food protein-induced enterocolitis	Cell-mediated	Protracted vomiting and diarrhoea (bloody) not infrequently with dehydration; abdominal distention, failure to thrive; vomiting typically delayed 1–3 hours post feeding	SPT ² negative; elimination of food protein results in clearing of symptoms within 24–72 hours; challenge induces recurrent vomiting within 1–2 hours, ≈15% develop hypotension
Food protein-induced enteropathy, e.g. coeliac disease (gluten-sensitive enteropathy)	Cell-mediated	Diarrhoea or steatorrhoea, abdominal distention and flatulence, weight loss or failure to thrive, € nausea and vomiting, oral ulcers	Endoscopy and biopsy IgA; elimination diet with resolution of symptoms and food challenge; coeliac disease: IgA anti-gliadin and anti-transglutaminase antibodies

¹ IgE - immunoglobulin E² SPT - skin prick test³ RAST - radioallergosorbent testSource: Sampson HA^{41,66}

1.6.4. Causal food allergens

Allergens are the antigenic molecules which provoke the allergic reaction and they tend to be proteins. A food contains different proteins and therefore different potential allergens which may or may not result in clinical manifestations.⁷⁸⁻⁸¹

Although any food can provoke a clinical reaction, relatively few foods are responsible for the vast majority of significant food-induced allergic symptoms (Table 1.4). Multiple food allergies are rare, and oral food challenge confirms allergy to no more than one or two foods, while a dozen foods or so account for most food hypersensitivities. In infants and young children the most common food allergens include milk, egg, peanuts, wheat and soya. In older children, peanuts, tree nuts, fish, shellfish, fruit vegetables and spices are the most common culprits.^{1,5,8,30-32,78,81} In the USA, the frequency of reactions to various foods in young children is estimated at 2.5% for cow's milk, 1.3% for egg, 0.8% for peanuts, 0.4% for wheat, 0.4% for soya, 0.2% to tree nuts, 0.1% to fish and 0.1% to shellfish.⁵

Table1. 4: Common food allergens

Food	Infants/Young children	Older Children and Adults	Anaphylaxis
Milk (cow/goat)	X		X
Chicken egg	X		X
Soy	X		
Peanut	X	X	X
Tree nuts (walnut, hazel/filbert, cashew, pistachio, Brazil , pine nut, almond)		X	X
Wheat	X		
Fish		X	
Shellfish (shrimp, crab, lobster, oyster, scallops)		X	X
Fruit		X	X
Vegetables		X	X
Seeds (cotton, sesame, psyllium, mustard)		X	X
Spices		X	

Source: Motala C¹³

Unusual food allergens, which have previously been overlooked, are increasingly being identified and associated with certain specific allergic conditions e.g. allergy to seeds such as sesame and potato allergy in children with persistent atopic dermatitis.^{1,5,8,30-32,78,81} Allergies to different types of foods display marked geographic variations with some allergic reactions being specific to certain countries or regions only e.g. mustard allergy in France, bird nest soup allergy in Singapore.¹⁴

Health professionals need to be aware of the fact that patients can come into contact with allergens through different routes of exposure other than food ingestion which may lead to food-related symptoms. These could include, skin contact and use of cosmetics containing the problem allergen, inhalation of fumes or food particles e.g. cooking egg or baking with flour or through breastmilk.

The allergenicity of foods may be destroyed, reduced or even enhanced by various methods of preparation such as heating, cooking, digestion or other denaturing e.g. enzyme hydrolysis (heat labile or stable). This better understanding of food allergenicity may have a significant impact on the practical application of elimination diets requiring the removal of certain foods.^{1,5,78-83}

Concordant allergies may exist between foods that are biologically unrelated. The association between cow's milk and soya allergy is well recognised - a proportion of infants who have cow's milk protein allergy (more likely delayed, non-IgE mediated reactions) are also allergic to soy protein.⁸⁴⁻⁸⁶ In young children with cow's milk protein allergy, soy protein allergy has been recorded to occur in between 17% and 47% of cases.⁸⁵ It is unclear whether this occurs as a co-allergy in otherwise food-allergic infants, or as a consequence of cross-sensitisation.⁸⁵

Many different food proteins share the same molecular profile allowing antigenic and allergenic cross reactivity. Cross reactivity exists between mammalian milk proteins, specifically cow's, goats and sheep. Only the whey fraction in the goat's milk differs from that in the cow's milk.^{1,5,78-83} Goat's milk is tolerated by only 10% of infants with cow's milk protein allergy due to IgE cross-reactivity.²⁵

Cross reactivity may also exist between inhalant and food allergens. (Table 1.5) A severe allergy to pollen can indicate that an individual may be susceptible to developing the oral allergy syndrome or anaphylaxis when eating certain foods. Such reactions are due to profilins, homologous proteins found both in pollens and plants and fruits, and to a lesser extent, other panallergens. Oral allergy syndrome also has been reported following ingestion of crustaceans by individuals who are sensitive to house dust mites.¹³

Table1. 5: Typical cross reactivity associations between inhalant and food allergens

Inhalant Allergen	Food Allergens
Birch pollen	Apple, raw potato, carrot, celery, hazelnut, pear, peach, plum, cherry
Mugwort pollen	Celery, apple, peanut, kiwi fruit, carrot, parsley, spices (fennel, coriander, aniseed, cumin)
Ragweed pollen	Melons, e.g., watermelon, cantaloupe, and honeydew, bananas
Latex	Avocado, kiwi fruit, chestnut, papaya, banana
Chironomidae	Crustaceans (shellfish)

Source: *Motala C*¹³

Evidence of cross reactivity as demonstrated by laboratory allergy testing or serological testing e.g. serum specific IgE or skin prick tests, does not necessarily indicate clinically relevant cross reactivity which is not very common. Incidence of cross reactivity is extremely food and individual specific.^{1,5,78-83} Thus avoidance strategies based on presumed cross-reactions between different proteins are usually unnecessary.⁸⁷ Cereals, legumes, and fish are examples of foods for which complete elimination of all members of the botanical or zoological family is not needed. Bovine milk and beef share common antigens and cross-reactivity because of amino acid sequence homology could support elimination.^{88,89} Nutritionally and economically, dairy products and beef are important protein sources in the Western diet. Cow's milk allergy is more common than beef allergy.⁸⁸⁻⁹⁰ One study found 20% of children with cow's milk allergy to also be allergic to beef.⁸⁹ By comparison, almost all children allergic to beef are allergic to cow's milk.^{88,90}

1.6.5. Diagnosis of food allergy

Although the field of allergy has advanced tremendously, diagnosis and management of these disorders still remains difficult and knowledge in the area is often lacking from health professionals having to deal with it.⁴⁵ Symptoms of non-allergic food-related reactions may mimic allergic responses, making identification of food allergies difficult as various differential diagnoses may need to be considered.⁶⁹ A correct and accurate diagnosis will not only instil trust in the medical practitioner but also hopefully ensure better patient compliance to treatment and improved quality of life for both the family and patient. It is especially important in children to avoid unnecessary exclusion diets which may contribute to impaired growth and development.

Food allergy is unpredictable and may be extremely individual in its manifestation. A systematic approach to diagnosis is advocated, which includes a careful clinical history (medical and dietary) and physical examination, followed by laboratory studies (SPT and serum tests for food specific IgE antibodies), trial elimination diets and often oral food challenges to confirm a diagnosis.^{5,32,91,92}

The clinical history can be considered the most important factor in diagnosing food allergy. It should attempt to determine the possible causal food or foods, quantity ingested, type of reaction, time course of reaction, confounding factors (e.g. exercise and/ or medication ingestion, environmental factors, hidden allergens, cross reactivity, allergen contamination) and reaction consistency (Table 1.6).^{5,32,69,92} A food-symptom diary, which is

not dependent on the patient's or parent's memory, may be a helpful adjunct to the medical history, where the patient keeps a chronologic record of all foods ingested (types and quantities) during a specified period and records any symptoms experienced during this time.

Ancillary tests should be considered valuable adjuncts to patient history in order to confirm or guide towards the correct diagnosis.⁶⁹ For IgE-mediated disorders, SPT and food-specific serum IgE concentrations (e.g. CAP RAST) may provide a rapid means to detect sensitisation as well as adding important information to a clear clinical history and consideration of the disease pathophysiology.^{5,68} A positive test response assessed in isolation however, does not necessarily prove that the food is causal.⁵

Table1. 6: Medical history in a workup for food allergies

Question	Possible significance
What is the suspected food allergen?	Consider whether the allergen is typical for the patient's age and population.
Was the suspected food allergen ingested, inhaled, or touched?	A proportion of patients have a reaction after inhalation of or contact with the allergen
Does the patient have an aversion to the suspected allergen?	Generally patients dislike and refuse food containing the allergens
How soon after exposure to the suspected food allergen did the symptoms occur?	IgE-mediated allergic reactions usually occur within 20 minutes after the exposure and certainly within 2 hours after the exposure
What are the specific symptoms and how severe are they?	If the symptoms are not typical of food allergy, consider a differential diagnosis; if the symptoms are severe, alterations of the emergency management plan may be necessary
How long did it take for the symptoms to resolve?	The typical time to symptom resolution after reaction to food is 4-12 hours
How reproducible are the symptoms with previous or subsequent ingestion?	A patient is unlikely to have a reaction to a food just one time, although reactivity may vary depending on factors such as preparation (e.g. depending on whether the egg is raw or cooked and how much antigen it contains)
Does exercise precipitate the symptoms?	Exercise that precipitates symptoms may suggest a diagnosis such as food-dependent, exercise-induced anaphylaxis.*

* In food-dependent, exercise-induced anaphylaxis, a patient tolerates a specific food without a clinical reaction and separately tolerates exercise. If the food is eaten within 2 hours before or after exercise, anaphylaxis may occur.

Source: Lack G⁹³

1.6.5.1. Skin-prick tests (SPT)

SPT are regularly used to screen patients for sensitivity to specific foods. Allergens eliciting a wheal diameter at least 3 mm larger than that produced by the negative control are considered positive, suggesting the patient has been sensitised to that allergen, and a possibility that the patient has symptomatic reactivity to the specific food. Strongly positive results (e.g. median wheal diameter > 8-10 mm) indicate a greater likelihood of clinical reactivity. The diameter size of the skin-prick test wheal does not necessarily predict clinical severity.^{25,94}

Negative skin test responses essentially confirm the absence of IgE-mediated allergic reactivity (negative predictive accuracy > 95%) and are extremely useful for excluding IgE-mediated food allergies.^{1,5} Positive skin test responses, generally suggest the presence of clinical food allergy and in some clinical situations when combined with a recent and clear-cut history of a food-induced allergic reaction to the food in question, may be considered confirmatory.^{1,5} A number of factors may negatively affect the acceptability or use of skin testing. These could include defective techniques, decay of allergen in the test material, concurrent use of antihistamines, severe eczema or dermatographism, or in rare cases sensitivity to a specific allergen found in low concentration or not present in the skin-prick test extract.⁶⁹ Of note is the inadequacy of commercially prepared extracts for evaluating allergy to fruits and vegetables due to the lability of the responsible allergen. In these cases, fresh food is preferred for skin testing.^{1,5,95}

1.6.5.2. Food-specific IgE antibody levels

Serum tests to determine food-specific IgE antibodies (e.g. RASTs or quantitative measurements of food-specific IgE antibodies, such as the CAP System FEIA or UniCAP) provide the other means of evaluating IgE-mediated food allergy reactions. These tests are particularly useful when SPT cannot be done (e.g. due to extensive dermatitis or dermatographism), or when antihistamines cannot be discontinued.²²

The presence of allergen-specific IgE reflects allergic sensitisation and not necessarily clinical allergy.²² Reporting IgE may be categorised by the laboratories in the form of classes (Class 1 to 6).⁴ This is not considered totally reliable and the numerical values in conjunction with a highly suggestive history, are considered more relevant. The magnitude of serum specific IgE tests do not necessarily predict clinical severity (no difference found between minor urticaria and anaphylaxis)⁹⁴, although increasingly higher concentrations of food-specific IgE correlate with an increasing likelihood of a clinical reaction.⁹⁶⁻⁹⁸ Multiple factors, such as the patients' age, duration of food allergen avoidance at the time of testing, and other clinical disorders of the patient may affect sensitivity of the test in predicting clinical reactivity.²²

Both methods present with problems in interpretation although SPT may be slightly more reliable than serum specific IgE (CAP RAST) in confirming allergy. Up to 46% of individuals tolerant to a nut will have positive SPT (\geq 3 mm) due to being sensitised but not allergic. It is difficult to predict clinical reactivity from results in a wide 'grey area' of SPT when wheal diameters are 3 to 7 mm.^{94,99} Undetectable allergen specific serum IgE levels occasionally occur in patients with IgE-mediated food allergy.²² Approximately 22% of negative CAP RAST tests

are falsely reassuring and 40% of positive CAP RAST results are misleading.⁹⁴ Patients with SPTs ≥ 8 mm and serum specific IgE levels ≥ 15 kU/L are rarely tolerant so these levels can almost always (in $\geq 95\%$) be considered diagnostic.⁹⁴

Due to the limited reliability of these tests, the importance of the individual's history must be emphasized as it is essential for establishing an accurate diagnosis.⁹⁴

1.6.5.3. Specificity of tests in predicting outcomes of food challenges

Recent diagnostic decision points for food-specific IgE concentrations, based primarily on studies of children in the United States, and skin-prick tests can be used with relative reliability, as a guide in predicting clinical reactions and the outcomes of double blind placebo controlled food challenges (DBPCFC). In the USA, these values have facilitated replacing the need for oral food challenges approximately by half and minimising potential risks associated with oral food challenges and ultimately reducing healthcare costs. They also have allowed for more accurate elimination of only specific offending allergens thus helping to alleviate the potential risk of further disadvantaging a child who may already be nutritionally compromised. Multiple food allergies could therefore be confirmed by DBPCFC tests only if necessary and when indicated.^{5,32,41,92,96,97,100-102}

Cut-off values for SPT (Table 1.7) and specific IgE concentrations (Table 1.8) may be 90-100% predictive of a positive challenge result to the food allergen concerned but not necessarily for clinical sensitivity.^{41,92,103} Although these values are extremely useful, approximately 50% of food allergic children will react to food challenges at concentrations below the suggested cut-off levels i.e. a positive test result is associated with true clinical reactions only approximately 50% of the time.^{91,104} It is therefore inappropriate to state that levels below the decision point levels represent a 'negative' result.^{41,91,92,103} Undetectable serum food-specific IgE levels might be associated with clinical reactions for 10% to 25% of cases.⁹⁶ It is also important to note that these decision points are country-specific and were primarily evaluated in the context of atopic eczema, thus their clinical value for predicting reactions in children who present with other symptoms is uncertain.

The clinical utility of SPT and serum food specific IgE have been evaluated in various referral populations.^{41,91} Results vary between study populations and generalized use should be cautioned as these values are country and population specific. Available predictive values were determined mainly in context of patients with eczema. They are therefore not globally relevant but may be helpful as a guide to understanding an individual's possible risk for clinical reactivity. They should be used in combination with a patient's individual medical, diet and symptom history. New studies are attempting to generate different predictive values while accounting for factors such as age, diet, disease and challenge protocol.⁹⁸ The results are most valuable when they are negative, since the high sensitivity makes them approximately 95% accurate for ruling out IgE-mediated reactions.⁹¹

Table1. 7: Skin prick testing: 100% positive predictive value

Food	100% PPV ¹ ≤ 2 yrs (Wheal diameter)	100% PPV ¹ ≥ 2 yrs (Wheal diameter)
Cow's milk	6 mm	≥ 8 mm
Egg	6 mm	≥ 7 mm
Peanut	4 mm	≥ 8 mm

¹ PPV - Positive predictive value

Source: Motala C^{100,103}, Sporik et al.¹⁰⁵

Table1. 8: Predictive value of food allergen-specific IgE levels

CAP-RAST System FEIA ² : 90-100% specificity decision points				
Allergen	Decision point (kU/l)	PPV ³ (%)	Sensitivity (%)	Specificity (%)
Milk	15	95	57	94
(Infants ≤ 2 yrs) *	5	95		
Egg	7	98	61	98
(Infants ≤ 2 yrs) **	2	95		
Peanut	14	100	57	100
Fish	20	100	25	100
Treenuts ***	≈15	≈95		
Soybean	30	73	44	94
Wheat	26	74	61	92

¹ IgE - Immunoglobulin E

² CAP-RAST System FEIA - CAP System fluorescent-enzyme immunoassay

³ PPV - Positive predictive value

* Garcia-Ara C et al.⁹⁶

** Bayano MT et al.¹⁰⁶

***Clark AT et al.⁹⁴

Source: Sampson HA¹, Motala C^{100,103}

In clinical practice, the interpretation of allergy test results and the information given to patients should be differentiated according to factors such as age, magnitude of sensitisation (number of allergens that tested positive, specific IgE levels), geographical circumstances, and when there is more than one sensitising allergen, the effect of the allergen load. Combining the sum of IgE antibody concentrations for those allergens for which a patient tests positive with the number of positive allergen tests may represent a more efficient diagnostic tool than single positive IgE antibody tests alone.⁷⁷ Diagnosing the nature of a specific allergy is useful for obtaining an estimate of prognosis, especially in young children.⁷⁷

Features considered favourable for a child to have outgrown a specific allergy include a reduced or small skin test result (< 6 mm to negative); a period of approximately one to two years with no reactions (this may vary

depending on type of allergic food); a history of only mild reactions; a decreasing trend for food-specific IgE levels, and few additional atopic diseases.⁹¹ Persistence of a positive skin-prick and/ or serum test for food specific IgE does not necessarily indicate persistent food allergy since these tests can remain positive even when the patient is no longer clinically sensitive. Reliance of these tests alone may unnecessarily prolong the period of dietary exclusion. An oral food challenge, under specialist supervision, is usually required to prove that the food allergy is no longer present.^{91,107}

In a patient with a history strongly suggestive of a non IgE-mediated food allergic reaction, a food challenge should still be performed regardless of the SPT result or food-specific IgE measurement. Elimination-challenge testing (blinded or open), individualised for the patient's situation and condition, remains the best way to establish whether a patient is truly allergic to a food or not.^{41,92,103}

1.6.5.4. Atopy patch test (APT) and Cellular antigen stimulation test (CAST)

More recently, the atopy patch test is increasingly showing promise for diagnosing non IgE-mediated allergy (particularly atopic dermatitis and allergic eosinophilic oesophagitis) although there are currently no standardised reagents, methods of application, or interpretation.^{1,5} Endoscopy and biopsy are the most definitive approaches for diagnosing many of the gastrointestinal hypersensitivities. Diagnosis of allergic eosinophilic oesophagitis where the pH probe is normal and the patient is non-responsive to antireflux medication, can be made when eosinophil levels in the oesophagus are greater than 10 to 20 eosinophils per 40X high-power field.⁷⁰ Eosinophils are normally present in the gastric and intestinal mucosa, and therefore eosinophil numbers must be greater to make the diagnosis of allergic eosinophilic gastroenteritis.¹

A CAST measures both IgE and non-IgE mediated leukotriene release by means of an enzyme-linked immunosorbent assay (ELISA) test. It is useful for detecting non-IgE mediated sensitivity specifically to food additives, preservatives and drugs. It can also confirm IgE-mediated sensitivity but is considered less efficient than food-specific IgE and SPT.¹⁰⁸

1.6.5.5. Double blind placebo controlled food challenge (DBPCFC)

A DBPCFC is still considered the reference standard for diagnosing food hypersensitivities, whether IgE or non-IgE mediated.^{23,109} Historically and even now, food challenges tend to be met with some reservation probably due to the mystery surrounding their implementation methods. Various attempts have recently been made internationally to standardise the three different food challenge methods namely, open-, single blind-, and double blind food challenges. (Table 1.9)²³

Table1. 9: Types of oral food challenges

Type of Challenge	Technique
Open challenge	<ul style="list-style-type: none"> • Food given in natural state and in normal serving size • Staff, patient and family aware what food is given • Open to bias
Single blind	<ul style="list-style-type: none"> • Food hidden in vehicle (safe) or in capsule • Staff know what food is given but neither patient nor family informed • Negative challenge must be followed by open challenge • Bias reduced
Double blind	<ul style="list-style-type: none"> • Food hidden in vehicle (safe) or in capsule • Patient, family and staff administering challenge not aware whether challenge food or placebo given • If delayed reaction suspected, protocol must be adjusted to monitor for longer time • Negative challenge must be followed by open challenge • No bias

Source: Motala C, Stear GJ²³

Despite attempts to make a uniform international protocol for performing oral food challenges, no consensus has been reached and many published studies have variations on a general theme.^{92,109-114} Every patient has individual needs making standardisation of a single protocol extremely difficult. To maximise reliability and minimise risk in any particular patient, the various steps for preparing and administering the food challenge usually require individualisation.¹¹²

Challenge testing is necessary in various settings for establishing a more definitive classification of patient sensitivity. It is performed for establishing or excluding a true food allergy, for scientific reasons in clinical trials, for enabling determination of the sensitivity of the actual patient (threshold value), for determining allergenicity of foods, and to determine whether a patient has outgrown his/ her allergy.^{109,112,114} A negative blinded test result should always be followed by an open, supervised challenge where a typical serving of the test food is ingested. This will rule out a false negative food challenge which may occur in 1-3% of cases.^{1,5,92,109-114}

Ultimately, a negative SPT response, a physician-supervised food challenge result or both are necessary to confirm the absence of clinical allergy.⁵ The general aims of diagnosis should be to determine if food is causing the disorder under evaluation and if so, to identify specific causal food/s. A proper and specific diagnosis will not only allow the patient to receive accurate instructions regarding avoidance of problematic foods but also prevent unnecessary and potential deleterious dietary restrictions when a suspected food allergy is not present. (Figure 1.2)^{91,114}

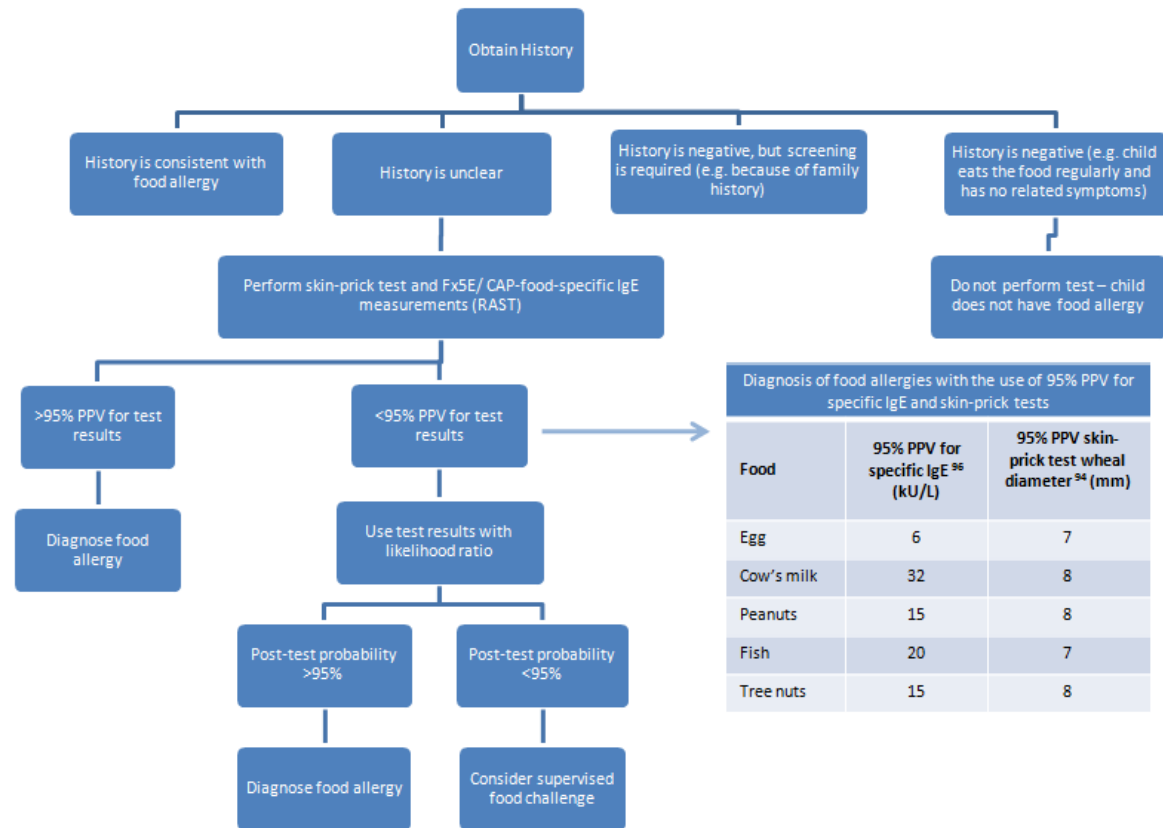


Figure 1. 2: Diagnostic algorithm for food allergy (Adapted from Lack⁹³)*

**This treatment algorithm can be used for any food allergy if the test result associated with a positive predictive value (PPV) of >95% and if the likelihood ratio is known for a given test result. A double-blind, placebo-controlled food challenge should not be performed if the patient has a history of severe anaphylaxis. In the skin-prick test, the mean wheal diameter obtained depends in part on the age of the patient, the extract used, the method of performing the test, and the site on the body where the test is performed. Values for specific types of tree nuts have not been validated.*

Source: Motala C, Hawarden D¹¹⁵

1.6.6. Complementary and alternative allergy testing

In South Africa a number of unvalidated tests are promoted by complementary and alternative (CAM) practitioners. Many of the tests sound plausible, superficially but they are based on unproven theories and explained with simplistic physiology. Most of these tests diagnose non-existent illnesses, are expensive, do not consider patient history, may lead to unnecessary anxiety, and divert attention from actual allergies, thus delaying conventional treatment that may offer genuine allergy relief.⁴³ The tests may lead to unsubstantiated elimination of a significant number of nutritionally important foods. This could have detrimental nutritional implications particularly in children as well as placing further financial and emotional strain on the family and individual.⁴³ Some commonly used "allergy tests" are briefly described in the ensuing subsections, all of which have no convincing evidence to substantiate their usefulness in diagnosing allergies:

1.6.6.1. Leucocytotoxic test (Bryan's or ALCAT test)

The basis of the test is that if the patient's white blood cells are mixed with the offending allergen, they swell. The test then measures any swelling of the leukocytes and if a certain threshold of swelling is measured, using a Coulter counter, a positive result is recorded. A large number of allergens are tested for and patients are usually positive to a number of foods, additives and other agents. Studies to date have shown the ALCAT test to have no diagnostic accuracy.^{43,116}

1.6.6.2. IgG ELISA allergy test

This test measures IgG antibodies to various foods (it may be confused by the general public with IgE antibody testing in conventional RAST and UniCAP). Most people develop IgG antibodies to foods they eat and this is a normal non-specific response. The IgG response may even be protective and prevent the development of IgE food allergy. In some instances, specific IgG to foods may even be considered predictive of clinical tolerance. There is no convincing evidence to suggest that this test has any value in diagnosing food allergy or intolerance.^{43,116} The exception is gliadin IgG antibody, used in monitoring adherence to a gluten-free diet in patients with histologically confirmed coeliac disease.¹¹⁶

1.6.6.3. Applied kinesiology (muscle testing)

This test relies on energy fields within the body to diagnose allergy and intolerance. The patient's muscle strength is tested when the allergen is placed in a vial in front of them. The patient holds out an arm and the practitioner applies a counter pressure. If the patient is unable to resist this, the test is considered positive to that allergen. There is no convincing evidence that this test has any useful role to play in allergy diagnosis.⁴³

1.6.6.4. Vega testing (electrodermal testing)

Also known as Dermatron, BEST and Quantum, this involves measuring electromagnetic conductivity in the body using a Wheatstone bridge galvanometer. The patient has one electrode placed over an acupuncture point and the other electrode is held while a battery of allergens and chemicals are placed in a metallic honeycomb. A fall in the electromagnetic conductivity or a 'disordered reading' indicates an allergy or intolerance to that allergen. The VEGA tests have no reproducibility or diagnostic accuracy.⁴³

1.6.6.5. Hair analysis testing in allergy

Hair is analysed for allergies in two ways. Firstly, it is tested for toxic levels of heavy metals (e.g. lead, mercury and cadmium) and then deficiencies of selenium, zinc, chromium, manganese and magnesium. There is no scientific evidence to support the hypothesis of heavy metal causing allergy. Secondly, the practitioner swings a pendulum over the hair and an allergy is diagnosed if an altered swing is noted. Studies have failed to find any accuracy in hair analysis diagnosing allergies.⁴³

1.6.6.6. *Provocation -neutralisation tests*

The allergen is applied sublingually, or by skin injection. Increasing test doses are given until a wheal appears on the skin (provocation dose). The dose is then decreased until the wheal disappears (neutralisation dose). This is then used to treat the allergy and 'desensitise' the patient. This test has also not been validated by studies and has no diagnostic reliability in allergy or treatment. This method may lead to anaphylaxis in some individuals.⁴³

1.6.6.7. *Live blood analysis*

The finger is pricked and a fresh blood specimen is examined under the light microscope for blood cell 'deterioration', rare parasites, or coagulation disorders. It is impossible to determine parasitaemia, bacteraemia or coagulation abnormalities on a drop of blood, without specialised stains and testing methods.⁴³

1.6.7. Natural progression of food allergies

The natural history of specific foods varies considerably i.e. whether a food allergy will be outgrown or not (Table 1.10). Early childhood allergies (diagnosed prior to 3 years of age) to milk, egg, soy and wheat tend to resolve by 3 to 5 years of age or school-going age.^{5,41,91} About 80-85 % of young children with milk and egg allergies have been shown to outgrow their allergy and develop clinical tolerance in the first 5 years of life⁴¹ although there have been reports of some children still reacting well into their teens.¹⁵ Recently, a cohort study in the UK established that 80% and 50% of children outgrew their cow's milk allergy and egg allergy respectively, by 3 years of age.³⁶

The prognosis of cow's milk allergy has been found to be good with 40-45% of cases resolved at 1 year, 60-75% at 2 years and 85-90% at 3 years of age.¹¹⁷

Peanut, tree nut and seafood allergies are usually permanent, however up to 20% of young children diagnosed with peanut allergy outgrow their allergy by aged 5 years.^{1,5,41,91,118-120} It is estimated that less than 10% of those with tree nut allergies acquire tolerance.¹¹⁰ Peanut allergy can recur, with one study finding a recurrence rate of 8%.¹²⁰ In children under the age of 5 years, this figure may even be as high as 50%.¹²¹

It would seem that individuals who produce high levels of IgE have more persistent food allergies while those with moderately raised food-specific IgE levels have more transient food allergies and are more likely to 'outgrow' them with age.⁹ Lack of exposure to a food for which oral tolerance has developed may result in recurrence of the original allergy.⁵ Health professionals need to be aware that food allergies can be resolved and hence the need for regular patient follow-up in order to implement oral food challenges to assess a child's individual oral tolerance to a specific food over time. This would minimise prolonged restriction diets and help ensure that a child is not unnecessarily labeled 'food-allergic'.

Table1. 10: Natural history of food allergy and cross-reactivity between common food allergies

Food	Usual age at onset	Cross-reactivity	Usual age at resolution
Hen's egg white	6-24 months	Other avian eggs	7 years (75% of cases resolve) *
Cow's milk	6-12 months	Goat's milk, sheep's milk, buffalo milk	5 years (76% of case resolve) *
Peanuts	6-24 months	Co-reactivity with tree nuts; Infrequent co-reactivity with other legumes ¥	Persistent (20% of cases resolve by 5 years)
Tree nuts	1-7 years; in adults, onset occurs after cross-reactivity to birch pollen	Other tree nuts; co-reactivity with peanuts	Persistent (9% of cases resolve after 5 years)
Sesame seeds	6-36 months	None known; co-reactivity with peanuts and tree nuts	Persistent (20% of cases resolve by 7 years)
Fish	Late childhood and adulthood	Other fish (low cross reactivity with tuna and swordfish)	Persistent †
Shellfish	Adulthood (in 60% of patients with this allergy)	Other shellfish	Persistent
Wheat ‡	6-24 months	Wheat allergy - other grains containing similar panallergens Coeliac disease - other grains containing gluten	5 years (80% of cases resolve)
Soybeans ‡	6-24 months	Other legumes (low frequency)	2 years (67% of cases resolve)
Kiwi	Any age	Banana, avocado, latex	Unknown
Apples, carrots, peaches §	Late childhood and adulthood	Birch pollen, other fruits, nuts	Unknown

* Recent studies suggest that resolution may occur at a later age

¥ In vivo, existence of co-reactivity between peanuts and other legumes (lentils, peas) may often be indicated but this is clinically infrequent

† Fish allergy that is acquired in childhood can resolve

‡ Although IgE-mediated allergies to wheat and soybeans are frequently suspected food allergies, in practice these diagnoses are rarely confirmed after evaluation by a specialist

§ Allergy to apples, carrots, and peaches (oral allergy syndrome) is commonly caused by heat-labile proteins. Fresh fruit causes oral pruritus, but cooked fruit is tolerated. There is generally no risk of anaphylaxis, although in rare cases, allergies to cross-reactive lipid transfer protein can cause anaphylaxis after ingestion of fruits and vegetables. This type of cross-reaction is region specific and is uncommon in parts of the Mediterranean e.g. Spain and Southern Italy.

Source: Lack G⁹³

1.6.8. Eczema and food allergy

The possible link between eczema and food allergies in children has been controversial in the past. Although the strongest risk factor for developing atopic disease still seems to be a family history, environmental and dietary factors may modulate the disease presentation.¹¹

There is now a well-documented link between the presence of early eczema in childhood and the development of food allergy, especially peanut, egg, and milk allergies. Between 33% and 81% of children with infantile eczema have been found to have IgE-mediated food allergy^{14,122,123} while approximately 35% of young children with moderate to severe atopic dermatitis have a confirmed food allergy.^{5,124} Eczema severity in the first year of life is associated with the development of egg, milk, and peanut allergies.^{14,55} The risk of egg, milk, or peanut allergy in infants was recently found to be almost twice as high if eczema was present in the first 6 months of life compared with the second 6 months of life. Peanut allergy risk seemed to increase over this period with more severe eczema.^{14,55,125}

Food hypersensitivity has been shown to increase eczema severity, mainly among younger children.^{68,73-76} A personal and/ or family history of atopy should raise suspicion of food allergy. It should also be considered in any child with moderate to severe atopic dermatitis with persistent symptoms despite standard therapy or requiring high-potency topical steroids in order to be controlled. The more severe the atopic dermatitis, the more likely it is that food is involved in the pathogenesis. Egg, milk, peanut, wheat and soya are the most common foods implicated as triggers of atopic dermatitis.¹²⁶

1.6.9. Management of food allergy

In general, there are four approaches to the management of allergic conditions: avoidance, education, pharmacotherapy and immunotherapy.⁹¹ Food allergies however are unique as there are no pharmaceutical interventions to completely prevent or cure these hypersensitivity reactions.¹²⁷ Currently, the primary modality of treatment of food allergies includes appropriate avoidance of the causal food allergen/s by means of a strict but nutritionally adequate elimination diet, which focuses on potential dietary insufficiencies, under the supervision of a registered dietitian; educating the patient (and parent) on avoidance of the responsible allergen with consideration for alternative sources of nutrition; and to initiate therapy in case of unintended ingestion e.g. self-injectable epinephrine.^{5,32,91,121,128,129} Success of the elimination diet is dependent upon the correct identification of the allergen/s and complete exclusion of these allergen/s from the diet.^{23,91} An accurate diagnosis must be made in order to determine if food is causing the disorder under evaluation and if so, to correctly identify the specific causal food/s. A proper and specific diagnosis will not only allow the patient to receive accurate instructions regarding avoidance of problematic foods but also prevent unnecessary and potentially deleterious dietary restrictions when a suspected food allergy is not present.⁹¹

1.6.9.1. Food elimination

Successful exclusion of identified dietary allergens requires extensive education of ingredient labels of commercial products and an appreciation for issues of cross-contact in settings such as restaurants and commercial manufacturing.^{91,128,129,130} The child and family's quality of life must also be considered and the nutrition care plan should be realistic and practical to minimise emotional and psychological aspects associated with elimination diets.^{23,32,128,131-138} Non-compliance could inadvertently lead to an unnecessary

lengthening of time on a particular elimination diet. Regular assessment of the quality of the diet as well as the degree of compliance is necessary to prevent future problems in growth and development.^{23,128}

In recent years, recognition and a better understanding of the many different proteins that may be responsible for an individual's food allergy has meant that restriction diets may be less restrictive than previously advocated. Some children who are allergic to either cow's milk and/ or egg may tolerate either protein when extensively heated e.g. as an ingredient in a baked product or when boiled at high temperatures. This has meant that elimination diets may be more varied, palatable, practical and acceptable to the patient thus improving overall compliance. Current research is attempting to determine who may tolerate baked forms and the specific implications of including these foods in the diet.¹³⁹⁻¹⁴¹

Most childhood food allergies resolve, mandating regular monitoring. Patients should be reevaluated intermittently to determine whether the allergy persists, thus allowing verification for continued food avoidance or the potential discontinuation of restriction diets with the safe inclusion of the particular food back into the diet.^{5,23,91,92}

Doctors need to work closely with dietitians when implementing dietary restrictions to ensure that the correct foods are avoided and that suitable alternatives are selected to provide balanced nutrition to maintain the child's nutritional status.

1.6.9.2. Pharmacotherapy

A number of medications have been prescribed for the treatment of food allergy. These include anti-inflammatory medication such as H₁ and H₂ antihistamines, ketotifen, corticosteroids and prostaglandin synthetase inhibitors. These drugs may modify allergic symptoms but, in general, are minimally effective and sometimes have unacceptable side effects. Oral sodium cromoglycate has been used but conflicting results are reported.¹⁰⁰

Generally, the pharmacotherapy of food allergies centres around emergency treatment for patients who are inadvertently exposed to food allergens to which they have previously had a reaction. Epinephrine is the treatment of choice for anaphylactic reactions, in general, and food-induced anaphylaxis in particular. Delayed administration of epinephrine is associated with poor outcomes thus injectable epinephrine with clear instructions for correct use (including self-injection) should be given to any patient with a history of an immediate systemic IgE-mediated reaction to food for administration early in the treatment of an anaphylactic reaction.^{32,59} As a guide, candidates considered eligible for prescription of self-injectable epinephrine may include: those with prior food allergic reactions involving the respiratory or cardiovascular system; persons with generalized urticaria/ angioedema to foods; individuals with allergy to peanut, nut or seafood; persons with food allergy and a family history of others with severe food-allergic reactions; and food-allergic individuals with asthma of any severity and a history of wheezing.³²

1.6.9.3. *Novel approaches to treatment*

There is promising evidence that the onset of the sensitisation phase as well as the degree of inflammation can be modulated by nutritional factors. To date, however the use of probiotics, particular fatty acids (omega 3 polyunsaturated fatty acids), antioxidants (vitamin C and β -carotene) and vitamins (vitamin D), with properties influencing immunoregulatory pathways, in treating food allergies have not shown conclusive benefit. More studies are needed to further evaluate the underlying mechanism of mucosal tolerance induction.¹⁴

An increased understanding of the mechanisms involved in tolerance has shifted the focus of food allergy treatment towards inducing tolerance. Patients whose allergies are likely to persist, as well as those who are susceptible to food allergies, are potential candidates for allergen immunotherapy. Injection of food allergens has been explored as a mechanism for immunotherapy, but the technique has been found to be unsafe.¹¹ Several alternatives to antigen injection, including injection with engineered antigen or ingestion of antigen through the gastrointestinal route, are currently being evaluated.¹¹ Immunization with engineered peanut protein allergens that have altered IgE-epitope binding sites is a strategy that has showed positive results in mice.¹¹ Patients receiving immunotherapy for pollen allergy may lose their oral allergy syndrome.¹⁰⁰

An increasing number of studies are investigating sublingual and oral immunotherapy (SLIT and OIT) for the treatment of food allergies through the effective reduction of sensitivity to a specific allergen. Both methods generally involve administering small (usually micrograms, milligrams, grams) yet increasing doses of antigen in a controlled setting followed by regular home dosing of a maximum tolerated amount of antigen. Treatment is then followed by an open or blinded food challenge with antigen or placebo. Although these treatment modalities show promise, it is necessary to understand side-effect profiles and safety, long-term efficacy, and especially whether they induce transient desensitisation or more permanent oral tolerance.^{11,139}

1.6.10. Vaccinations and food allergy

The measles vaccine forms part of the routine vaccination programme for children worldwide. In South Africa, it is given as a monovalent vaccine at nine and eighteen months of age.²⁵ A common and unfounded misperception exists amongst the lay public and health professionals that an egg allergy is a contra-indication for administration of the measles or measles, mumps and rubella (MMR) vaccine. It is believed that the vaccine contains egg which may cause a reaction in egg allergic children. It is in fact grown on cultured chick fibroblasts and does not contain egg protein.^{142,143}

Studies have shown that the number of egg allergic children that react to the vaccine is low and parents should rather be advised to ensure that their children's immunizations are up to date.^{32,142,143} The influenza and yellow fever vaccines are however prepared in hen's eggs and are contraindicated in severe egg allergy.²⁵

1.6.11. Prevention of food allergy

A family history of atopy or early evidence of allergy or sensitisation in infants identifies a child at risk for atopic disease and provides health practitioners an opportunity for prevention. Although both dietary and environmental allergen avoidance have shown positive effects, the prevention effect of isolated dietary interventions remains questionable.¹⁵ In the past, it was believed that lack of oral exposure to the potent food allergens would protect infants at risk for allergies from developing them. However, in light of the dramatic increase of allergic disorders and especially certain food allergies e.g. peanut allergy, preventative strategies have been reassessed. It is now well documented that establishment of tolerance in infants and small children might be important for preventing the development of food allergies.^{11,144-147}

Tolerance to food allergens now appears to be linked to early, regular exposure to these proteins, in gradually increasing quantities, within a critical window of development. Evidence suggests that delayed introduction of complementary foods beyond 4 to 6 months of age may increase the risk of food allergy; and that factors such as favourable colonisation of the digestive tract and continued breastfeeding promote tolerance and provide protection during this period of initiating complementary feeding.^{63,145,148} The risk for the development of coeliac disease depends on genetic, immunological, and environmental factors. Both early (<4 months) and late (>7 months) introduction of gluten may accelerate the onset of coeliac disease. Gradual introduction of gluten in combination with breastfeeding may reduce the risk or at least delay the onset of coeliac disease as well as wheat allergy.¹⁴¹

The use of soy-based, partially hydrolyzed, extensively hydrolyzed and amino acid-based infant formulas for allergy prevention has also been questioned.^{84,85,148} Formulas prescribed to infants with the intention of preventing allergy and food intolerance have traditionally included hydrolysed cow's milk protein (partially or extensively), elemental formulas, and adapted or hydrolysed soy formulas. Hydrolysed formulas are designed to change the allergenic milk protein with the aim of preventing sensitisation or intolerance. They may be produced from cow's milk or soy milk, be derived from predominately whey or casein proteins and be partially or extensively hydrolysed.^{84,85} These formulas whether soy based, partially hydrolysed or to a lesser extent, extensively hydrolysed still have the potential to induce sensitisation and allergic reactions. It is also well recognised that a proportion of infants with cow's milk protein allergy are also allergic to soy protein.⁸⁶ Whether this occurs as a co-allergy in otherwise food-allergic infants, or as a consequence of cross-sensitisation is unclear.⁸⁵ Sensitisation to soy has been reported in 10% to 14% of infants with cow milk allergy.⁸⁶

The available scientific evidence does not support the use of partially or extensively hydrolysed formulas over exclusive breastfeeding for prevention of allergies. There is limited evidence to support feeding with a hydrolysed formula over cow's milk based formula to reduce allergies in babies and children. Although there is no evidence of benefit of a soy formula in prevention of allergy, no study indicates an increase in allergy

prevalence.^{84,85} Hence, soy formula cannot be recommended for feeding of high risk infants for the prevention of allergy or food intolerance.⁸⁴

Unfortunately, old and often unsubstantiated practices are still being advocated to the detriment of the infant and mother as well as the entire family. These may include advice to all mothers while pregnant and lactating as well as their infants, regardless of potential allergy risk, to follow highly restricted diets for extended periods; delayed introduction of complementary foods beyond 6 months; and trials with numerous different infant formulas whether cow's milk, soya protein or partially hydrolysed infant formulas.

Based on available scientific evidence, the current guidelines for maternal and infant diets for prevention of allergic disease include the following:

1. Maternal dietary restriction during pregnancy and lactation does not prevent atopic disease with the possible exception of atopic eczema.^{56,57,144,147,149-150}
2. Exclusive breastfeeding is highly recommended for all infants irrespective of atopic heredity.⁵⁷ In infants at high risk of developing atopic disease, exclusive breastfeeding for at least 4 months compared with feeding intact cow milk protein formula decreases the cumulative incidence of atopic dermatitis and cow's milk allergy in the first 2 years of life.^{56,57,144,147,150} Exclusive breastfeeding for at least 3 months appears to protect against wheezing in early life although its protection of allergic asthma beyond 6 years of age is unconvincing.^{56,144,150} There is no evidence that breastfeeding beyond 4 to 6 months provides further benefit with respect to prevention of atopic disease.^{144,147,148,149,151}
3. Use of soy protein based infant formula should be avoided in healthy and high-risk infants for prevention of atopic disease.^{56,84,85,144,147,149,150}
4. There is no evidence to support the use of hydrolyzed infant formulas in place of exclusive breastfeeding in the prevention of allergic disease. In high risk infants however who are not able to receive exclusive breastfeeding for at least the first 4 months of life or are formula fed, use of extensively or partially hydrolyzed formulas can reduce the incidence of allergy, especially atopic eczema in early childhood. Extensively hydrolysed formulas may be more effective than partially hydrolysed in allergy prevention. The use of amino acid formulas for atopy prevention is unclear. The higher cost of these specialised formulas must be considered when deciding on their use.^{56,84,144,147,148,149,152}
5. The prophylactic use of hydrolyzed formulas in the first 4 to 6 months of life in infants from low-risk families does not seem to be preventive against atopic disease.^{56,84,144,148,149,152}
6. Complementary foods should not be introduced before 4 to 6 months of age. There is no evidence that delaying the introduction of solids or specific allergens after this age has a protective effect on development of atopic disease regardless of whether infants are fed cow milk protein formula or human milk.^{56,57,144,145,147,149,153} This includes delaying introduction of foods that are considered to be highly allergic e.g. fish, egg, cow's milk, wheat and foods containing peanut protein.^{56,144,147,149}
7. There is insufficient data to support a protective effect of any dietary intervention for the development of atopic disease after 4 to 6 months of age.^{56,144,145,147,149,150,153}

These changes with regard to dietary allergy prevention strategies will have a profound impact on the information being disseminated to parents by health professional at all levels of health care. Appropriate and on-going education and training of health care professionals is necessary to ensure that the current approaches in food allergy prevention are understood and that the evidence-based recommendations are implemented. (Table 1.11)

Table1. 11: Dietary prevention recommendations from several professional organisations

Definitions/ interventions	AAP ¹ 2008 Clinical Report	AAP ¹ 2000 recommendations	ESPACI ² / ESPGHAN ³ 1999, ESPGHAN 2008 recommendations	SP-EAACI ⁴ , 2004, 2008 recommendations
Risk category: 'high risk'	Parent or sibling with documented allergic disease	Biparental or parent plus sibling history of allergy	Parent or sibling affected (1999)	Parent or sibling with documented allergic disease
Pregnancy avoidance	Lack of evidence	Possibly peanut		No special diet *
Breast-feed 'exclusively' until	Evidence for 3-4 months (waiting 4-6 months tied to introducing solids *)	6 months	4-6 months *	At least 4 months, prefer 6 months *
Maternal lactation avoidance of allergens	Some evidence for reduced atopic dermatitis	Peanuts, tree nuts and 'consider' egg, milk, fish, and 'perhaps other foods'		No special diet *
Prevention formulas	Compared with whole cow's milk protein, evidence for certain extensive hydrolysates, partial hydrolyastes, but not soy	'Hypoallergenic formula' (extensive hydrolysate, possibly partial hydrolysate); not soy	Confirmed reduced allergenicity (1999)	Extensively hydrolysed until 4 months of age (2004) ; documented reduced allergenicity (2008)
Types of 'solids' and complementary foods	Evidence to wait 4 (to 6) months; lack of convincing evidence for avoiding specific allergenic foods	Solids held to 6 months: Dairy products – age 1 year Egg – age 2 years Peanuts, nuts, fish – age 3 years	Not before 17 weeks and no later than 26 weeks; no convincing evidence for delaying potentially allergenic foods such as fish, egg (2008) *	No evidence of diet effect after 4-6 months

¹ AAP - American Academy of Pediatrics

² ESPACI - European Society for Pediatric Allergology and Clinical Immunology

³ ESPGHAN - European Society for Pediatric Gastroenterology, Hepatology and Nutrition

⁴ SP-EAACI - Section on Pediatrics, European Academy of Allergology and Clinical Immunology

*Advice that is the same for those not 'high-risk'

Source: Sicherer SH, Burks AW¹⁴⁶

1.7 Food Allergies and the Nutritional Environment in South Africa

The National Food Consumption Survey (NFCS) (1999 and 2005), which assessed the nutrient intake and nutritional status of South African children aged 1 to 9 years from all ethnic groups, found that one out of ten children was underweight and more than one in five children were stunted due to chronic or long term undernutrition (one to three years of age were most severely affected).^{154,155} By contrast, 10% of children nationally were classified overweight and obesity affected 4% of children.¹⁵⁵

More recently, Bosman et al. analysed the NFCS anthropometry data using the 2006 WHO standards to assess the nutritional status in South African children aged 12-60 months. The prevalence of stunting was higher than previous analyses at 20.1% and combined overweight/ obesity had increased to 30%. The percentage of children found to be underweight was 6.8%.¹⁵⁶ The study confirms that South African communities face a major challenge with regard to managing the extremes in malnutrition, namely severe undernutrition and overnutrition.¹⁵⁶

According to the NFCS, South African children were found to have suboptimal dietary intakes i.e. < 67% Recommended Daily Allowances (RDA) for energy, calcium, iron, zinc, selenium, vitamin A, D, C and E, Riboflavin, Niacin and vitamin B₆.¹⁵⁴

On the one hand, the possible link between obesity and asthma is becoming an increasing burden to the health care system, making increased awareness for early identification of these children a necessity.¹⁵⁵⁻¹⁵⁹ On the other end of the scale, food allergies, managed with restriction diets have been associated with numerous risks including starvation or malnutrition, vitamin and mineral deficiencies, placing an additional burden on an existing problem.²³

A preliminary study (unpublished data) at Red Cross Children's hospital ($N = 76$) assessed the nutritional status of children with diagnosed food allergies (Addendum A²⁶). Using parameters of weight-for-height, height-for-age and weight-for-age, more than half of the sample demonstrated stunting or chronic undernutrition.²⁶ Wasting and stunting were more prevalent and severe in the lower income group. The major food allergens the patients reacted to included cow's milk, egg, peanuts and soya. These foods constitute vital nutrients and are usually more affordable energy and protein sources but would require elimination from the diet for effective management. Government feeding schemes and initiatives aimed to assist in decreasing the existing poor nutritional status of South African children can also not be utilized as they consist mainly of dairy, soya, peanut and wheat containing foods. The study showed that all the children benefited from dietetic and nutritional intervention, especially those with multiple food allergies and a higher median income.²⁶

According to the NFCS, only 25% of households were able to sustain adequate food security thus effective implementation of and adherence to restrictive diets may be extremely difficult in the lower socio-economic groups considering financial constraints within these households.¹⁵⁴ Food choice was found to be limited with

cow's milk and bread being amongst the most frequently consumed foods by South African children.¹⁵⁴ The potential elimination of these foods in atopic children would further decrease an already limited food variety.

The NFCS highlighted the fact that allergic children in the South African environment, who have a tendency to demonstrate poor growth, could be at increased risk for inappropriate growth and development. An incorrect diagnosis may result in unnecessary elimination of important food groups and vital nutrients, placing these children, particularly those below the age of 5 years (the age group most likely to be affected by food allergies), with single and multiple food allergies, at the greatest risk for nutritional deficiencies. The challenge for health professionals in South Africa is thus to provide scientifically sound allergy care with appropriate food elimination and a balanced diet which is affordable, culturally acceptable and comprises foods that are easily accessible.

In South Africa where poor nutritional status affects a large proportion of young children, children with allergies and specifically food allergies, who require elimination of important nutrients from their already limited diets, should be considered at nutritional risk. Careful diagnosis, appropriate elimination and replacement of problem allergens as well as regular follow up and evaluation of possible oral tolerance would help to minimise the potentially negative long term effects of restriction diets.

Given the difficulties of diagnosis, evaluation and treatment of food allergies and the complex nature of food allergy in South Africa, multidisciplinary involvement of specialist Allergists, Dietitians, Psychologists and support groups in managing cases is warranted, particularly for those individuals with multiple food allergies.

1.8 Dietary Misconceptions in Treatment of Food Allergy

Various misconceptions surrounding diet and food allergy exist. These are often promoted by the media and are advocated by complementary and alternative medical practitioners. They are also strongly believed by the broader public and parents of food allergic children. Unfortunately the knowledge and practices of some health professionals may also be influenced by the advocacy of these 'out-dated' beliefs and unsubstantiated misconceptions.²⁵

Consequences of these inaccurate beliefs could include a heightened anxiety with significant restriction of normal activities for the allergic child, risk taking, misunderstanding and disillusionment with conventional medicine and inappropriate food exclusion with profound nutritional consequences.²⁵

The use of Complementary and Alternative Medicine (CAM) has increased in the diagnosis of food allergies with unproven or disproven diagnostic methods and CAM treatments being used by approximately 20% of families in the USA. Neglect and poor insight in the field from medical healthcare providers appears to be a large contributor to use of alternative medicine.⁶ In South Africa too, many unconventional allergy tests are available for diagnosing perceived food allergies or intolerances, most of which are expensive, misleading, and

tend to misdiagnose or divert attention from actual allergies, delaying use of conventional treatment which could genuinely offer the necessary relief, improving both the patient and family's quality of life.⁴³

The most common misconceptions surrounding dietary aspects and food allergy include the following:

1.8.1. Use of soya milk infant formula as a suitable alternative to cow's milk infant formula in treating infants with cow's milk allergy²⁵

Soy infant formula is widely used as an alternative to the standard cow's milk formula. Reasons for its use include cultural and religious beliefs, following a vegetarian diet and treatment of cow's milk protein allergy. Concerns exist regarding the safety of the high levels of phyto-oestrogens found in soya formulas as well as its use as a first line treatment in cow's milk allergy.^{25,85} Some cow's milk allergic infants may also be soya allergic due to concordant reactivity.⁸⁶ It is estimated that up to 60% of children with non-IgE-mediated cow's milk allergy e.g. cow's milk protein enterocolitis, will react to soya.¹⁶⁰ Anecdotal evidence in South Africa suggests that this level may be lower, possibly around 20%.⁶⁹ Concordant reactivity between soya and cow's milk is less likely in the case of IgE-mediated cow's milk allergy.²⁵

Based on current evidence, recommendations do not advocate use of soya formula before six months of age as the sole source of nutrition or as first-line treatment for cow's milk allergy.⁸⁵ In infants older than 6 months with IgE mediated cow's milk protein allergy, soy formulas may be used if extensively hydrolysed formulas are refused and tolerance to soy protein is established. Soya formulas are readily available offer better palatability and are more affordable than extensively hydrolysed infant formulas.^{25,85,161,162}

1.8.2. Use of soya milk for prevention of food allergy

In infants with a strong family history of allergy who are unable to breastfeed, soya infant formula is often advised in order to prevent the onset of a food allergy. A Cochrane review of available evidence found that feeding with a soy formula cannot be recommended for prevention of food allergy in infants.^{84,85}

1.8.3. Goat's milk can be given as an alternative to cow's milk infant formula in managing infants with cow's milk allergy²⁵

Goat's milk has also been advocated as a suitable alternative to cow's milk in infants with cow's milk allergy. Medical science can now prove that cow's milk and goat's milk have similar protein compositions and significant cross-allergenicity has been reported with up to 90% of cow's milk allergic infants demonstrating IgE cross-reactivity to goat's milk.^{25,163}

Unmodified goat's milk and goat's milk infant formula have been found to be extremely low in folate, do not contain the recommended iron fortification, have a high renal solute load and doubtful microbial safety.¹⁶⁴

Considering the evidence, goat's milk and goat's milk infant formula are not recommended in treatment of cow's milk protein allergy.¹⁶⁵ There is also insufficient data to establish its nutritional adequacy and safety in infants. The use of goat's milk infant formula has as a result been banned from sale in the UK.¹⁶⁴

The recommended treatment for infants with cow's milk protein allergy, who cannot breastfeed, is extensively hydrolysed formula, an elemental formula or soya formula after 6 months of age. Soy, rice, almond and oat milk are often used for children with cow's milk allergy but these are not nutritionally adequate for infants and should only be given to children older than two years of age in conjunction with a balanced diet.²⁵

1.8.4. Infants and mothers of infants at high risk for developing food allergy should avoid high-risk foods during pregnancy and lactation

Allergy prevention tends to focus on children at high-risk for developing allergy i.e. those with a family history of allergic disease. Until recently, strategies for prevention of the development of food allergies have been aimed at limiting early exposure to allergenic food proteins. Dietary restrictions of common food allergens have been recommended to families with high-risk infants including, avoidance of peanuts, tree nuts and fish until the age of 3 years, egg until the age of 2 years and cow's milk until 12 months of age.^{10,14} Recommendations have also been for mothers to avoid peanuts during pregnancy and lactation with restrictions of additional allergens (egg and cow's milk and fish) during lactation.^{10,14,150,151,166}

Unfortunately, in medical practice (whether at primary or secondary level) these recommendations have also translated into advice for multiple dietary restrictions being given to the parents of infants as well as pregnant and lactating mothers in the broader public, regardless of allergy risk.^{150,151,166}

It is now thought that food allergen avoidance may contribute to a delayed oral tolerance and thus the development of allergy rather than the prevention of it. Early exposure to allergens in utero, through breastmilk, and in gradually increased amounts in the diet of an infant may in fact be protective and induce oral tolerance.^{14,25,150,167}

Little evidence exists as to when allergens should be introduced in the diet of infants and whether to introduce the foods in small or large quantities, regularly or irregularly.¹⁴ According to The European Society for Paediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition (ESPGHAN), there is no convincing evidence that avoidance or delayed introduction of potentially allergenic foods, such as fish and eggs, reduces allergies in infants either at risk or not.¹⁴⁹ It recommends that complementary foods be introduced after 17 weeks but no later than 26 weeks.¹⁴⁹ These conclusions were influenced by several studies confirming negative effects of solid food timing (before 4 months or delayed beyond 7 months) and limited food diversity introduced in the first 6 to 12 months¹⁶⁸, as well as protective effects of fatty acids in fish¹⁶⁹, and the possible detrimental effects of delayed introduction of wheat¹⁷⁰ or other solids.¹⁵³ The American Academy of Paediatrics (AAP) has recently changed its stance on recommended period of avoidance of common food

allergens stating that there is “no current convincing evidence” regarding protective effects of a delay of solids or specific allergens beyond 4 to 6 months.^{56,57,144,150}

There is also no evidence to support maternal dietary avoidance during pregnancy or lactation and such practices may nutritionally compromise both the mother and child.^{56,57,151} In the USA, Europe and the UK, previous guidelines have recently been withdrawn with new recommendations compiled, endorsing no maternal dietary restriction during pregnancy and lactation.^{56,57,144,147,150,151}

1.8.5. Introduction of complementary foods should be delayed after 6 months to prevent development of food allergy

Another common misconception is that the later solid foods are introduced into an infant’s diet (> 6 months), the less likely the infant is to develop food-induced hypersensitivities.

There is a growing concern that delaying introduction of solid food beyond 6 months may actually increase rather than decrease allergic disease as evidence suggests that an optimal ‘window’ exists to induce oral tolerance through early and repeated exposure to food proteins between 4 to 6 months of age. (Figure 1.3)^{56,147}

There appears to be no evidence to support a delayed introduction of solid foods beyond 4 or 6 months for the prevention of asthma, allergic rhinitis, and food or inhalant sensitisation (at 2 and 6 years).^{56,153,168,171} For eczema, results are conflicting, and a protective effect of a delayed introduction of solids beyond four months cannot be excluded although introduction of solid foods beyond 6 months of age has been associated with an increased risk for eczema.¹⁷¹

The AAP states that no current convincing evidence exists regarding the protective effects of a delay of solid foods beyond 4 to 6 months.^{56,57,144,150} ESPGHAN recommends that complementary foods be introduced after 17 weeks but no later than 26 weeks.¹⁴⁹ Breastfeeding while introducing solid foods may favour the development of oral tolerance and is advised specifically when introducing gluten-containing grains.^{56,147,172}

Currently, there is no evidence that delayed introduction of solid foods beyond 6 months prevents allergy.¹⁶⁸ Recommendations are for high risk infants to be exclusively breastfeeding for at least 4 months with introduction of complementary foods from 4 to 6 months. Continuing breastfeeding while introducing solid foods is advised.^{56,57,144,145,147,149,150,153,168}

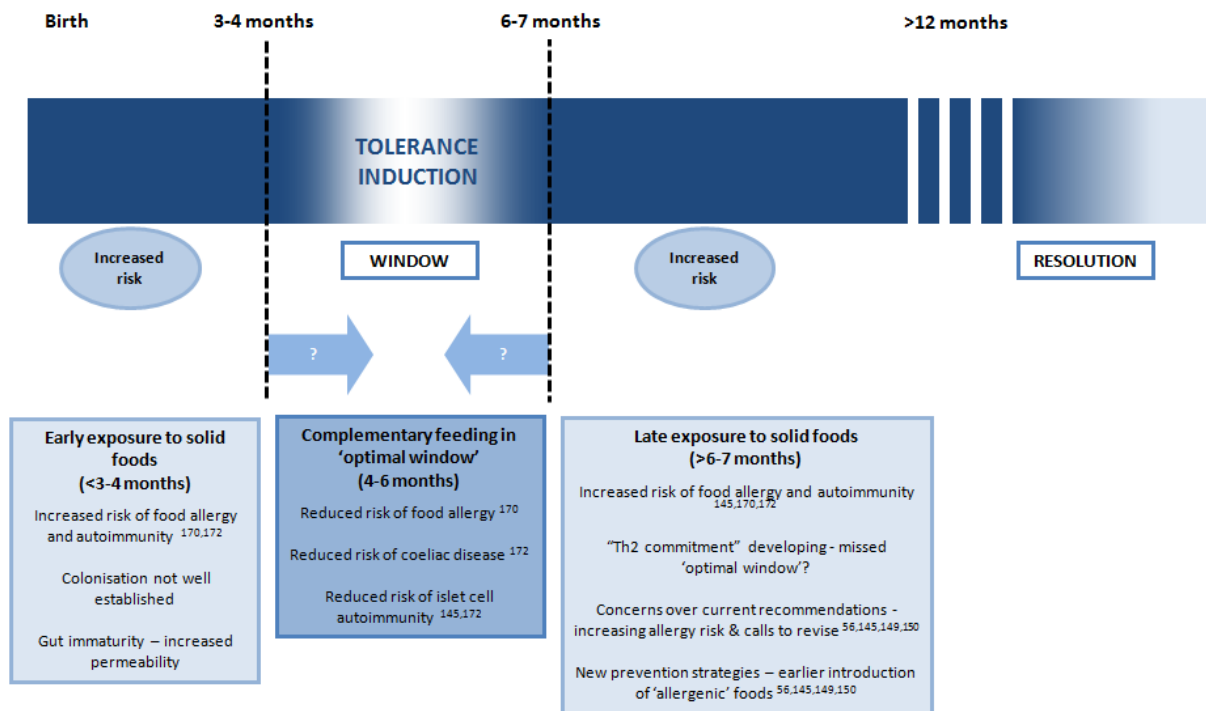


Figure 1. 3: Possible 'critical early window' of tolerance for introduction of complementary foods (Adapted from Prescott¹⁴⁵)

1.8.6. Everyone with a peanut allergy must avoid all types of tree nuts, legumes and foods containing the word 'nut'

Peanuts are legumes yet they tend to be categorized together with tree nuts (almonds, cashew nuts, pecan nuts, hazelnuts, walnuts, pistachio nuts) by many health practitioners and the layman. Due to the severity of peanut-associated allergic reactions, peanut-allergic children are often advised to avoid all forms of peanuts as well as all types of tree nuts.

While they are botanically unrelated, 60% of children with peanut allergy will be sensitised to one or more tree nuts.¹⁶⁷ Many peanut allergic children can tolerate one or more tree nuts and inclusion in the diet allows for more variety. Careful education on the risk for cross contamination is important in these cases.^{25,146}

Many children unnecessarily avoid legumes (beans, peas, chickpeas, lentils, soya) due to the misperception that these will lead to a reaction through cross-reactivity.²⁵ Legumes are important sources of plant protein and fibre and avoidance of these foods should not be routinely advised unless previous reactions are reported.

Some foods are avoided, again unnecessarily because they contain the word 'nut' e.g. pine nuts, coconut, nutmeg and butternut.²⁵ Allergies to these foods are in fact rare and do not appear to be more common in children with peanut allergies thus avoidance of these foods should not be encouraged in peanut-allergic children.

1.9 Risks and Complications Associated with Restriction Diets

Strict antigen avoidance diets remain the mainstay of food allergy treatment and as such nutritional management should be aimed at prevention of specific diet-related deficiencies. Elimination diets are antigen specific, successful in reducing or removing the specific allergic inflammation induced by the food responsible. Allergic inflammation requiring extensive dietary regimens may underlie the poor growth frequently reported in allergic children.^{128,131}

Unnecessarily prolonged or incorrectly implemented elimination diets as well as inappropriate nutritional misconceptions can lead to a variety of complications in growing children including the following (Table 1.12):^{23,53,109-111,127,128,131-133,173-176}

1.9.1. Malnutrition and growth retardation

The independent negative influence of allergic disease, particularly atopic dermatitis, on nutritional status and growth, irrespective of early type of feeding and the severity of the disease, in children is well known.¹⁷⁷ Children with food allergies, who are eliminating one or more common dietary staples, will need additional attention paid to their overall energy, protein, fat (particularly essential fats), vitamin and mineral intakes as these may all be compromised with allergen-restriction diets, further compromising growth and development. Assessment of the quality of the diet as well as the degree of compliance with restriction is necessary to prevent potential problems with growth.^{128,129} Children with moderate to severe atopic dermatitis may have even higher energy and protein needs based on the degree of skin involvement.¹²⁸ Various reports have documented inadequate energy intake and failure to thrive if a significant number of foods or food groups are avoided, highlighting the need for elimination diets to be undertaken with caution.^{53,128,129,131,132,174,178}

Malnutrition in various forms, ranging from childhood obesity¹⁵⁷ to oedematous malnutrition and severe wasting^{53,174} due to a lack of adequate intake have been found to occur in atopic children. Isolauri et al. found that growth (using length and weight-for-length indexes) was decreased in children younger than twelve months of age with cow's milk allergies, when compared with age-matched controls.¹³² Other research has found that children with multiple food allergies are significantly shorter than those with single food allergy¹³¹ and more children on milk-free diets have low relative heights (not statistically significant).¹⁷⁸ The age at the onset of symptoms and the length of elimination diet are major contributors to growth problems.¹²⁸

Aggressive, uncontrolled⁵³ or unnecessarily prolonged¹³² elimination of staple foods can also lead to deficiencies in vital nutrients from the diets, as confirmed by Christie et al.¹³⁰ More than 25% of children with single and multiple food allergies had less than the acceptable 67% of the RDA for calcium, vitamin D and E. Children not receiving nutritional counseling or a safe infant, toddler or soy formula were significantly more likely to consume less than the RDA for both calcium and vitamin D.¹³¹ Children on milk-free diets were found to have significantly lower intakes of energy, protein, fat, calcium, riboflavin and niacin placing them at nutritional risk.¹⁷⁸ Vitamin D and calcium deficiency rickets has also been reported in a children with a cow's

milk allergy.¹⁷⁹ It is therefore critical to ensure that despite avoidance of allergenic foods, essential dietary requirements are being met by means of a well balanced, nutritionally complete diet as well as necessary vitamin and mineral supplementation.

1.9.2. Anxiety in the child and family

Accidental exposure may occur and compromise the health of an otherwise healthy individual, sometimes creating a burden of fear for the patient. This fear of a reaction to a particular food in an allergic child may result in overprotection and social isolation of the child.^{23,133} An inadequate diagnosis may also prompt the avoidance of numerous harmless foods, placing additional anxiety on the child, immediate family and third parties. Implementing an allergen-free diet may also place a financial burden on the family as specialised formulas (protein hydrolysates/ amino acid-based products) and adapted foods or recommended alternatives, free of the culprit allergen, tend to be far more expensive than regular options.^{23,133,134} Parents may feel they should accompany their child to parties, social occasions and on recreational outings.¹⁸⁰ The constant vigilance required in implementing a restriction diet (e.g. careful label reading of manufactured products, concerns about cross-contamination of foods with allergens in a variety of settings, time for meal preparation) can be a source of tension between family members with siblings of food-allergic children even becoming resentful of the extra attention given to the allergic child. Limitations and stresses are placed on both the allergy sufferer and the family in common social activities associated with eating e.g. eating out, planning holidays, managing shopping and food preparation, attending parties and other social events, and taking advantage of other recreational options.^{23,130,133-138,180-185}

1.9.3. Disappointment or anger when symptoms re-develop

Inappropriate management of a food allergy with poor education and training to ensure dietary adherence as well as irregular monitoring to evaluate progress may result in poor compliance or inappropriate food avoidance and the resultant disappointment or anger from parents should symptoms either persist or return.²³

1.9.4. Psychological impact on the child

Feelings of being different or excluded may have a negative effect on the allergic child.^{133,138} Allergic children may even be the target of teasing and/ or harassment at school.¹³⁴ Severe diet restriction may lead to eating disorders and a life-threatening episode may manifest in more food avoidance or aversion due to post traumatic stress disorder. The severity of the psychological impact on the child will be age dependent.¹³⁸

1.9.5. Inappropriate and continued food avoidance despite negative challenges

Approximately a quarter of previously allergic children continue a food avoidance diet despite a negative food challenge.¹⁸⁶ The hesitation of families to introduce new foods despite confirmed negative food challenges, as well as food aversions acquired during the symptomatic periods may contribute to undernutrition.^{132,186}

Nutritional ignorance as well as parental beliefs of actual versus perceived allergies can lead to severe, unnecessary food elimination diets over extended periods of time.⁵³

An unusual but still potential danger lies in the elimination of foods to which IgE antibodies were previously identified, and which were then associated with chronic disease. Elimination or even the inappropriate exclusion of a specific food allergen may lead to the establishment of a loss of a desensitised state (tolerance) to the specific allergen over time, unknown to the clinician, resulting in an acute reaction, possibly fatal, with re-exposure to the eliminated food protein.^{176,187} This highlights the necessity to continually reassess the individual for possible tolerance, in order to avoid unnecessarily prolonged elimination. It is also vital to stress to parents the importance of including any previously allergenic food in the child's diet once this food is tolerated again.

1.9.6. Feeding difficulties

Elimination diets may worsen neophobia (a fear of anything new) resulting in a reluctance of children who have outgrown their allergy to test new foods. Factors contributing to this behaviour include late diagnosis of food allergy, the distressing effect and lack of variety in the meal preparation.¹⁷⁵ Children with tactile defensiveness, learning-disabled children and hyperactive children appear to have an increased incidence of confirmed allergy which could contribute to an even more limited dietary intake, requiring nutritional support.^{188,189}

1.9.7. Negative impact of food allergy on quality of life for both child and family

Living with a food allergy has been shown to have an adverse effect on the quality of life of the affected child and family, interfering with daily life, habits, social life and emotions.¹⁹⁰ Childhood food allergies have a significant impact on general health perception, the emotional impact on the parent, and limitation on family and social activities (restaurant meals, social activities, child care, and holidays).^{100,135-137,180,190} Associated atopic disease e.g. asthma and atopic dermatitis, and the number of foods being avoided have been found to affect these factors even further.^{133-138,180-185}

Table1. 12: Summary of complications associated with elimination diets

Risks to patient and family of elimination diets
Malnutrition, growth retardation
Increased costs for family
Family anxiety
Overprotection of the child
Social isolation
Psychological impact on child
Disappointment or anger when symptoms return

Source: Motala C, Stear GJ²³

1.10 The Role of the Dietitian in the Management of Food Allergies

Assessment of growth and nutrition is fundamental to the care of children with or without food allergy. Allergic disease can expose infants to an increased risk of nutritional inadequacies. Elimination diets need to be implemented with caution, particularly if a number of foods or food groups are avoided. Numerous reports have documented associated inadequate energy intake, rickets, iron deficiency and failure to thrive.^{53,131,132,174,178,179,191-195}

Almost every facet of the diagnosis and treatment of food allergies requires careful consideration for nutritional and dietary issues, including^{23,128,191}:

1. Accurate identification of allergenic foods – accurate dietary history with specific detail pertaining to the food-symptom association.
2. Removal of identified or suspected allergens from the diet – either long term as a therapeutic intervention or briefly as a diagnostic intervention; requires detailed education about allergen avoidance with careful consideration for appropriate nutrition alternatives.
3. Provide a nutritionally adequate diet to ensure appropriate growth and development in the long term despite removal of certain foods; requires regular follow-up, growth monitoring and nutritional assessment.

A Dietitian can assist in identifying the exact foods to be eliminated as well as compose an individualised diet of foods allowed that takes any possible nutritional issues into account. On-going nutritional assessment and growth monitoring with emphasis on growth velocity can be done and is vital for evaluating the effectiveness of the treatment.

It is uncertain what the extent of appropriate referral between doctors and dietitians is in an attempt to provide comprehensive and optimal nutritional intervention for the food allergic child. General practitioners

and paediatricians who play a key role in initially identifying children with food allergy and then monitoring them over time, need to be educated on when to refer to the appropriate specialist e.g. Dietitian or Allergist.^{23,47,128}

Additional professional input from a Dietitian could be beneficial for the following circumstances^{23,128,191}:

- Obtaining a definitive diagnosis by means of elimination diets and oral food challenges
- Multiple maternal dietary restrictions during breast feeding
- Avoidance of multiple food groups
- To determine appropriate, affordable and easily accessible safe substitutions of allergenic foods
- To determine the nutritional adequacy of the diet in the face of poor growth
- To educate the family and patient regarding the words, terms and indicators used on food labels to indicate the presence of a particular allergen

In summary, the diet should be individualised to meet the child's overall nutritional requirements and the personal situation. The risk of reaction on re-exposure and natural history of the specific food allergy being treated must be considered to assess the likelihood of persistence or outgrowing the allergy. Clinical history, type of food allergen, and demonstration of declining specific IgE tests will determine the time of oral challenges.¹⁹¹

Apart from the crucial role in treating an existing food allergy, dietitians should also be integral in providing scientifically sound nutritional information on nutritional support during pregnancy and lactation; prevention of food allergies; appropriate feeding practices for infants with regard to breastfeeding and breast milk substitutes; correct introduction of foods into the infant's diet.

In light of the existing high rates of malnutrition (under and over) in the South African paediatric population and the fact that dietary manipulation forms the cornerstone of food allergy treatment, the role of the dietitian in the management of food allergies is extremely important.

1.11 The Burden of Food Allergy on Health Care in South Africa

The increase in food allergies continues to place a large and growing burden on healthcare systems, patients and their families around the world.^{14,29,35} In addition, the high rates of perceived food allergies²⁵ together with a lack of specialists for provision of care⁴⁶ and a lack of allergy training and education opportunities for non-specialists¹⁹⁶, is contributing to the burden further and ultimately leading to poor allergy care, conflicting advice and patients who are confused and dissatisfied with the services they receive.^{46,196}

Co-existing atopic conditions place an increased strain on effective allergy care. Children with atopy (atopic dermatitis, allergic rhinitis and/ or asthma) are more likely to suffer from a food allergy than non-atopic children.^{30,41} The prevalence of food allergy may be as high as 30-35% in children with moderate to severe atopic dermatitis^{30,41,124} and around 6-8% of asthmatic children develop food-induced wheezing.^{30,41,197} The

burden to healthcare is exacerbated by the fact that allergic disorders affect both males and females of all ages as well as people from all social classes and ethnic groups.

It is noteworthy that allergies affect 25-30% of the South African population of all ages, socio-economic groups and geographical regions, making it more prevalent, numerically speaking, than Tuberculosis (TB) and Human Immunodeficiency disease/ Acquired Immunodeficiency Syndrome (HIV/AIDS). Therefore, in addition to the epidemic levels of certain conditions, limited resources, understaffed facilities and financial constraints, allergies should be considered a significant contributor to the burden on the healthcare sector.²⁷

Health professionals should thus have a good understanding of the severity of the problems within the South African setting and work together to provide the most effective allergy and nutritional care, thus lessening the burden on the health system.²⁷ It would therefore be helpful to understand where the greatest need lies for food allergy education and training interventions.

1.12 Available Allergy Expertise, Education and Training

Adverse reactions to food are frequently suspected in daily clinical practice, yet knowledge of food allergies, food allergens and the mechanisms involved and appropriate management remains poor.^{44,45} A lack of standardised diagnostic procedures, specific therapy and controversial studies contributes to conflicting messages amongst health care professionals.²⁰ Primary and secondary health care facilities, general practitioners, paediatricians or consultants in other specialities, with little or no allergy training, tend to be the first points of contact for patients suffering from food allergies. Limited knowledge from these health care professionals, as well as few allergy consultants available for referral, result in a poor intervention in managing the condition, potentially inappropriate use of medications and elimination diets as well as self-diagnoses by parents due to poor basic knowledge and expertise of healthcare professionals.^{20,44,46,133}

A lack of recognition of allergology as a speciality and of the need to provide adequate training in allergic disease is a worldwide phenomenon with allergy not being included at all in some medical and dietetic curricula yet diagnosing and managing allergic patients may still make up a large portion of the patients seen, particularly in private practice.¹⁹⁸ Formal allergy training is not offered in most pediatric and family medicine training programmes. In light of the dynamic and unpredictable nature of food-induced reactions as well as the increase in childhood food allergy with its threat of anaphylaxis, there is an urgency to educate general practitioners about appropriate diagnosis and treatment of the condition.⁴⁵ Interestingly, medical residents who had an allergy rotation felt more comfortable with common allergic disorders and referred patients more often to allergists.¹⁹⁹ This reaffirms the fact that allergy education and training is essential in providing better care.

Internationally, several resources now exist to help in the diagnosis and management of food allergy. The World Allergy Organisation (WAO) has attempted to create a consensus document to provide guidelines for education and to define what the medical practitioner should know in order to care for allergic patients.^{198,200}

The European Union of Medical Specialists recently compiled a core curriculum for Allergology and Clinical Immunology defining basic requirements for good clinical practice in allergology.²⁰¹ In the USA, the American Academy of Allergy, Asthma and Immunology (AAAAI) has created guidelines for consultation and referral to also define the expertise of the allergist, when referral could be helpful, and to improve patient outcome.^{47,91}

In 2010, an expert panel sponsored by the National Institute of Allergy and Infectious Diseases published guidelines for diagnosing and managing food allergies in the USA, based on a comprehensive review and objective evaluation of the recent scientific and clinical literature on food allergy, in an attempt to provide 'best-practice' clinical guidelines for health professionals dealing with food allergies.^{21,22} These guidelines, are intended for use by a wide variety of health care professionals, including family practice physicians, clinical specialists, and nurse practitioners. They are intended to assist health care professionals in making appropriate decisions about allergy patient care, as well as to provide a resource to guide clinical practice and develop educational materials for patients, their families, and the public. They include a consensus definition for food allergy, discuss comorbid conditions often associated with food allergy, and focus on both IgE-mediated and non-IgE-mediated reactions to food. Topics addressed include the epidemiology, natural history, diagnosis, and management of food allergy, allergy prevention, as well as the management of severe symptoms and anaphylaxis.^{22,23}

There has also been the recent development of task groups attempting to compile internationally accepted practice guidelines, consensus documents and standardised approaches all based on scientific evidence in an attempt to ensure that the best practice, by various health professionals, is provided to allergy patients in numerous different settings. Useful tools are available for an overview of food allergy management, providing decision trees for quick reference when evaluating a child with suspected food allergy.^{45,93,202,203}

The Allergy Society of South Africa (ALLSA) has compiled position statements regarding the interpretation of specific IgE and skin prick testing in the evaluation of food allergy, the use of inappropriate diagnostic tests (ALCAT and IgG), and allergen skin prick testing.^{99,104,204} It has also published a useful guideline for diagnostic testing in allergy.¹¹⁵

A recently developed food allergy education program, based on identified education needs and areas of deficiency in the field (identifying life-threatening food allergy, food allergy diagnosis, education of patients regarding treatment), was found to improve physician's comfort in recognising and managing food allergies in the USA.²⁰³ In South Africa, better understanding of education needs and the effective dissemination and use of educational materials is needed to better equip medical practitioners and dietitians to meet the needs of the food allergic patient and family.⁴⁵

Interventions would need to be adaptable to accommodate patients in both low and high socio-economic environments, according to individual and family circumstances, without compromising the care provided. Parental expectations regarding the management and its implementation need to be considered.¹²⁷

Consultation techniques should consider education levels, financial means and living conditions of patients to provide relevant and practical advice.

In South Africa, to date, there is no specialisation for registered dietitians in the field of food allergy. Recognition of allergy as a sub-speciality of medicine, family medicine and paediatrics was approved in 2010 by the Health Professions Council of South Africa (HPCSA). It is currently awaiting gazetting through the Department of Health. The Allergy Society of South Africa, under the auspices of the Colleges of Medicine of South Africa, offers a Diploma in Allergology (sub-speciality allergology certificate) to medical doctors - General Practitioners, Paediatricians and Physicians.²⁷ In 2010, the Allergy Society also started offering Allergy Master classes to health practitioners for continued professional development. New, sub-specialist training courses are envisaged to be offered by 2011.²⁷

In terms of undergraduate education and training, medical students receive very little nutrition and allergy education on the one hand, while dietetic students receive no or minimal teaching (one to four lectures) with regard to atopic disease and appropriate dietary management (this is academic institution specific). (Table 1.13) This lack of basic knowledge could contribute to poor communication between health professionals, a limited understanding of appropriate cross referral, poor clinical practice, under and over diagnosis, and a lack of continuity of care for the patient, exacerbating the burden of allergy care.

This highlights the need for more appropriate education and training of healthcare professionals in the country in the diagnosis, treatment and management of allergic disease as well as availability of better support structures. This would help to ensure effective assessment, follow-up and monitoring for continuity of care, particularly of undernourished, allergic children with multiple allergies.

Table1. 13: Allergy education and training for Dietetics students at various universities in South Africa

Name of academic institution	Allergy education received in third year of Dietetics degree
University of Stellenbosch	<ul style="list-style-type: none"> - Outsource expertise of allergy consultancy, FACTS¹ - 4 lectures (45 minutes each) presented by an Allergist and a Dietitian - Objectives: <ul style="list-style-type: none"> • Understand the difference between food allergy and intolerance • Understand Coeliac Disease • Understand the different types of assessment tools, including interpreting allergy test results • Understand the various aspects of management of allergies and intolerances • Understand how allergy development can be prevented
University of Pretoria	<ul style="list-style-type: none"> - Students expected to understand Chapter on allergy in prescribed textbook (<i>Food, Nutrition and Diet Therapy, Mahan and Escott-Stump</i>) - 5 hour practical training on food allergies in babies, children and adults presented by 2 Dietitians in private practice. - Detail of sessions and objectives not given
Kwazulu Natal	<ul style="list-style-type: none"> - 1 lecture with class notes detailing: <ul style="list-style-type: none"> • Types of food allergies, symptoms, risk factors for development of food allergies • Diagnosis • Patient management and drug therapy • Pointers for allergen specific restriction diets • Prevention of food allergies • Food intolerances
University of the Free State	<ul style="list-style-type: none"> - Collaborate closely with allergy consultancy, FACTS¹ - 3-4 lectures detailing: <ul style="list-style-type: none"> • Background to immune system • Pathophysiology of food allergies, symptoms, risk factors for development of food allergies, common allergens • Diagnosis • Prevention of food allergy • Management and allergen avoidance • Food intolerances
University of Cape Town	<ul style="list-style-type: none"> - Outsource expertise of allergy consultancy, FACTS¹ - 1 lecture (3 hours) on basics of food allergy and intolerance with case study discussion. - 2-3 hours of recipe modification and cookery adaptations for food allergy and intolerance. - In depth knowledge of the subject area considered 'sub-specialist' discipline and therefore not essential/core for entry level general practice.
University of Werstern Cape	<ul style="list-style-type: none"> - 1 theoretical lecture detailing: <ul style="list-style-type: none"> • Differences between IgE and non-IgE mediated allergies • Clinical signs and symptoms • Elimination diets for prevention and treatment of food allergies - Students expected to understand Chapter on allergy in prescribed textbook (<i>Clinical Paediatric Dietetics, Shaw and Lawson</i>)

¹ FACTS - Food & Allergy Consulting and Testing Services

Source: Information obtained from the Head of Dietetics Departments at each of the various universities

1.13 Interdisciplinary, Evidence-Based Paediatric Allergy Practice in South Africa

Various studies have emphasised the benefits of a multidisciplinary comprehensive team approach for the successful care of atopic infants and their parents with regard to meeting parental expectations, improving parental knowledge and reducing the severity of atopic reactions.^{20,135,205,206} Despite this, there are very few multidisciplinary allergy clinics in South Africa where specialised allergy care is offered - three centres in the Western Cape (Groote Schuur Hospital, Red Cross Children's Hospital, The Lung Institute); two centres in Gauteng (Johannesburg General Hospital, Pretoria Academic Hospital) and no centres in KwaZulu Natal.

There is thus a growing need for integrated care pathways to provide appropriately managed allergy care and for consensual diagnostic, management and prevention criteria in clinical practice. Allergists, Dermatologists, Pharmacologists, Gastroenterologists, Pulmonologists and Dietitians need to generate dynamic relationships between their disciplines to integrate the work of primary care General Practitioners, Paediatricians, referring Physicians and hospital-based specialists into their areas of expertise.²⁰⁷ A unified approach in the diagnostic work-up of infants and children with suspected food induced disorders could also be helpful in overcoming the intrinsic differences between subspecialties involved in the care of young children with food allergies and intolerances (e.g. Dermatology, Gastroenterology and Allergology).^{20,48,207}

It should be noted however, that the South African context is complex, and in order for doctors and dietitians to provide successful allergy intervention, a number of potential barriers would need to be considered.^{23,26}

These would include:

- Language barriers limiting effective education
- Cultural differences and traditional beliefs regarding food
- Financial constraints and limited food choices
- Multiple caregivers
- Socioeconomic differences in terms of access to resources, transport and food
- Illiteracy, lack of education, dietary and medical misconceptions
- Media and internet misinformation with susceptibility to self diagnosis and fad diets
- Pre-existing poor nutritional status of patients before considering the added impact of atopy
- Lack of communication and continuity of care between health professionals and patients leading to incorrect diagnosis and inaccurate food elimination
- Lack of allergy expertise

Appropriate and consistent evidence-based care across the disciplines would help to lessen the burden of care as well as the burden on parents and improve the quality of life of patients and families as a whole.

1.14 Motivation for the Study

With the frequency in which food allergy and particularly perceived food-induced reactions are encountered in general pediatric medical and dietetic practice, it is essential for Doctors and Dietitians alike to have up-to-date knowledge of the clinical features of food allergy and current approaches to management. They need to be adequately equipped to diagnose and recognize limitations of currently available tests, as well as prevent unnecessary dietary limitations and patient anxiety. In South Africa, there is a growing need for integrated care pathways and for consensual diagnostic, management and prevention criteria in clinical practice. Health practitioners need to have a better understanding as to the role different professionals play in allergy care to ensure more effective referral across disciplines.

It is therefore necessary to evaluate the type of care provided to parents and children with food allergy, to establish the need for better allergy education and training to both Doctors and Dietitians in South Africa. The dissertation which follows will attempt to understand the current knowledge and approaches in the management of children with food allergies of Dietitians and Medical Doctors practicing in South Africa. There is a paucity of this kind of information in South Africa and this will be the first study of its kind in the country.

It will also hope to identify problem areas in current allergy care within South Africa as compared to the most recent evidence-based consensus recommendations and management approaches. Another objective is to determine and understand the extent of interdisciplinary collaboration amongst health professionals managing food allergies.

The findings will help assess the need for better food allergy education and training of medical doctors and dietitians, the establishment of South African-specific evidence-based guidelines as well as better allergy support networks.

The expected impact of the study would be to provide insight into the problem areas in knowledge and management approaches. It could provide a motivation for the development of South African specific 'best practice' clinical guidelines for diagnosis and management of food allergies to ensure minimum competency levels in allergy care. The findings would create a platform on which to build a better understanding of food allergies amongst health professionals through revised undergraduate and postgraduate training programmes and continued professional development opportunities. Health professionals would be better advised as to when and where to refer patients, in an attempt to prompt more suitable collaboration between various disciplines to achieve comprehensive allergy care.

Correct and consistent evidence-based care across the disciplines would help to lessen the burden of care on the already stretched healthcare system in South Africa. This would also have a positive impact on the strain placed on parents of allergy sufferers and improve the quality of life of patients and families alike. When published, findings could also help to create a greater public awareness of the problem. It would help to emphasise the need to obtain and disseminate sound scientifically based information about food allergy.

CHAPTER 2

METHODOLOGY

2.1 Aim

To determine aspects of the knowledge and practices of dietitians and medical doctors in the management of food allergies in children in South Africa

2.2 Objectives

Knowledge:

- To describe aspects of current knowledge of doctors and dietitians managing children with food allergies
- To determine the need for education and training as well as for South African-specific evidence-based guidelines and allergy support networks

Practice:

- To describe aspects of current practice in the management of food allergies in children by doctors and dietitians
- To examine interdisciplinary collaboration amongst health professionals managing food allergies

2.3 Study Instrument

A quantitative questionnaire was compiled, under the guidance of allergy specialists and a qualified quantitative analyst. It comprised predominantly closed-ended questions and a few open-ended questions. The language medium of the questionnaire was English. In compiling the questionnaire for the purpose of the study, questions were constructed to pertain to aspects of the current knowledge, practices and possible problem areas in the diagnosis and management of food allergies in children. The questions were constructed with the aim of determining aspects of basic allergy knowledge, assessing diagnostic techniques being used and to understand what clinical practices were being followed, whether based on unsubstantiated misconceptions or on scientifically sound thinking. It also attempted to understand dietary management provided by professionals and knowledge of prevention strategies (Addendum B).

2.3.1. Content validity

The ten members of the Executive Committee of the Allergy Society of South Africa (ALLSA) were approached to evaluate the questionnaire in terms of its content. The committee was selected as it was considered to be the most comprehensive group of Allergy experts in the country. In order to obtain insight from a dietary perspective, three registered dietitians, considered authorities in South Africa in the field of food allergy were also approached to evaluate the questionnaire content.

The complete questionnaire as compiled by the researcher was provided for evaluation. The selected experts were requested to evaluate the level of difficulty of the questionnaire, its appropriateness for assessing basic allergy knowledge and minimum competency levels for the selected health professionals. They also had to

critically evaluate the comprehensiveness of the questionnaire in order to meet the study objectives. A standardised approach was not used to assess the questionnaire. Each expert appraised the questionnaire independently and provided the researcher with written comments on the aspects evaluated. Any additional comments and suggestions were welcomed.

Of the ten ALLSA executive committee members, six gave feedback. These were the individuals who worked more with food allergies. All three of the dietitians commented on the content of the questionnaire. Responses and insights were then read by the researcher and in conjunction with the study leaders, it was decided whether the recommendation was appropriate and the final study questionnaire was adjusted accordingly.

2.3.2. Face validity

A pilot study was then conducted to obtain face validity for the questionnaire. Medical doctors of varying specialisations and Dietitians attending the annual ALLSA Congress (2008) were requested to complete the questionnaire and give comment on the level of understanding of the questions as well as any weaknesses. One hundred questions were handed out to those health professionals attending the allergy related presentations. Out of a possible hundred, twenty health professionals responded - fifteen medical doctors and five Dietitians. The answers and opinions were then evaluated by the researcher and suggestions were considered in consultation with the study leaders. The questionnaire was adapted to improve its flow and some questions were reworded or simplified to ensure a better understanding.

2.3.3. Validated questionnaire

The final face and content validated questionnaire contained a total of twenty-four knowledge-related questions while the remainder assessed current approaches in managing food allergic children, collaboration between dietitians and doctors in particular, and opportunities for education and training. It consisted of seven sections, covering aspects of the diagnosis and management of food allergies (Addendum B). Below is a summary of the sections and the areas that were assessed:

1. Professional background – years in practice, private or public sector, allergy training received, ALLSA membership, interest in opportunities for continued professional development
2. Knowledge of general food allergy information – common foods, types of allergies treated, disease expression, natural history of food allergies and prognosis
3. Diagnosis - types of diagnostic tests and understanding of how to interpret each; use of tests in practice
4. Oral food challenges – knowledge regarding appropriate implementation and evaluation of use in practice, interdisciplinary communication between Doctors and Dietitians
5. Elimination diets – what information regarding food elimination is being advised for children at risk for allergy, pregnant and lactating mothers (allergy prevention), evaluation of food allergy over time, collaboration between Doctors and Dietitians

6. Feeding practices – knowledge on infant feeding and appropriate breastmilk substitutes, advice given to patients regarding feeding practices for allergy prevention and treatment of cow's milk allergy, recommendations for introduction of solid foods (timing and types of food), use of nutrition supplements for managing food allergy, extent of multidisciplinary input and referral across disciplines
7. Support structures in South Africa – challenges experienced in caring for food allergic children in South Africa, knowledge of where to find appropriate allergy expertise and information, establish the need for additional allergy information and evidence-based guidelines, preferred ways of acquiring allergy information.

2.4 Study Population

The study population comprised of health professionals registered with HPCSA most likely to treat and manage children with food allergy and were chosen based on the disease expressions often seen in childhood food allergies and thus the different medical and nutritional care that may be required namely, General Practitioners, Dietitians and Medical Specialists most likely to treat children with food allergy symptoms, such as paediatricians, gastroenterologists, dermatologists, ear-nose-and-throat specialists and practitioners with a diploma in allergy (obtained from the College of Medicine of South Africa). All had to be currently practicing in South Africa and treat children with allergic symptoms in their practice.

The health professionals were selected from the three largest provinces in South Africa namely, Gauteng, Kwazulu Natal and the Western Cape. Due to limited resources in terms of budget and personnel, these three specific provinces were chosen out of the possible nine provinces as they have the greatest population numbers in South Africa and they are also the best resourced in terms of allergy care. It was hypothesised that the responses would therefore provide a broader range of insights, while the other, smaller provinces would predominantly have limited feedback.

Participants were randomly selected from the 2008 name-base of the HPCSA, to which all practicing health professionals must be registered. (Table 2.1) Random selection was made, according to region, by means of proportional stratified (profession and specialty) random selection and under the supervision of a statistician. The total number of participants ($N=376$) was selected on the basis of selecting a Bernoulli proportion with a precision of 5% from a total population of 17343 health professionals (N). The final sample was oversampled by 75% to accommodate an estimated possible drop-out or non-response rate similar to that seen in the pilot study. The final sample size of the study was $N=660$.

Table 2. 1: Total numbers of doctors and dietitians registered with the HPCSA in January 2008

Health Professionals	Gauteng	Kwazulu Natal	Western Cape	Grand Total
Dietitians	612	182	407	1201
General Medical Practitioners (GPs)	7,237	3,733	4,120	15,090
Specialist/ Paediatrician	274	111	183	568
Specialist/ Dermatology	75	30	52	157
Specialist/ Otorhinolaryngology (ENTs)	123	51	74	248
Specialist/ Gastroenterology	39	11	17	67
Specialist/ Allergy diploma*	7	1	4	12

Source: Health Professionals Council of South Africa (HPCSA) Jan 2008

**Information obtained from Allergy Society of South Africa (ALLSA) 2008*

2.5 Study Design

The research design was that of a cross sectional, analytical study.

Questionnaires were sent in the post and emailed to all respondents in an attempt to reach as many prospective respondents as possible. Participants were requested to complete the questionnaire and to return it to the researcher by email or in the post by means of a self addressed, stamped envelope which had been included with the questionnaire (Addendum C). The time frame allocated for responding was eight weeks. A reminder via post and email was sent out. In an attempt to obtain more responses, the deadline was extended by a further five weeks. Another reminder was emailed and posted to the selected individuals (Addendum D).

The researcher was responsible for checking the questionnaires, coding them and capturing the data into Excel spreadsheets. There were non responses and blank questionnaires returned which were not used. No incomplete questionnaires were received from those who participated. Reasons for non-participation in the study were obtained and recorded.

2.6 Ethics

Ethical approval was obtained from the University of Stellenbosch, Faculty of Health Sciences Committee of Human Research - project approval number NO8/02/030 (Addendum E).

Participation in the study was voluntary for all randomly selected medical doctors and dietitians. Completion of the questionnaire was accepted as consent to participate in the study (Addendum C).

In order to ensure and protect the anonymity of each participant, the questionnaires were pre-coded by numbers. Only the researcher had access to personal information as well as the knowledge of the names and corresponding numbers, all of which remained confidential.

2.7 Statistical Analyses

For the purpose of analysis, respondents were divided into three categories, namely General Practitioners (GP), Medical Specialists (SP) and Dietitians (DT) and comparisons were drawn between these three categories with regard to food allergy knowledge and approaches to diagnosis and management. Data obtained from the health professionals was evaluated according to area of expertise (General Practitioners, Specialists, Dietitians). In some cases, the years of experience in the field was considered in the analysis.

Outcomes that were determined included:

- Understanding of basic allergy knowledge
- Referral between disciplines
- Perceived ability in treating food allergy patients and need for additional allergy training
- Dietary management of food allergy patients according to latest consensus regarding food elimination and prevention strategies
- Dietary advice being given by Medical Doctors and Dietitians – what advice and material is used to assist effective implementation

For descriptive purposes, frequency tables, histograms, means and standard deviations were calculated. To compare different categories, cross tabulation with the more robust maximum likelihood (ML) Chi-square test were performed on categorical (yes/ no) responses and either non-parametric ANOVA techniques were used for ordinal responses e.g. Kruskal-Wallis test, Mann-Whitney test, Bonferroni multiple comparison procedure. Statistika 9 was the statistical programme used to analyse data.

CHAPTER 3

RESULTS

3.1 Total Questionnaire Response

A total of 82 health professionals (12.4%) participated in the study and completed the questionnaire; 47 were General Practitioners (GP), 22 Medical Specialists (SP) and 13 Dietitians (DT) (8.5%, 30.2% and 33.3% of the total sample, respectively). Although the study aimed for 5% precision, the poor response of only 82 from all three professional categories and from all three regions meant the overall precision for estimating a proportion with a 95% confidence interval was 10.8%.

An additional 23 blank questionnaires were returned with reasons for 'non-participation' - 16 came from the General Practitioners, 5 were Dietitians and 2 were Medical Specialists (Gastroenterologists). Reasons for 'non-completion' of the questionnaire included 'retired', 'not currently practicing in the country', 'do not have knowledge of food allergy', 'deceased', 'time constraints' and 'do not see food allergy patients'. (Figure 3.1)

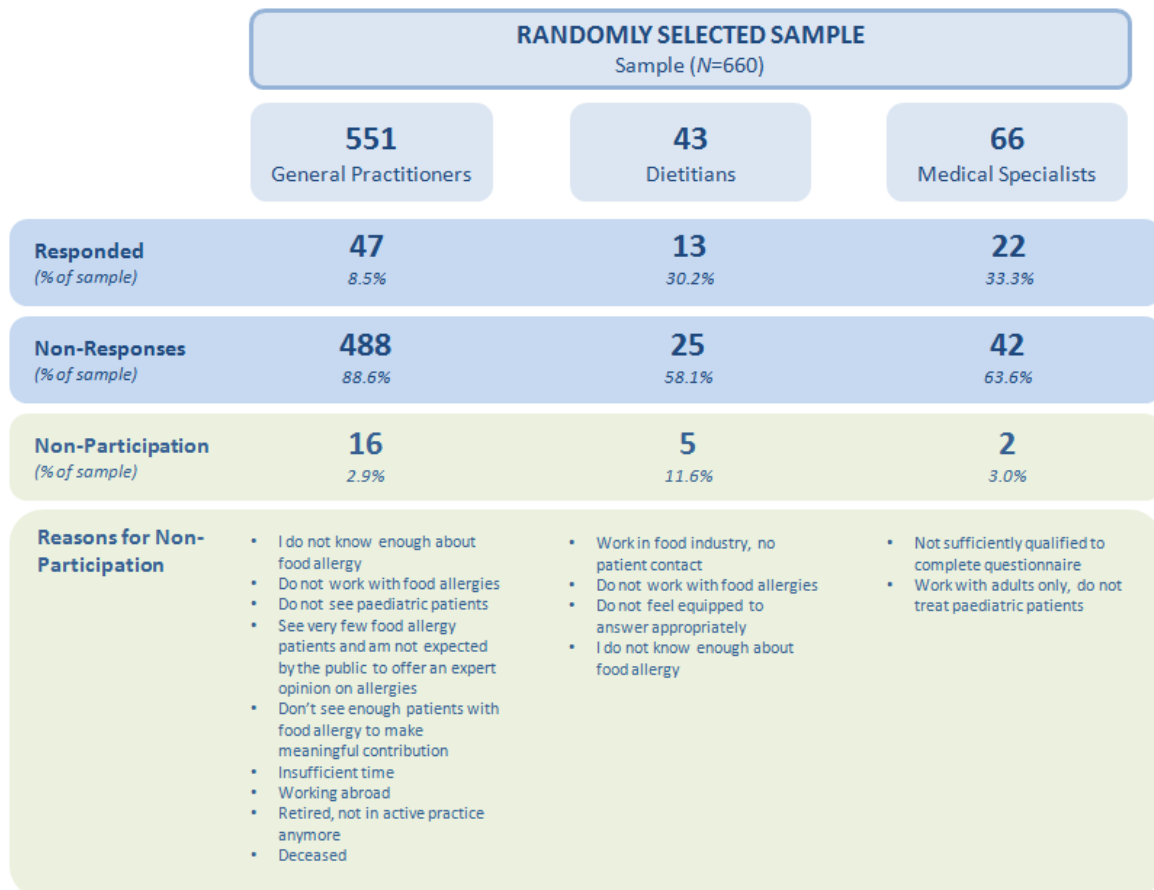
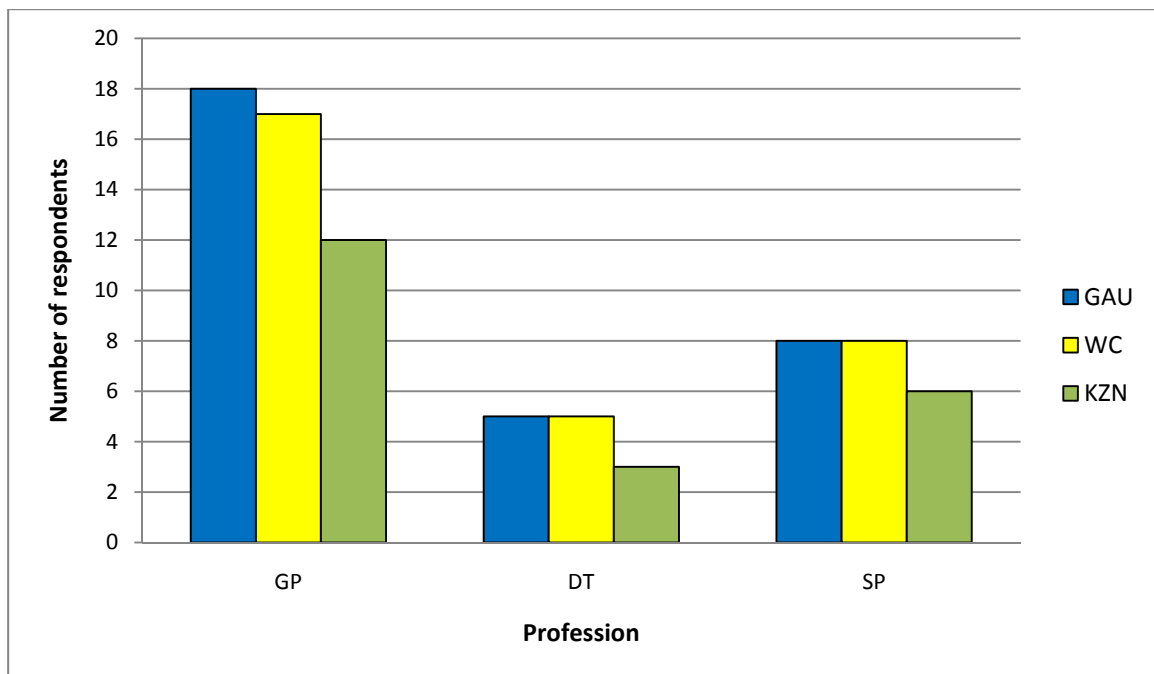


Figure 3. 1: Diagram to illustrate questionnaire responses and non-participation per category

3.2 Professional Demographic Information

3.2.1. Professional distribution according to location and workplace

There was a relatively equal distribution from the chosen provinces between the three categories of respondents with the maximum likelihood (ML) chi-square test showing no significant difference between the number of respondents from the three provinces ($p=0.99$). (Figure 3.2) The majority of practitioners were English (68%, $N=57$), followed by Afrikaans (29%, $N=24$) and Zulu speaking (2%, $N=1$). Health practitioners in the private sector made up 59% ($N=48$) of all respondents while 41% ($N=34$) worked in the public health care system. More of the medical doctors and specialists who responded also came from the private, albeit the difference was not significant ($p=0.6$). (Figure 3.3)



GAU - Gauteng

WC - Western Cape

KZN - Kwazulu Natal

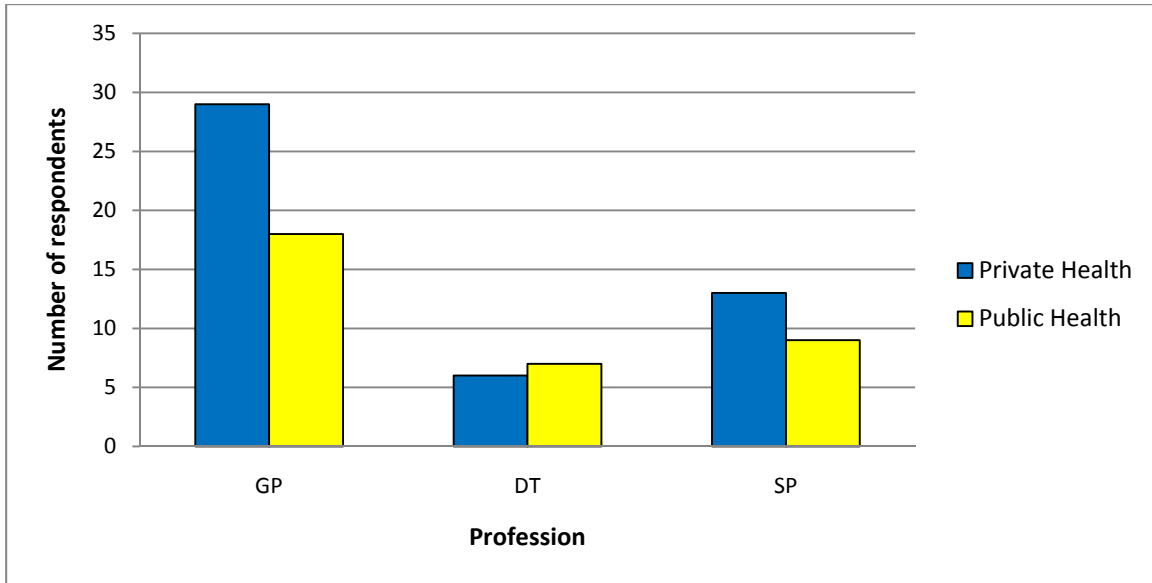
GP - General Practitioners

DT - Dietitians

SP - Medical Specialists

* Differences per professional category not statistically significant (Maximum likelihood (ML) chi-square test) $p=0.99$

Figure 3. 2: Professional distribution of respondents from the three provinces - Gauteng, Western Cape, Kwazulu Natal



GP - General Practitioners

DT - Dietitians

SP - Medical Specialists * Differences per professional category not statistically significant (ML chi-square test) $p=0.6$

Figure 3. 3: Professional distribution of respondents from Private and Public healthcare sectors

3.2.2. Years in practice

All respondents were currently practicing in their respective fields of expertise. The time in practice varied greatly, ranging from 1 year to 48 years in practice. The average (Mean [Standard Deviation (SD)]) years in practice of the three different categories were 14.6 (9.4) years for General Practitioners, 22.6 (12.7) years for Medical Specialists and 8.9 (4.9) years for Dietitians. These means were statistically different when compared with a Kruskal-Wallis test ($p<0.01$).

3.2.3. Affiliation to a professional association

Affiliation to a South African medical or dietetic association as opposed to no affiliation was significant ($p=0.0098$) using a maximum likelihood (ML) chi-square test. All the dietitians (100%, $N=13$) were members of the Association for Dietetics in South Africa (ADSA), 60% of the General Practitioners ($N=28$) and 68% of the Specialist group ($N=15$) were members of the South African Medical Association (SAMA). Half of the Medical Specialists (50%, $N=11$) but none of the Dietitians or General Practitioners were affiliated to an international association.

In terms of membership to allergy-related associations, 13.6% of Medical Specialists were members of the European Academy of Allergology and Clinical Immunology (EAACI) ($N=3$), 9% to American College of Allergy, Asthma and Immunology (ACAAI) ($N=2$), 9% to the American Academy of Allergy, Asthma and Immunology (AAAAI) ($N=2$). Only 12% of all respondents were affiliated to the Allergy Society of South Africa (ALLSA) – none of these came from the General Practitioners and Dietitians; 45% of Medical Specialists ($N=10$) were ALLSA

members ($p < 0.001$). Readership of the ALLSA journal, *Current Allergy and Clinical Immunology*, was significantly different ($p = 0.0036$) amongst the respondents – 10.6% of General Practitioners ($N = 5$), 45% of Medical Specialists ($N = 10$) and no Dietitians had subscription to the journal. Analyses were done using a 2-way contingency table and the robust ML chi-square test.

3.2.4. Allergy congress attendance

Reported attendance of local or international allergy congresses was significantly different, according to the ML chi-square test, between the three categories of health professionals ($p = 0.008$). Those who attended came mostly from the medical specialist group (Medical Specialist 59%, $N = 13$; Dietitians 30.7%, $N = 4$; General Practitioners 21.3%, $N = 10$). The mean (SD) percentage of sessions believed by those who attended allergy congresses to be dedicated to food allergy topics compared to respiratory allergy topics was 22% (19.5) versus 78% (19.5) respectively. Analysis between the the professions was not significantly different using the Kruskal-Wallis test ($p = 0.15$).

3.3 Allergy Education and Training

An overwhelming 88% of all respondents ($N = 72$) believed more attention should be paid to allergy care in their professional training.

3.3.1. Allergy training according to profession

Although there was no significant difference between those in the three professional categories who said they received no allergy training ($p = 0.64$), it was of concern that as many as a fifth of Medical Specialists (18%) and General Practitioners (19%), and a third of Dietitians (30.7%) had no allergy training. There was a significant difference, between the three categories of those who had allergy training at the undergraduate ($p = 0.015$) and postgraduate ($p < 0.001$) levels. The General Practitioners and Dietitians had more training at undergraduate level (76.6%, $N = 36$, and 69%, $N = 9$, respectively) while the Medical Specialists reported a more even distribution of allergy training at under- and post graduate levels (40.9%, $N = 9$ and 54.5%, $N = 12$, respectively). Observed frequencies were analysed by means of the robust ML chi-square test.

Analyses of observed frequencies by means of the ML chi-square test, found no significant difference between the three professional categories as to which aspects of training would be most beneficial to improve education and training ($p = 0.93$).

The majority in all three categories believed training needed to be improved at both undergraduate and postgraduate level (General Practitioners 61.7% $N = 29$, Dietitians 61.5% $N = 8$, Medical Specialists 59% $N = 13$), with the latter preferably in the form of continued professional development activities.

3.3.2. Allergy training according to years in practice

When years in practice were compared to the amount of allergy training, there was a significant difference in terms of 'no allergy training' ($p < 0.01$) with the mean (SD) number of years in practice being 21.7 (10.4) years and 'undergraduate training' ($p < 0.01$), where the mean number of years in practice was 13 (9), years using the non-parametric ANOVA test, the Mann-Whitney test. The longer the health professional had been in practice, the less likely the respondent was to have received any allergy training at all or at the undergraduate level. Interestingly, 88% of all practitioners, with a mean of 15.9 (11.1) years in practice, felt more allergy training was necessary.

3.4 Types of Paediatric Allergy Patients Treated

3.4.1. Confirmed versus perceived food allergy

The number of paediatric patients treated by the three professional categories on average per month was 1-5 patients each for both confirmed and perceived allergies. This was not found to be significantly different between each professional category for confirmed food allergy ($p = 0.45$) but a trend towards significance was seen for perceived food allergy ($p = 0.06$); analysis was done according to the non-parametric ANOVA test, the Kruskal-Wallis test. (Table 3.1)

Table 3. 1: Number of patients with confirmed and perceived food allergy managed by each group of health professionals in a month

Number of patients per month by professional group	Patients with Confirmed* food allergy managed %(N)			Patients with Perceived** food allergy managed %(N)		
	1-5 patients	6-14 patients	15-29 patients	1-5 patients	6-14 patients	15-29 patients
General Practitioners	70 (33)	17 (8)	0	53 (25)	30 (14)	17 (8)
Dietitians	69 (9)	8 (1)	0	53.8 (7)	23 (3)	0
Medical Specialists	73 (16)	0	9 (2)	50 (11)	32 (7)	5 (1)

* Differences per professional category not statistically significant (Kruskal Wallis test) $p = 0.45$

**Differences per professional category nearing significance (Kruskal Wallis test) $p = 0.06$

3.4.2. Frequency in managing allergy-related symptoms

When asked to report on the frequency of treating various allergy-related symptoms (either 'regularly', 'seldom' or 'never'), there was no significant difference for confirmed and perceived food allergies between the three groups ($p = 0.12$ and $p = 0.77$, respectively). Asthma, allergic rhinitis and atopic eczema were the conditions seen most regularly by the two categories of medical doctors. General Practitioners tended to

manage the most atopic dermatitis and perceived food allergies between the three categories while Medical Specialists were treating the most patients with confirmed food allergy. Dietitians reported treating confirmed food allergy 'seldom' (84.6%, $N=11$) and managed perceived food allergies more 'regularly' than confirmed food allergy (38.5%, $N=5$ versus 7%, $N=1$). (Table 3.2) In all the above observed frequencies, 2-way contingency tables were analysed by means of the robust ML chi-square test.

Table 3. 2: Allergic symptoms treated and managed 'regularly' in practice by each of the three professional categories

Symptoms	General Practitioners %(N)	Medical Specialists %(N)	Dietitians %(N)
Allergic rhinitis	78.7 (37)	63.6 (14)	0
Asthma	82.9 (39)	54.5 (12)	7.69 (1)
Conjunctivitis	53.2 (25)	31.8 (7)	0
Atopic dermatitis	70.2 (33)	59.1 (13)	15.38 (2)
Confirmed food allergy*	6.4 (3)	22.7 (5)	7.7 (1)
Perceived food allergy**	44.7 (21)	31.8 (7)	38.5 (5)

* Differences per professional category not statistically significant (ML chi-square test) $p=0.12$

**Differences per professional category not statistically significance (ML chi-square test) $p=0.77$

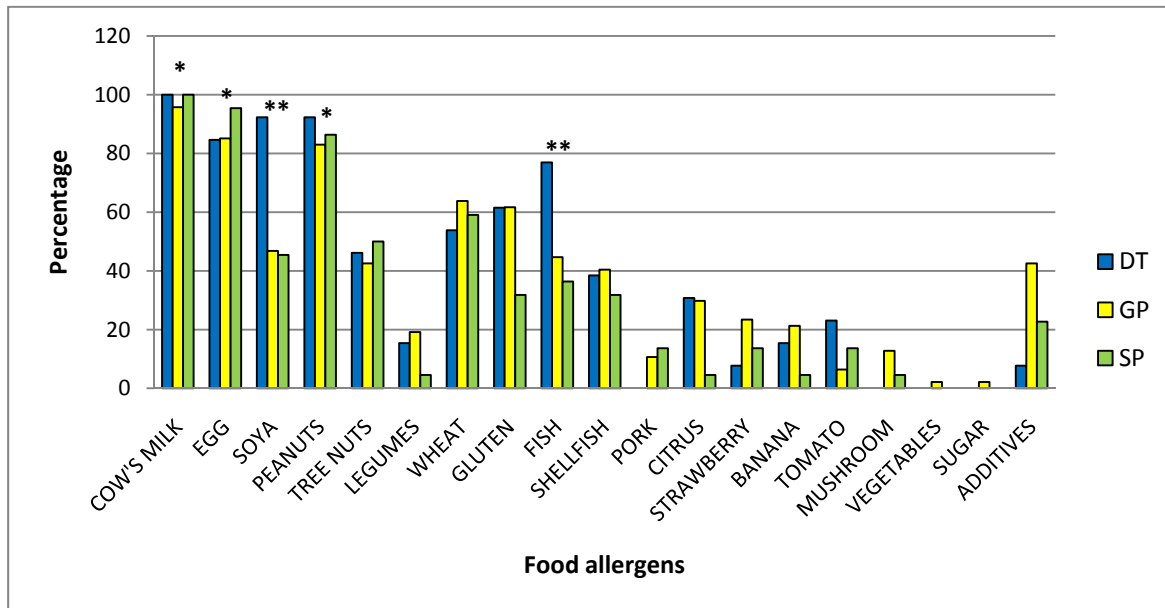
3.5 Food Allergy Knowledge

3.5.1. Common food allergens in infants and young children

Cow's milk, egg and peanut were correctly identified by most respondents as the foods most commonly associated with food allergy in infants and young children under five years ($p=0.32$, $p=0.37$ and $p=0.67$ for each of the foods, respectively). Observed frequencies using 2-way summary tables and the ML chi-square test showed significant differences in opinions regarding other foods such as soya ($p=0.004$) and fish ($p=0.05$). More Dietitians rated these two foods as common food allergens than the two medical categories. Although not significantly different, more than half of respondents from each group believed wheat to be a common allergen in young children [54% Dietitians ($N=7$), 59% Medical Specialists ($N=13$), 64% General Practitioners ($N=30$)] and opinion between the three professions regarding gluten as a common allergen was nearing significance ($p=0.054$). Shellfish and treenuts were considered less common allergens in young children under 5 years of age overall. (Figure 3.4)

Of concern was the fact that a number of respondents believed that certain allergens, usually not associated with food allergy in young children, were allergenic in this age group. These included citrus, strawberries, banana, legumes, tomato, mushrooms, pork and additives. As many as 20% of respondents ($N=16$) from all three categories incorrectly believed citrus and strawberries to be common allergenic foods in young children.

A third of the total number of respondents also incorrectly identified additives, namely tartrazine, colourants, MSG, benzoates and preservatives, as causing food allergies in young children ($p=0.02$).



DT - Dietitians

GP - General Practitioners

SP - Medical Specialists

* Differences per professional category not statistically significant (ML chi-square test) (cow's milk $p=0.32$; egg $p=0.37$; peanut $p=0.67$)

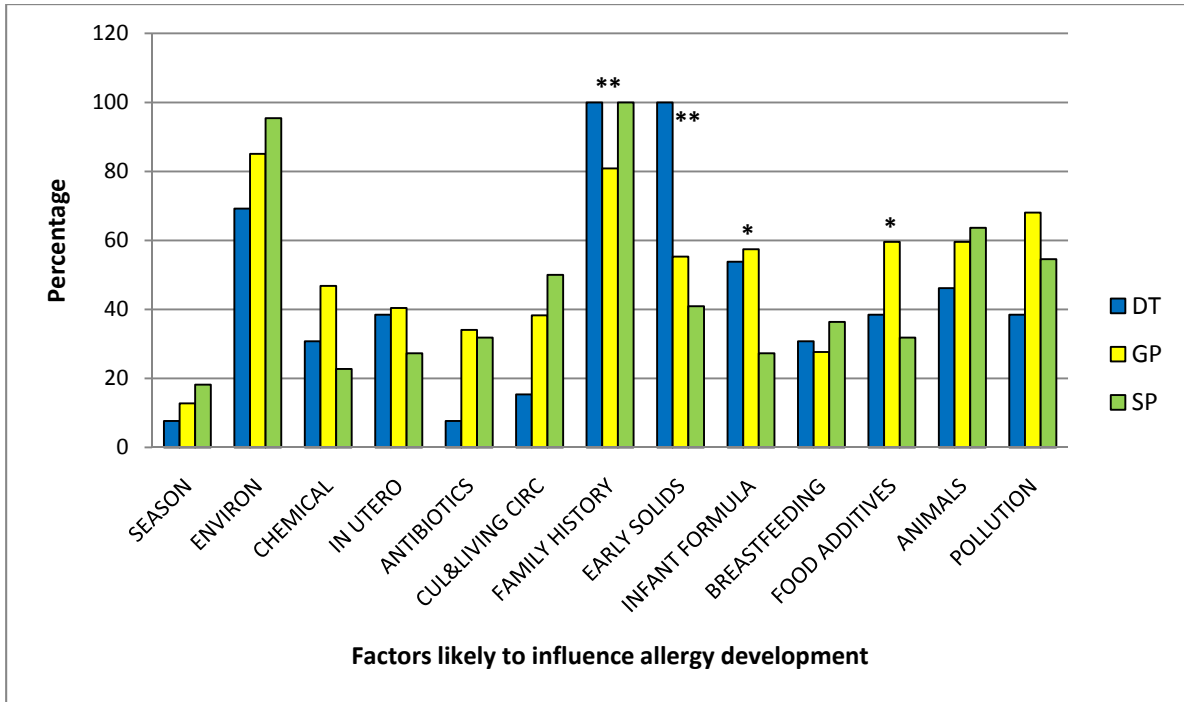
** Differences per professional category statistically significant (ML chi-square test) (soya $p=0.004$; fish $p=0.05$)

Figure 3. 4: Foods believed to be commonly associated with food allergy in infants and young children according to professional category (%)

3.5.2. Factors believed to influence development of allergy

A family history was correctly considered to be the most important indicator for allergic predisposition in children by the majority of participants – 87% General Practitioners ($N=41$), 84.6% Dietitians ($N=11$), 95.5% Medical Specialists ($N=21$) ($p=0.46$).

With regards to the factors that may influence development of allergies, family history was the factor considered most frequently [General Practitioners 80.8% ($N=38$), Dietitians 100% ($N=13$) and Medical Specialists 100% ($N=22$)]. This was followed by environmental allergen exposure [General Practitioners 85% ($N=40$), Dietitians 69% ($N=9$) and Medical Specialists 95.5% ($N=21$)], chemicals, animals and pollution. All the Dietitians ($N=13$) also believed the early weaning and introduction of solid foods to influence allergy development. More than half of General Practitioners and Dietitians (57% ($N=27$) and 54% ($N=7$) respectively) believed infant formula feeding influenced allergy development. A significant difference, according to ML chi-square tests used to analyse 2-way summary tables of observed frequencies, was seen for family history ($p=0.004$), early weaning and introduction of solid foods ($p=0.002$). Opinions were nearing significance regarding infant formula feeding ($p=0.055$) and food additives ($p=0.068$). (Figure 3.5)



DT - Dietitians

GP - General Practitioners

SP - Medical Specialists

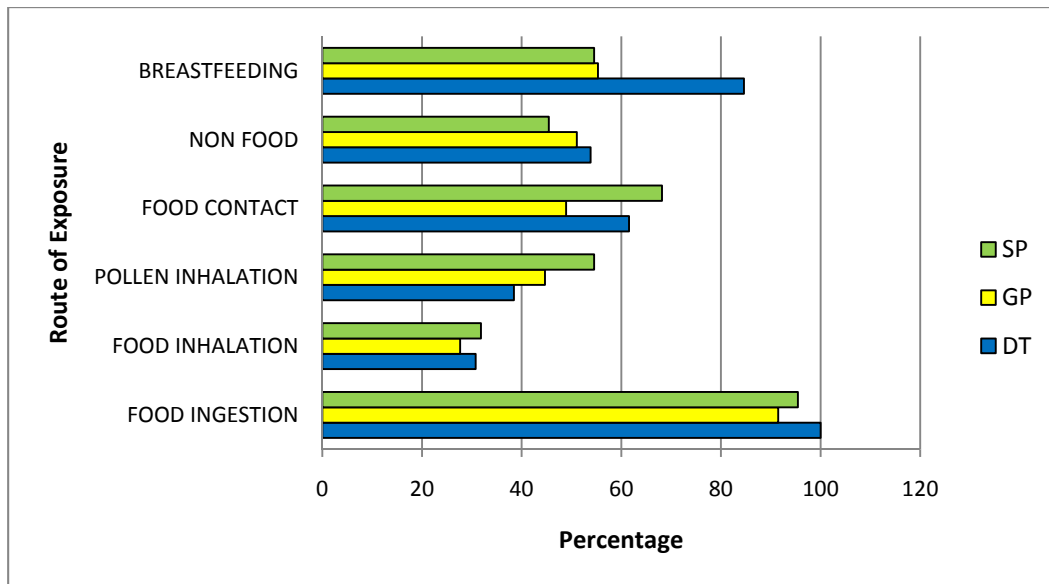
* Differences per professional category nearing significance (ML chi-square test) (infant formula $p=0.055$, food additives $p=0.068$)

** Differences per professional category statistically significant (ML chi-square test) (family history $p=0.004$; early solids $p=0.002$)

Figure 3. 5: Factors considered by professional category most likely to influence allergy development

3.5.3. Route of exposure to food allergens

Almost all the health professionals identified food ingestion as the most likely potential route of exposure to an allergen in an infant – General Practitioners 91.5%, ($N=43$); Dietitians 100% ($N=13$); Medical Specialists 95.5% ($N=21$). Knowledge as to possible routes for allergen exposure was similar for all three categories except for breastfeeding which was acknowledged by more Dietitians as a possible means of coming into contact with a food allergen (84.6% ($N=11$) versus 55.3% ($N=26$) and 54.5% ($N=12$), for General Practitioners and Medical Specialists, respectively). Analysis of the various routes of exposure was done using contingency tables and ML chi-square test and no significant difference was found between the three categories. (Figure 3.6.)



SP - Medical Specialists

GP - General Practitioners

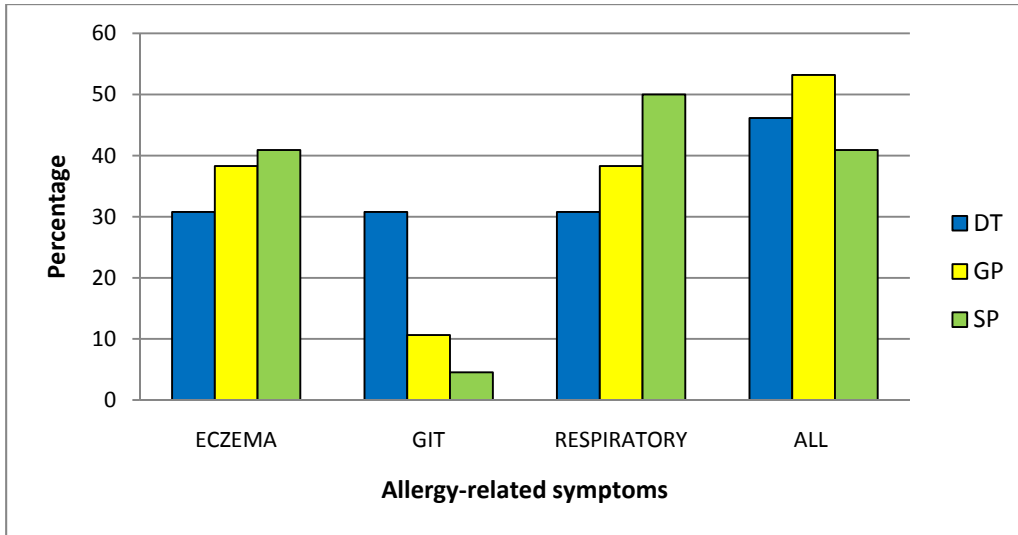
DT - Dietitians

* Differences per professional category not statistically significant (ML chi-square test)

Figure 3. 6: Potential routes believed to lead to exposure to food allergens by professional category

3.5.4. Symptoms related to food allergy in children under 5 years of age

Observed frequencies using 2-way summary tables calculated no significant difference between the three categories and the belief that skin, respiratory and GIT related symptoms can all appear in young children ($p=0.62$, ML chi-square test), with approximately half of the respondents answering correctly (General Practitioners 53.2%, $N=25$; Medical Specialists 40.9%, $N=9$; Dietitians 46.2%, $N=6$) that children younger than 5 years could experience skin, respiratory as well as gastrointestinal symptoms together. (Figure 3.7)



GIT - Gastrointestinal tract

DT - Dietitians

GP - General Practitioners

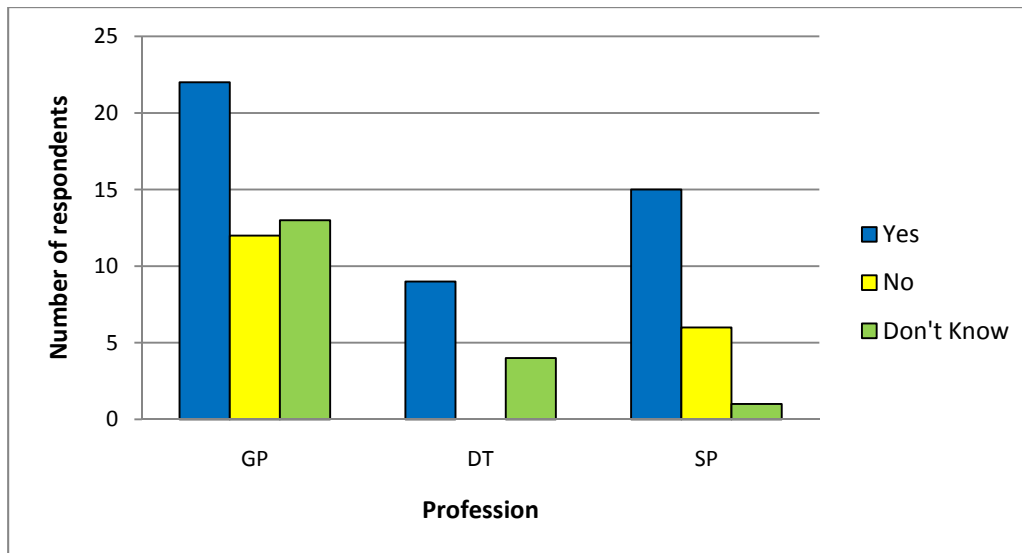
SP - Medical Specialists

* Differences per professional category not statistically significant (ML chi-square test)

Figure 3. 7: Allergy symptoms considered to occur most frequently in children younger than 5 years old according to profession

3.5.5. Food allergy and atopic dermatitis link

There was a significant difference between the opinions of the three categories regarding the association between atopic dermatitis and food allergy, according to the observed frequency ML chi-square test ($p=0.009$). Up to one third of both the General Practitioners and Dietitians did not know that the conditions were linked to each other. Of the Medical Specialists, it was interesting that neither of the Dermatologists ($N=2$) acknowledged a positive association between atopic dermatitis and food allergy in infants and young children. (Figure 3.8)



DT - Dietitians

GP - General Practitioners

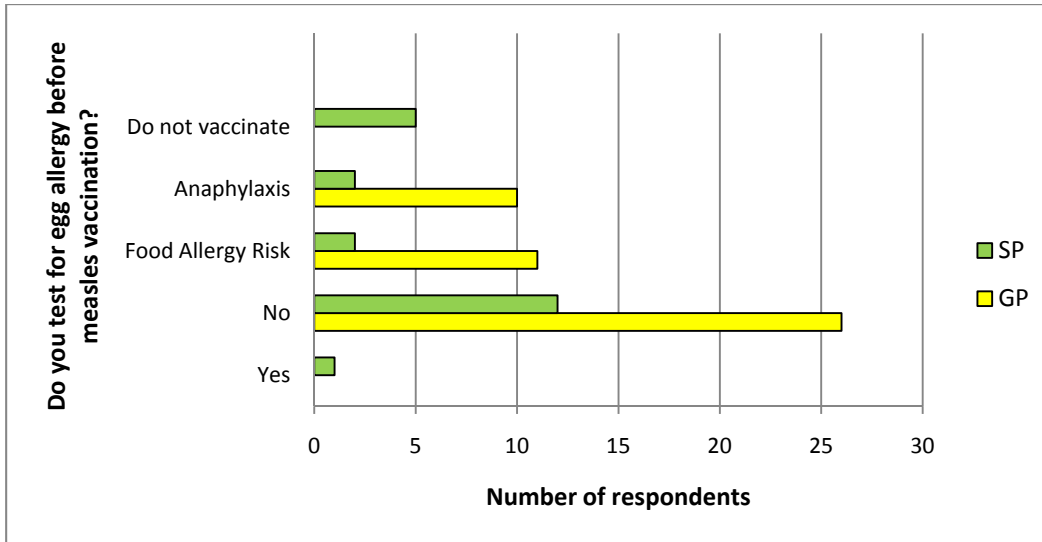
SP - Medical Specialists

* Differences per professional category statistically significant (ML chi-square test) $p=0.009$

Figure 3. 8: Association between food allergy and atopic dermatitis considered by professional category

3.5.6. Egg allergy and measles vaccination

Observed frequencies using a ML chi-square test showed a significant difference between General Practitioners and Medical Specialists routinely testing for egg allergy prior to measles vaccination ($p=0.02$). More than half of the medical doctors (55.3%, $N=26$) and specialists (54.5%, $N=12$) did not routinely test for egg allergy prior to giving measles vaccinations. (Figure 3.9) In the case of a risk of food allergy, predominantly General Practitioners tested for egg allergy compared to Medical Specialists (23.4%, $N=11$ versus 9%, $N=2$ respectively). If a patient presented with a history of anaphylaxis, 21.3% ($N=10$) of General Practitioners and 9% of Medical Specialists ($N=2$) did test for egg allergy before vaccination.



SP - Medical Specialists

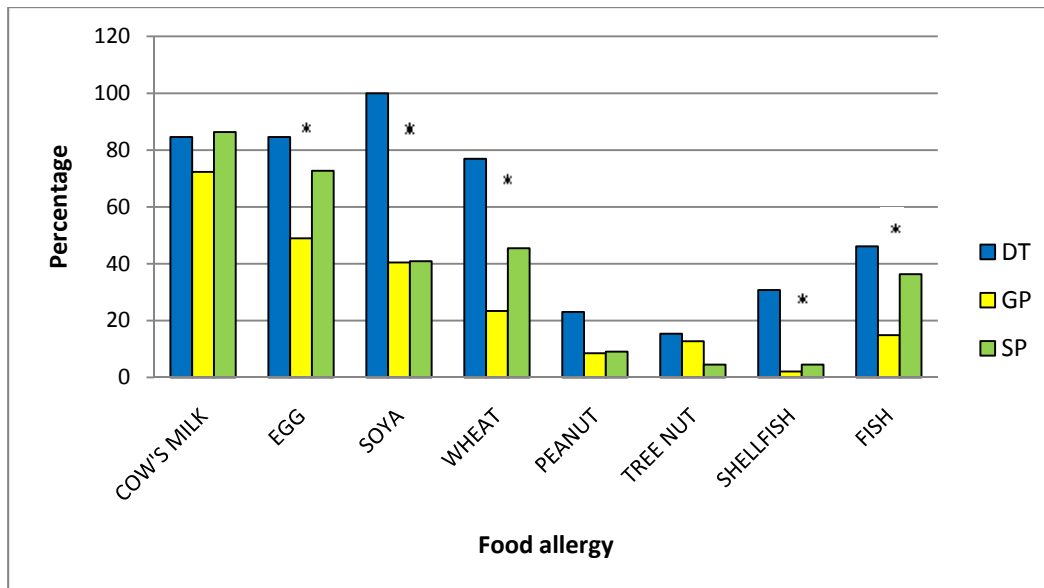
GP - General Practitioners

* Differences per professional category statistically significant (ML chi-square test) $p=0.02$

Figure 3. 9: Testing for egg allergy prior to measles vaccination by medical doctors

3.5.7. Natural progression of food allergy

Cow's milk was considered by the majority of participants the most likely food allergy to be outgrown in children. Of the General Practitioners, Dietitians and Medical Specialists, 72% ($N=34$), 84.6% ($N=11$) and 86.4% ($N=19$) respectively, believed this to be the case. Peanut and treenut were considered the least likely to be outgrown with General Practitioners, Dietitians and Medical Specialists reporting this 91.5% ($N=43$), 76.9% ($N=10$) and 90.9% ($N=20$), respectively for peanut and 87% ($N=41$), 84.6% ($N=11$), 95.5% ($N=21$) for tree nut, respectively. The categories differed significantly for a number of allergens when observed frequencies were analysed by means of 2-way contingency tables and the ML chi-square test. These included egg ($p=0.02$), soya ($p<0.001$), wheat ($p=0.001$), fish ($p=0.03$) and shellfish ($p=0.01$). (Figure 3.10)



DT - Dietitians

GP - General Practitioners

SP - Medical Specialists

* Differences per professional category statistically significant (ML chi-square test) (egg $p=0.02$, soya $p<0.001$, wheat $p=0.001$, fish $p=0.03$ and shellfish $p=0.01$)

Figure 3. 1: Food allergies considered by each category likely to be outgrown

3.6 Diagnosis

3.6.1. Types of diagnostic methods used by professionals

There were some significant differences in relation to the diagnostic methods frequently used by the three categories (respondents were asked whether a method was used 'always', 'occasionally' or 'never'). General Practitioners and Medical Specialists were most likely to 'always' use patient history (74.5%, $N=35$ and 95.45%, $N=21$, respectively) where as only 46% of the Dietitians ($N=6$) reportedly 'always' used patient history. According to observed frequency tables analysed by means of the robust ML chi-square test, this was statistically significant ($p=0.01$).

Dietitians and Medical Specialists were the most likely to always use diet history (92.3%, $N=12$ and 86.3%, $N=19$, respectively) as a method for diagnosing food allergy. Only 53% of General Practitioners reported 'always' taking a diet history for diagnosis of food allergy. Again these differences between the categories were significant ($p=0.001$). A food diary was used by 23.4% General Practitioners ($N=11$), 30.7% ($N=4$) Dietitians, and 19% Medical Specialists ($N=4$) ($p=0.006$). Food elimination diets were used by about one third of General Practitioners (31.9%, $N=19$) and Dietitians (30.7%, $N=4$) alike and only 13.6% of Medical Specialists ($N=3$) to assist in diagnosis of food allergy ($p=0.02$). Very few respondents used SPT and serum specific IgE tests often to help diagnosis food allergy with Medical Specialists being the group most likely to do so (SPT

p=0.002, Serum specific IgE p=0.076). The majority of respondents from all three categories 'never' used oral food challenges to help with food allergy diagnosis (p=0.32) – 85% General Practitioners (N=40), 69.3% Dietitians (N=9), 63.64% Medical Specialists (N=14). (Table 3.3)

Table 3. 3: Frequency of use of various diagnostic tools by profession

	General Practitioners %(N)			Dietitians %(N)			Medical Specialists %(N)		
	A	O	N	A	O	N	A	O	N
Patient history**	74.5 (35)	17 (8)	8.5 (4)	46 (6)	46 (6)	7.7 (1)	95.5 (21)	4.6 (1)	0
Diet history**	53.2 (25)	27.6 (13)	19.2 (9)	92.3 (12)	0	7.7 (1)	86.4 (19)	13.6 (3)	0
Food diary**	23.4 (11)	21.3 (10)	55.3 (26)	30.8 (4)	61.5 (8)	7.7 (1)	19 (4)	47.6 (10)	33.3 (7)
Elimination diet**	31.9 (15)	40.4 (19)	27.6 (13)	30.7 (4)	69.3 (9)	0	13.6 (3)	59 (13)	27.3 (6)
Skin prick test**	4.26 (2)	48.9 (23)	46.8 (22)	0	30.8 (4)	69.2 (9)	31.8 (7)	18.2 (4)	50 (11)
Serum specific IgE test**	19.15 (9)	36.2 (17)	44.7 (21)	7.7 (1)	46 (6)	46 (6)	40.9 (9)	40.9 (9)	18.2 (4)
Oral food challenge*	2.13 (1)	12.7 (6)	85.1 (40)	7.7 (1)	23.1 (3)	69.2 (9)	4.55 (1)	31.8 (7)	63.6 (14)

IgE - Immunoglobulin E

A - Always

O - Occasionally

N - Never

* Differences per professional category not statistically significant (ML chi-square test) (oral food challenge p=0.32)

** Differences per professional category statistically significant (ML chi-square test) (patient history p=0.01, diet history p=0.001, food diary p=0.006, elimination diet p=0.02, skin prick test p=0.002, and serum specific IgE p=0.076)

3.6.2. Sensitisation

Sensitisation was correctly understood by only 50% of Medical Specialists (N=11), 40% of General Practitioners (N=19) and 38.5% of Dietitians (N=5) (p=0.21). The ML chi-square test was used to analyse contingency tables.

3.6.3. Blood tests

Medical Specialists were the group who ordered serum specific blood tests the most in practice (72.7%, N=16). Approximately half of the General Practitioners (48.9%, N=23) and 15% Dietitians (N=2) reported ordering serum specific bloods. These findings were significant between the three categories (p=0.003, analysis done by ML chi-square test). There was no significant difference between the categories when asked about the

screening test for food allergens ($p=0.27$) while the difference regarding the screening test for airborne allergens was significant ($p=0.002$). The Medical Specialists were most likely to acknowledge being aware of the food and airborne allergen screening tests (64%, $N=14$). Of concern, however, was the fact that of those who reported knowing what the relevant screening tests for food and airborne allergens were, very few could correctly name the relevant screening tests as Fx5 and Phadiotop, respectively. (Table 3.4)

Table 3. 4: Awareness versus knowledge of allergen screening tests by professional category

Awareness versus knowledge	General Practitioners %(N)	Medical Specialists %(N)	Dietitians %(N)
Aware of food allergen screening test*	47(22)	64 (14)	38 (5)
Correctly name test – Fx5 (%)	10	36	15
Aware of airborne allergen screening test**	32 (15)	68 (15)	15 (2)
Correctly name test - Phadiotop (%)	19	45	15

* Differences per professional category not statistically significant (ML chi-square test) $p=0.27$

** Differences per professional category statistically significant (ML chi-square test) $p=0.002$

3.6.4. Interpretation of blood tests

Interpretation of serum specific IgE tests were significantly different between the categories ($p<0.001$). Almost half of the general practitioners did not know how to interpret the blood tests (48.9%, $N=23$) and tended to follow the laboratory interpretations. If they did interpret readings, more used 'Classes 1-6' (23.4%, $N=11$). Of the Dietitians, 30.7% ($N=4$) regarded a reading above '0' as positive requiring food elimination and 23% ($N=3$) followed the 'Classes 1-6' approach, as sent back from the laboratory, to interpret blood tests. The Medical Specialists mostly used both 'Classes 1-6' and 'decision points/ levels' to interpret results (45.4%, $N=10$). (Table 3.5)

Table 3. 5: Serum specific levels for which food elimination is considered per profession

Laboratory categorisation of level of allergic reaction (kU/l IgE)	General Practitioners %(<i>N</i>)	Dietitians %(<i>N</i>)	Medical Specialists %(<i>N</i>)
Class 1 (0.3-3.5)	17 (8)	30.7 (4)	13.6 (3)
Class 2 (3.5-17.5)	19 (9)	30.7 (4)	18 (4)
Class 3 (17.5-35)	38.3 (18)	53.8 (7)	36.4 (8)
Class 4 (35-50)	46.8 (22)	69.2 (9)	50 (11)
Class 5 (50-100)	48.9 (23)	69.2 (9)	63.6 (14)
Class 6 (> 100)	51 (24)	69 (9)	68 (15)

IgE - Immunoglobulin E

More than 50% of all respondents said they would recommend food elimination if blood results showed either 'Class 4, 5, 6' (mainly the two medical doctor categories). 'Class 3' would be considered relevant for food elimination in 40% of all respondents (predominantly Dietitians) and approximately 20% would consider food elimination if results showed 'Class 1 or 2' (again, mainly Dietitians).

3.6.5. Skin Prick Tests (SPT)

In terms of skin prick tests, there was a significant difference between the two medical categories and administering the test in practice. Medical Specialists were the most likely to perform SPT in practice (32%, *N*=6) compared to general practitioners (8.5%, *N*=4)(*p*=0.02) and were the group who were aware of the decision points for specific foods which can be used as a guide in interpreting results (*p*=0.005). Observed frequencies were all analysed with the robust ML chi-square test.

3.6.6. Interpretation of SPT

More Medical Specialists compared to the other two categories correctly identified factors considered important for interpreting SPT. (Table 3.6) Only 3 General Practitioners (15%), 1 Dietitian (20%) and 4 Medical Specialists (25%) knew how to correctly interpret SPT according to the size of the wheal diameter compared to the histamine wheal size (*p*=0.38). Again, comparisons were done using cross-tabulation of variables and analysed by the ML chi-square test.

Table 3. 6: Factors considered important for interpretation of skin prick tests

Professional Group	Wheal size* %(N)	Medication ¹ %(N)	Flare size %(N)	Patient age %(N)	PPV ² %(N)	Extract stability %(N)	NPV ³ %(N)
Medical Specialist	81.8 (18)	54.5 (12)	50 (11)	41 (9)	41 (9)	36.4 (8)	27.3 (6)
General Practitioner	53.2 (25)	29.8 (14)	32 (15)	14.9 (7)	8.5 (4)	8.5 (4)	8.5 (4)
Dietitian	53.8 (7)	23 (3)	23 (3)	0	7.7 (1)	7.7 (1)	7.7 (1)

¹ Medications - Antihistamine and corticosteroids

² PPV - positive predictive value

³ NPV - negative predictive value

* Differences per professional category not statistically significant (ML chi-square test) p=0.38

Approximately half of all the participants correctly answered other questions pertaining to skin prick tests, namely:

1. The size of the reaction does differ between food allergens - General Practitioners 53%, N=25; Dietitians 46%, N=6, 59%, N=13 (p=0.72, ML chi-square test)
2. The size of the skin prick wheal does not correlate with the severity of the food reaction - General Practitioners 57%, N=27; Dietitians 46%, N=6, Medical Specialists 50%, N=11 (p=0.89, ML chi-square test)
3. A SPT can be positive without eliciting a reaction when the food is ingested - General Practitioners 53%, N=25; Dietitians 30.7%, N=4, Medical Specialists 77.3%, N=17 (p=0.02, ML chi-square test).

There was confusion amongst the professionals as to what a 'positive histamine control' indicated. A number of respondents either 'didn't know' or believed it indicated an 'allergy to histamine'. (Table 3.7)

Table 3. 7: Opinions per category as to what a 'positive histamine' indicates on a skin prick test

Professional group	Valid test, positive control %(N)	Allergy to histamine %(N)	Don't know %(N)
General Practitioners	23 (11)	17 (8)	60 (28)
Dietitians	38 (5)	31 (4)	31 (4)
Medical Specialists	59 (13)	27 (6)	14 (3)

3.6.7. Non-IgE mediated food hypersensitivity

All categories underestimated the percentage of food-induced reactions considered non-IgE mediated with means (SD) of 15.5% (16.7), 25% (26.5) and 12.5% (7) for General Practitioners, Medical Specialists and Dietitians respectively. This was not significant as interpreted using the non-parametric ANOVA test, the Kruskal-Wallis test (p=0.13).

3.6.8. Knowledge of tests for diagnosing non-IgE mediated hypersensitivity reactions

There was confusion regarding useful methods for diagnosing non-IgE mediated reactions with Medical Specialists having a better knowledge overall of appropriate methods. A large number of General Practitioners and Dietitians in particular were unclear as to the available diagnostic methods which may be helpful in practice. There was uncertainty of different types of hypersensitivity reactions requiring different diagnostic methods as well as the apparent endorsement of some tests proven to be unreliable for diagnosis of food-induced hypersensitivity reactions (both IgE and non-IgE mediated).

Again, data was analysed by means of contingency tables (2-way summary) and the robust ML chi-square test. There was a significant difference between the three categories regarding the following methods – patient history ($p=0.012$), IgG ($p=0.01$), CAST ($p=0.02$), APT ($p<0.001$). The Medical Specialist group was the group most likely to correctly identify the appropriate tests for diagnosing non-IgE mediated hypersensitivity reactions. Surprisingly less than two thirds of General Practitioners and Dietitians recognised patient history as important (64%, $N=30$ and 54%, $N=7$, respectively). Only 52% ($N=43$) of all respondents named food challenges as useful and very few knew that CAST (12% of total, $N=9$) and APT (13% of total, $N=11$) could be used. Unreliable tests specifically IgG testing, were believed to be useful by half the Dietitians (54%, $N=7$) and a third of the General Practitioners (34%, $N=16$).

3.6.9. Use of unreliable tests in practice

As many as 23% of Medical Specialists ($N=5$) and 19% of General Practitioners ($N=9$) actually used IgG testing in practice to diagnose non-IgE mediated food allergy and ALCAT testing was being used by 6% ($N=3$) of General Practitioners. Differences between the three categories and the use in practice of food challenges, CAST and APT were significant when analysed by means of cross-tabulation and ML chi-square test ($p<0.001$, $p=0.01$ and $p<0.001$, respectively). (Table 3.8)

Table 3. 8: Methods considered useful for diagnosing non-IgE mediated food hypersensitivity reactions per professional category

Diagnostic methods	Medical Specialists %(N)		General Practitioners %(N)		Dietitians %(N)	
	Yes	Don't know	Yes	Don't know	Yes	Don't know
Patient history	95.5 (21)	0	63.4 (30)	15 (7)	53.8 (7)	15.4 (2)
Elimination diet	63.6 (14)	4.5 (1)	49 (23)	23.4 (11)	46 (6)	15.3 (2)
Food challenge**	68.2 (15)	9 (2)	49 (23)	27.7 (13)	38.5 (5)	15.4 (3)
CAST ^{1**}	27.3 (2)	22.7 (5)	6.4 (3)	53 (25)	7.7 (1)	23 (3)
APT ^{2**}	41 (9)	18 (4)	4.3 (2)	49 (23)	0	30.7 (4)
SPT ³	22.7 (5)	18 (4)	29.8 (14)	21.3 (10)	38.5 (5)	15.4 (2)
Serum specific IgE ⁴ test	27.3 (6)	9 (2)	34 (16)	23.4 (11)	30.7 (4)	15.4 (2)
ALCAT ⁵ test	4.5 (1)	32 (7)	15 (7)	42.6 (20)	7.7 (1)	30.7 (4)
IgG ⁶ test	9 (2)	18 (4)	34 (16)	27.7 (13)	54 (8)	15.4 (2)
VEGA ⁷ test	4.5 (1)	22.7 (5)	2 (1)	53.2 (25)	0	46 (6)

¹ CAST - Cellular antigen stimulation test

² APT - Atopy patch test

³ SPT - Skin prick test

⁴ IgE - Immunoglobulin

⁵ ALCAT - Antigen leukocyte cellular antibody test

⁶ IgG - Immunoglobulin G

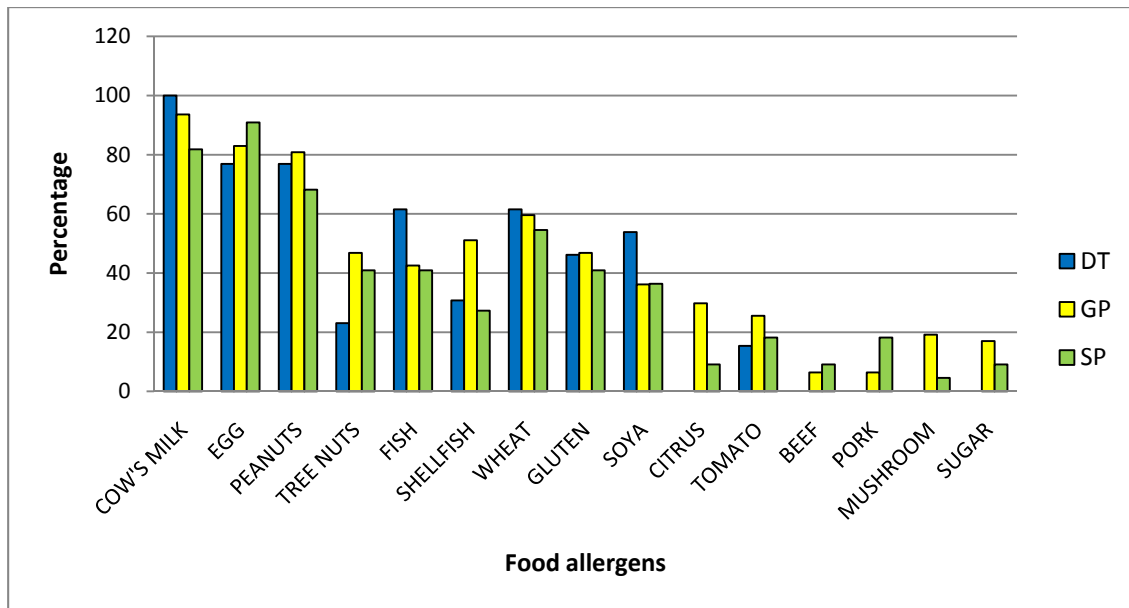
⁷ VEGA - Electroacupuncture device/ probe

** Differences per professional category statistically significant (ML chi-square test) (food challenge p<0.001, CAST p=0.01, APT p<0.001)

3.7 Food Elimination and Oral Food Challenge Tests

3.7.1. Food elimination diet

Data on the foods considered by each professional category necessary to eliminate initially when implementing an elimination diet indicated that, cow's milk, egg, peanuts and wheat were considered important to eliminate by 50% or more respondents from each of the three categories but not fish, shellfish, tree nuts or soya. Some unusual foods were also included such as citrus, tomato, sugar and mushroom. (Figure 3.11)



DT - Dietitians
 GP - General Practitioners
 SP - Medical Specialists

Figure 3. 11: Foods considered necessary to eliminate initially when implementing an elimination diet according to professional category

3.7.2. Oral food challenge tests

The majority of all three health professional categories (84%, $N=69$) were aware of food challenge tests – General Practitioners 83% ($N=39$), Dietitians 77% ($N=10$), Medical Specialists 95% ($N=21$) ($p=0.20$). The relation seen between awareness and use of food challenge tests was significant ($p=0.004$) and only 22 of those who were aware, reportedly used challenge tests in practice – 11 General Practitioners, 2 Dietitians and 9 Medical Specialists. No difference was found between the public and private sector in terms of awareness of and the use of food challenge tests ($p=0.32$ and $p=0.94$, respectively). Analyses were done using basic statistics cross tabulation by means of 2-way contingency tables and ML chi-square tests.

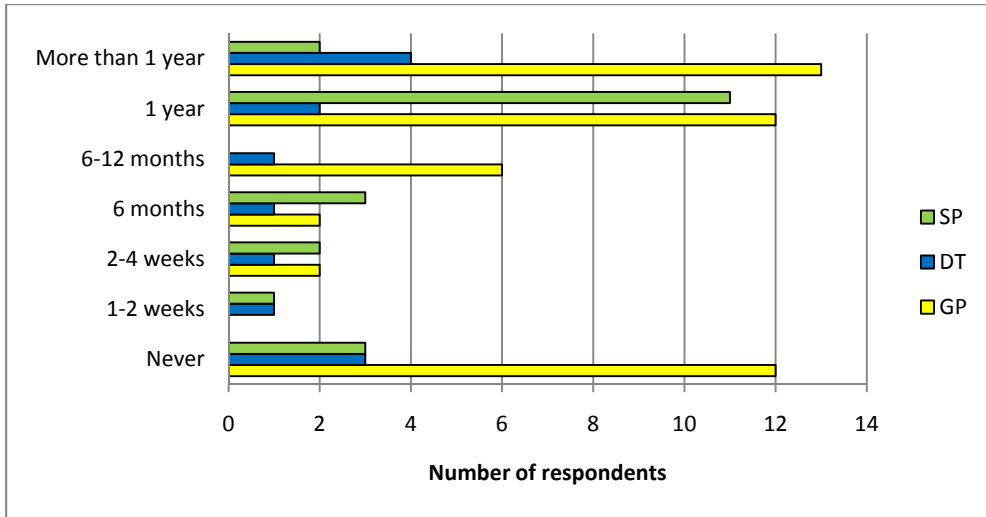
The types of food challenges performed amongst those health practitioners using them in practice were described using frequency tables of the data – 14 made use of open oral food challenges at home (63.6%), 10 performed open food challenges within their practice (45%), 5 used single blind food challenges (22.7%), 2 carried out double blind placebo controlled food challenges (9%). When asked whether they would select to perform a food challenge on the basis of skin prick test or serum specific IgE test results, 7 respondents said 'yes if either test were negative' (31.8%), 7 were 'uncertain' (31.8%), 4 reported 'never selecting on the basis of skin prick and serum specific IgE' tests (18%), and 3 said 'yes if either test were positive' (13.6%).

3.7.3. Resuscitation and food challenges

Of the medical doctors performing food challenges 19 had resuscitation training (90.5%) but only 14 of them had appropriate resuscitation equipment available (66.7%) – 5 General Practitioners (50%) and 9 Medical Specialists (100%). Contingency tables of observed frequencies (2-way summary tables) showed a difference between General Practitioners and Medical Specialists in this regard with the use of ML chi-square testing ($p=0.004$). After a food challenge, 8 (36.4%) doctors reported sending the child home 'immediately without monitoring'; 5 (22.7%) 'waited 30 minutes', 5 (22.7%) monitored the patient 'for 1 to 2 hours'; 1 (4.5%) monitored 'for twelve 12 to 24 hours'; and 3 (13.6%) reported following up the patient 'for 48 to 72 hours' after the challenge .

3.7.4. Patient re-evaluation to assess oral tolerance

There was no difference between the three categories ($p=0.94$) according to the non-parametric ANOVA test, the Kruskal-Wallis test, in terms of period of food elimination considered appropriate before reassessing a child for possible oral tolerance. The reported mean (SD) period of all three categories for retesting was after '6-12 months' (2.3). The type of work place significantly influenced the period for re-evaluating children. Analysis was done using the non-parametric ANOVA test, the Mann-Whitney test ($p=0.044$). The mean time period in private was '6-12 months' (2.2). In public, the mean (SD) period was '6 months' (2.3). When the frequency of reported periods of elimination were cross-tabulated using contingency tables, approximately a third of General Practitioners (27.7%, $N=13$) and Dietitians (30.7%, $N=4$) considered retesting children 'after more than 1 year'; half of Medical Specialists (50%, $N=11$) and a quarter of general practitioners (25%, $N=12$) re-evaluated patients 'after 1 year'; a quarter of General Practitioners (25%, $N=12$), 23% of Dietitians ($N=3$) and 13.6% of Medical Specialists ($N=3$) reported 'never' reassessing patients to test for oral tolerance. (Figure 3.12) Those in private tended to re-evaluate children 'after more than a year' or 'after 1 year' (31%, $N=15$ and 29%, $N=14$, respectively) while in public, the time periods reported most frequently for reassessment included 'never' and 'after 1 year' (29.4%, $N=10$ and 32.3%, $N=11$, respectively). (Figure 3.13)



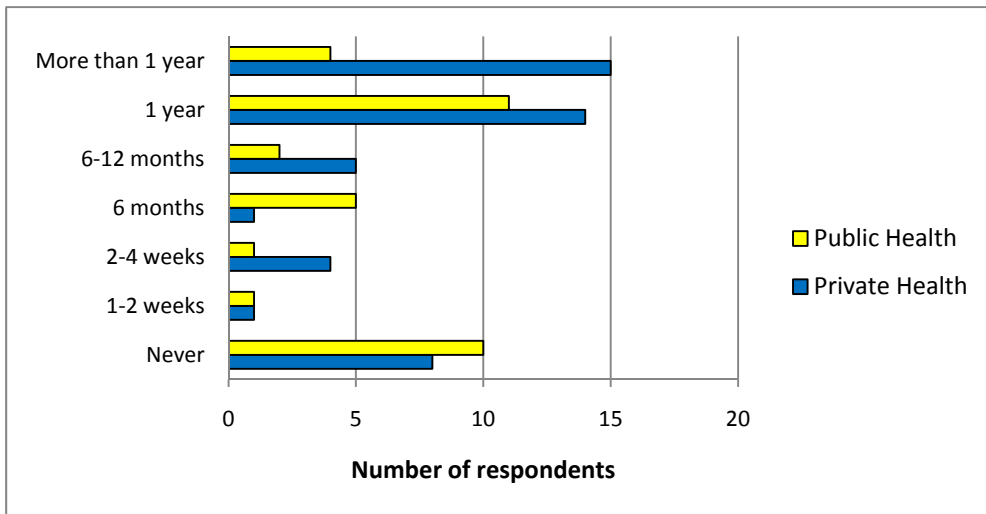
SP - Medical Specialists

DT - Dietitians

GP - General Practitioners

* Differences per professional category not statistically significant (Kruskal Wallis test) $p=0.94$

Figure 3. 12: Approximate timeframe before reassessing a child for oral tolerance according to *profession*



** Differences per workplace category statistically significant (Mann-Whitney test) $p=0.044$

Figure 3. 13: Approximate timeframe before reassessing a child for oral tolerance according to *work place*

3.8 Use of Complementary and Alternative (CAM) Therapies

There was no significant difference between the three categories and the use of CAM therapies with alternative testing methods by patients prior to seeking medical management and during medical treatment ($p=0.81$ and $p=0.39$, respectively). Alarming but not surprisingly, at least half of all the health practitioners (53%, $N=44$) reported the use of CAM therapy by patients 'prior to' seeking more conventional medical care. As many as 43% of all respondents ($N=35$) believed their patients were using CAM medicines 'in conjunction' with their management. The most common therapies included homeopathy, kinesiology and traditional African herbal remedies. (Table 3.9)

Table 3. 9: Number of patients using complementary and alternative therapies prior to and with treatment according to profession

Use of CAM ¹	General Practitioners %(N)	Medical Specialists %(N)	Dietitians %(N)
CAM prior to medical management*	53.2 (25)	59.1 (13)	46.1 (6)
CAM with medical management*	36.17 (17)	50 (11)	53.85 (7)

¹ CAM - Complementary and Alternative medicine/ therapy

* Differences per professional category not statistically significant (ML chi-square test) (CAM prior to medical management $p=0.81$, CAM with medical management $p=0.39$)

There was also no significant difference between the patients seen in private practice versus public health facilities and CAM use. (Table 3.10) The most patients using CAM before and in conjunction with medical treatment came from the private sector. All the above statistical analyses were done using contingency tables and the robust ML chi-square test.

Table 3. 10: Number of patients using complementary and alternative therapies prior to and with treatment according to work place

Use of CAM ¹	Private %(N)	Public %(N)	p-value
CAM prior to medical management	58.33 (28)	47.06 (16)	$p=0.51$
CAM with medical management	43.75 (21)	41.18 (14)	$p=0.93$

¹ CAM - Complementary and Alternative medicine/ therapy

* Differences per professional category not statistically significant (ML chi-square test) (CAM prior to medical management $p=0.51$, CAM with medical management $p=0.93$)

3.9 Multidisciplinary Care

3.9.1. Referral between medical disciplines

Cross tabulation with contingency tables and the ML chi-square test was again used to analyse the following data. When asked whether respondents managed food allergy as part of a team or individually, there was no significant difference between the three categories ($p=0.089$) although clear distinctions did exist. General Practitioners were more likely to work as individuals (63.8%, $N=30$), Dietitians were the group most likely to work in a multidisciplinary environment, predominantly with general practitioners and paediatricians (69.2%, $N=9$). Medical Specialists reported equal individual and team management (50% each, $N=11$), usually with another Medical Specialist (Allergist, Dermatologist, ENT).

Interdisciplinary collaboration between health professionals varied significantly between work place environment. The public sector health professionals were more likely to work as a team (65%, $N=22$) than those in private who were more likely to work as individuals (69%, $N=33$) in managing food allergy patients ($p=0.002$).

3.9.2. Referral of food allergy patients between medical doctors and dietitians

A significant difference was found between General Practitioners and Medical Specialists who referred food allergy patients to Dietitians and those who did not ($p=0.049$). There was also a difference between those medical practitioners being referred to by Dietitians or not ($p=0.02$). (Table 3.11)

Table 3. 11: Referral of food allergy patients to and from dietitians by medical doctors

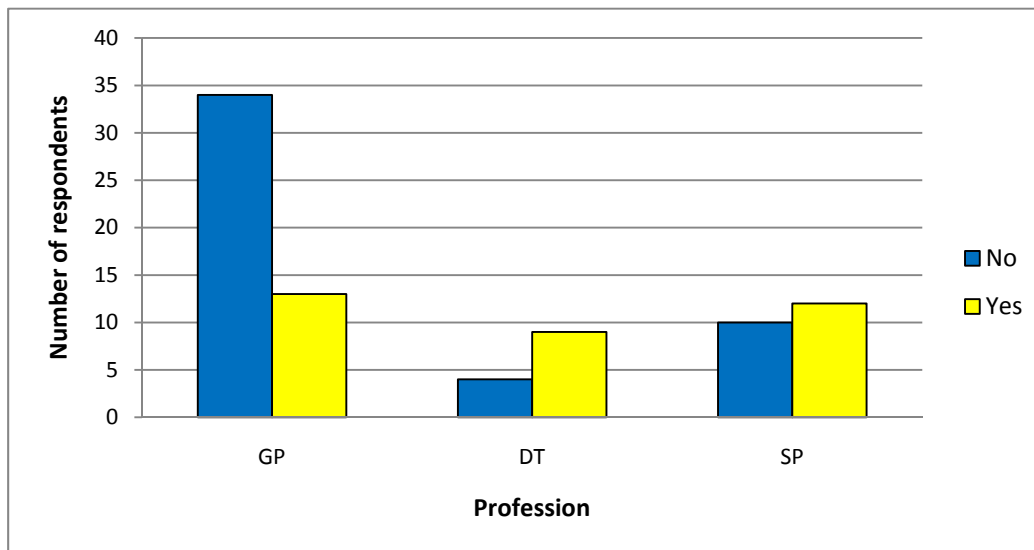
Medical Doctor	Referral TO a dietitian		Referral BY a dietitian	
	Yes $\%(N)^*$	No $\%(N)$	Yes $\%(N)^{**}$	No $\%(N)$
General Practitioners	29.8 (14)	70.2 (33)	14.9 (7)	85.22 (40)
Medical Specialists	54.55 (12)	45.45 (10)	40.91 (9)	59.09 (13)

* Differences per professional category statistically significant (ML chi-square test) $p=0.049$

** Differences per professional category statistically significant (ML chi-square test) ($p=0.02$)

The poor utilisation of dietetic expertise by doctors, particularly General Practitioners, was reiterated when the study sample was questioned on how closely they worked together for considering an elimination diet and food challenge test in diagnosing a food allergy - 72.34% of ($N=34$) 'do not' refer while 27.66% ($N=13$) 'do refer' to Dietitians; 45.45% of Medical Specialists ($N=10$) reported no referral, while 54.5% ($N=12$) 'do refer' to a Dietitian. Dietitians seemed to be better at referring patients to the medical professionals with 69% ($N=9$) who

'do refer' versus 30.7% ($N=4$) who 'don't refer'. These findings were all analysed by means of ML chi-square tests of observed frequency tables and were found to differ significantly ($p<0.001$) between the three categories. (Figure 3.14)



GP - General Practitioners

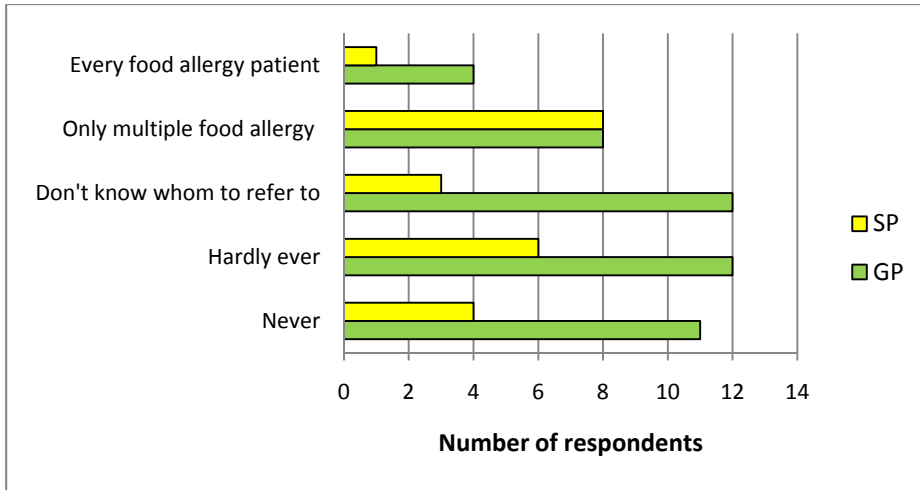
DT - Dietitians

SP - Medical Specialists

** Differences per professional category statistically significant (ML chi-square test) $p<0.001$

Figure 3. 14: Referral of food allergy patients between medical doctors and dietitians by professional category

Interestingly, when questioned in more detail regarding referral to a Dietitian, both General Practitioners and Medical Specialists acknowledged limited collaboration with Dietitians in implementing elimination diets. Only 6.2% of General Practitioners and Specialists combined referred every patient to a Dietitian; 23% of the two medical categories together 'only referred patients with multiple food allergies'; 22% 'never' referred to a Dietitian and implemented his or her own diet plan; 26% 'hardly ever' referred and 22% wanted to but 'didn't know whom to refer to'. The two medical categories showed no significant difference ($p=0.44$) with regard to referral to a Dietitian. There was also no significant difference between General Practitioners and Medical Specialists working in private or public health care in terms of referral to a Dietitian ($p=0.33$). Those in private were more likely to refer patients with multiple food allergies than those in public health (29% versus 15% respectively). Approximately one fifth of medical doctors in private healthcare either 'never' (19.1%, $N=8$) or 'hardly ever' (21.4%, $N=9$) referred food allergy patients on to a Dietitian. Of those in public health, a quarter 'never' (26%, $N=7$) and a third 'hardly ever' (33.3%, $N=9$) used a Dietitian for management of food allergy patients. These data were analysed using contingency tables of observed frequencies and analysed by means of ML chi-square tests. (Figure 3.15)



SP - Medical Specialists

GP - General Practitioners

* Differences per professional category not statistically significant (ML chi-square test) $p=0.33$

Figure 3. 15: When do medical doctors collaborate with and refer food allergy patients to dietitians?

When questioned on the extent of close working associations with doctors in implementing food elimination diets, Dietitians reported 'never' working with doctors in 46% of cases ($N=6$), 'occasionally' in 38% of cases ($N=5$) and 15% ($N=2$) reported working with a doctor 'for every patient'. (Figure 3.16) There was no significant difference between those Dietitians in private versus those working in public health ($p=0.16$) although Dietitians in private were more likely to work closely with a medical doctor.

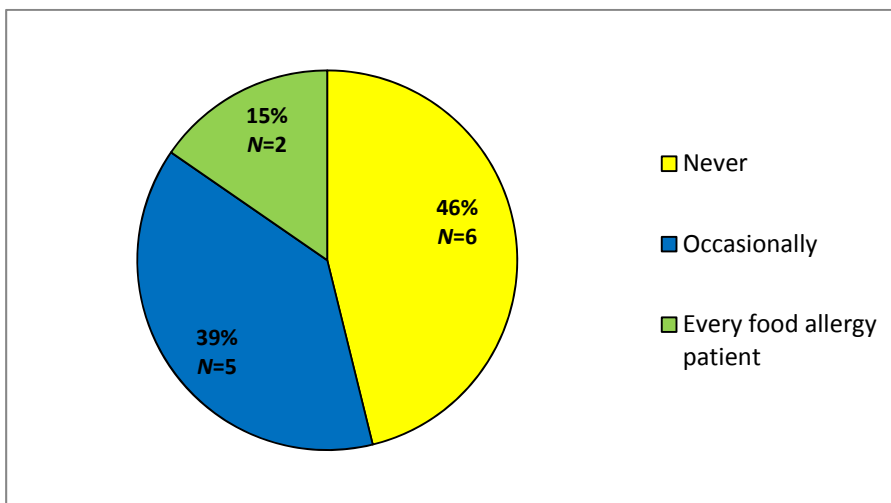
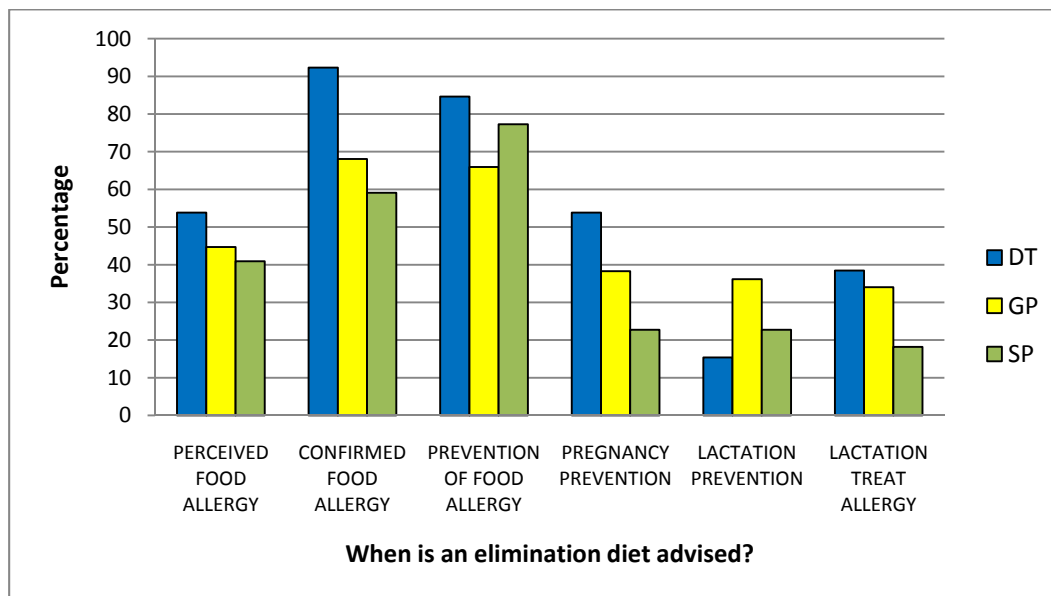


Figure 3. 16: Extent to which dietitians work closely with medical doctors in managing food allergy patients

3.10 Food Elimination Practices and Dietary Advice for Prevention and Treatment of Food Allergy

3.10.1. When do professionals advise an elimination diet?

Dietitians as a group considered an elimination diet for the most situations including treatment of perceived and confirmed food allergies (54%, $N=7$ and 92.3%, $N=12$, respectively), prevention of food allergy in infants (84.6%, $N=11$), during pregnancy for allergy prevention (54%, $N=7$) and during lactation for confirmed food allergy related to breastfeeding (38.5%, $N=5$). General Practitioners were more likely than the other two categories to use elimination diets during lactation for allergy prevention (36.2%, $N=17$). Contingency tables of observed frequencies of responses, analysed by means of ML chi-square testing, found no significant difference between the three categories with regards to situations where elimination diets were considered in practice. (Figure 3.17)



DT - Dietitians

GP - General Practitioners

SP - Medical Specialists

* Differences per professional category not statistically significant (ML chi-square test)

Figure 3. 17: Circumstances in which an elimination diet is considered by professional category

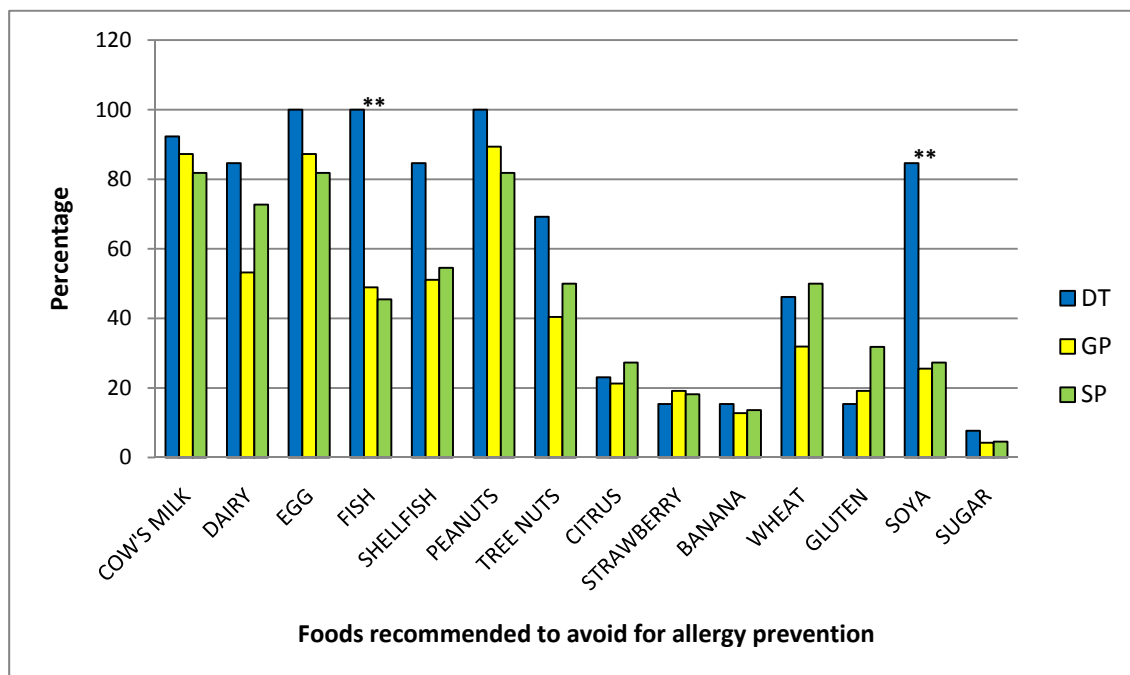
3.10.2. Timing of dietary advice

The time when dietary advice was given to mothers with a strong allergic background regarding appropriate feeding practices for her infant for allergy prevention varied significant between the three categories (during pregnancy $p=0.03$, once the baby has been born $p=0.02$). General Practitioners tended to advise mothers during pregnancy (53%, $N=25$) and once the baby was born (57.5%, $N=27$). Dietitians predominantly gave advice to mothers during pregnancy (77%, $N=10$), while Medical Specialists were more likely to advise mothers once the baby was born (50%, $N=11$).

3.10.3. Dietary advice for allergy prevention in high risk infants

The majority of health professionals from each of the three categories advised extensive food avoidance in high risk infants for the first 12 months of age for allergy prevention. The foods most frequently recommended for avoidance (50% or more from each group) included cow's milk, egg, peanut, tree nuts, shellfish and wheat. (Figure 3.18)

There was no significant difference between the three categories in terms of these foods when analysed with ML chi-square tests, using cross tabulation. The same analysis found a significant difference regarding advice for avoidance of fish and soya between the three categories ($p < 0.001$ and $p < 0.001$ respectively). Dietitians were more likely than the two medical categories to advise avoidance of these two foods in high risk infants [100% ($N=13$) and 84% ($N=11$) of Dietitians for fish and soya, respectively] for allergy prevention. Dietitians tended to be the most extreme in terms of length of time for food elimination. A concern was the number of General Practitioners, Medical Specialists and Dietitians also advising avoidance of unusual allergens including citrus (21%, $N=10$; 27%, $N=6$; 23%, $N=3$, respectively), strawberry (19%, $N=9$; 18%, $N=4$; 15%, $N=2$, respectively) and banana (13%, $N=6$; 13%, $N=3$; 15%, $N=2$, respectively). Avoidance of gluten-containing grains was advised by 32% of Medical Specialists ($N=7$), 19% General Practitioners ($N=9$) and 15% of Dietitians ($N=2$).



DT - Dietitian

GP - General Practitioners

SP - Medical Specialists

** Differences per professional category statistically significant (ML chi-square test) (fish $p < 0.001$, soya $p < 0.001$)

Figure 3. 18: Foods advised to eliminate in high risk infants for allergy prevention

In terms of the number of months advised by the three professions for avoidance of various allergens in high risk infants, the means were found to be significant for dairy ($p=0.05$), wheat ($p=0.05$) and soya ($p=0.01$); nearing significance for cow's milk ($p=0.07$), egg ($p=0.09$) and citrus ($p=0.07$). The non-parametric ANOVA test, the Kruskal Wallis test was used for analysing data. (Table 3.12)

Table 3. 12: Average number of months advised for avoidance of foods in high risk patients by professional categories

Common food allergens	Average number of months advised for food avoidance (SD)			
	Dietitians	General Practitioners	Specialists	TOTAL
Cow's milk **	13 (3.5)	11 (3.8)	11 (2.4)	11 (3.8)
Dairy *	13 (3.6)	10 (4.4)	10 (2.6)	11 (3.9)
Egg **	14 (4.7)	11 (3.9)	13 (5.1)	12 (4.5)
Peanut	18 (6.2)	16 (9.2)	16 (15.7)	16 (10.6)
Tree nuts	16 (6)	16 (12.1)	13 (8.2)	15 (9.8)
Soya *	13 (3.8)	10 (2.6)	7 (3.9)	10 (3.9)
Fish	14 (4.5)	11 (3.9)	13 (8.9)	12 (5.5)
Shellfish	13 (3.6)	13 (4.9)	18 (18.6)	14 (10.1)
Wheat *	14 (4.9)	9 (3.6)	9 (3.1)	10 (4)
Gluten	17 (10.6)	11 (5.6)	17 (24.7)	14 (15.6)
Unusual food allergens				
Citrus **	8 (1.7)	8 (2.1)	11 (2.5)	9 (2.5)
Strawberry	9 (4.2)	9 (4)	11 (1.5)	10 (3.4)
Banana	8 (2.1)	8 (3.1)	8 (4)	8 (2.9)

* Differences per professional category nearing significance (Kruskal Wallis test) (dairy $p=0.05$, wheat $p=0.05$, soya $p=0.01$)

** Differences per professional category statistically significant (Kruskal Wallis test) (cow's milk $p=0.07$, egg $p=0.09$, citrus $p=0.07$)

In general, the Dietitians as a group appeared to recommend food allergen avoidance for the longest period of time per food for allergy prevention in infants without clinical allergy.

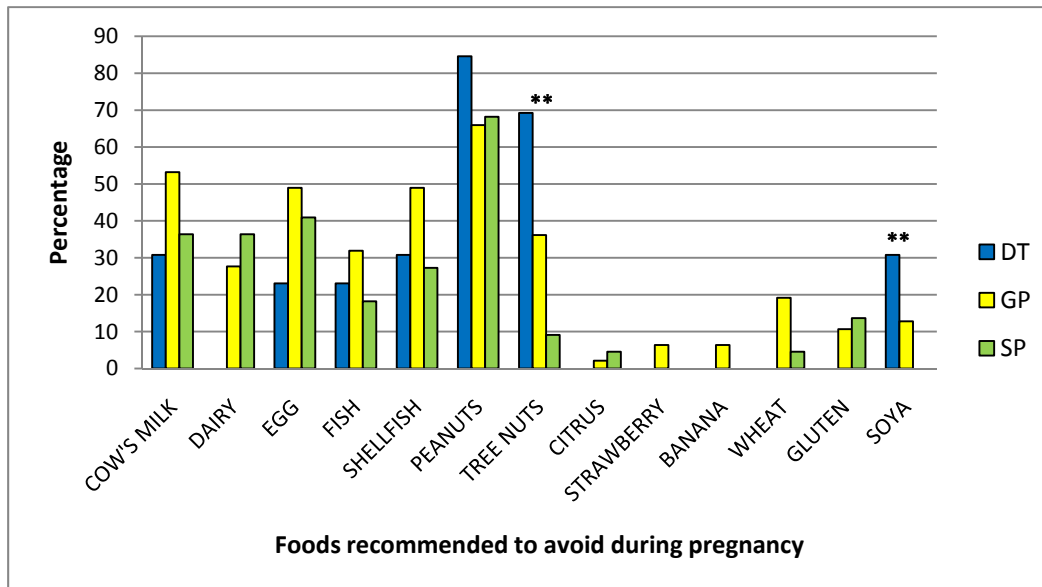
3.10.4. Dietary advice during pregnancy for high risk women

Approximately three quarters of all participants reported their current practice was to advise pregnant women to avoid specific foods for allergy prevention – 77% of General Practitioners ($N=36$), 85% of Dietitians ($N=11$), 73% of Medical Specialists ($N=16$).

Peanut is the food recommended for pregnant women to avoid by 50% or more respondents from each group (General Practitioners 66%, $N=31$; Dietitians 85%, $N=11$; Medical Specialists 68%, $N=15$) ($p=0.39$). The three

categories weighted allergenic foods differently for removal during pregnancy. A third of the Dietitians recommended soya be avoided (31%, $N=4$). This was significantly different to the two medical doctor categories when 2-way summary tables were analysed by means of the ML chi-square test ($p=0.001$). Avoidance of egg ($p=0.22$), fish ($p=0.44$) and shellfish ($p=0.17$) was recommended to a similar extent between the categories, with no significant difference. More General Practitioners (36%, $N=17$) and Dietitians (69%, $N=9$) than Medical Specialists (9%, $N=2$) recommended elimination of tree nuts during pregnancy in conjunction with peanuts, a practice found to be significantly different between the three categories ($p=0.001$). Again, the above analyses were done by comparing observed frequencies and using the ML chi-square test).

As mentioned in previous results, unusual foods such as strawberry, citrus and banana continued to be implicated and removal from the diet recommended by a few respondents from the General Practitioners group in particular. Wheat and gluten were also recommended by a few respondents from the General Practitioner (19%, $N=9$ and 11%, $N=5$, respectively) and Medical Specialist (5%, $N=1$ and 13.6%, $N=3$, respectively) categories. (Figure 3.19)



DT - Dietitians

GP - General Practitioners

SP - Medical Specialists

** Differences per professional category statistically significant (ML chi-square test) (tree nuts $p=0.001$, soya $p=0.001$)

Figure 3. 19: Foods recommended by each professional category to be avoided during pregnancy for allergy prevention

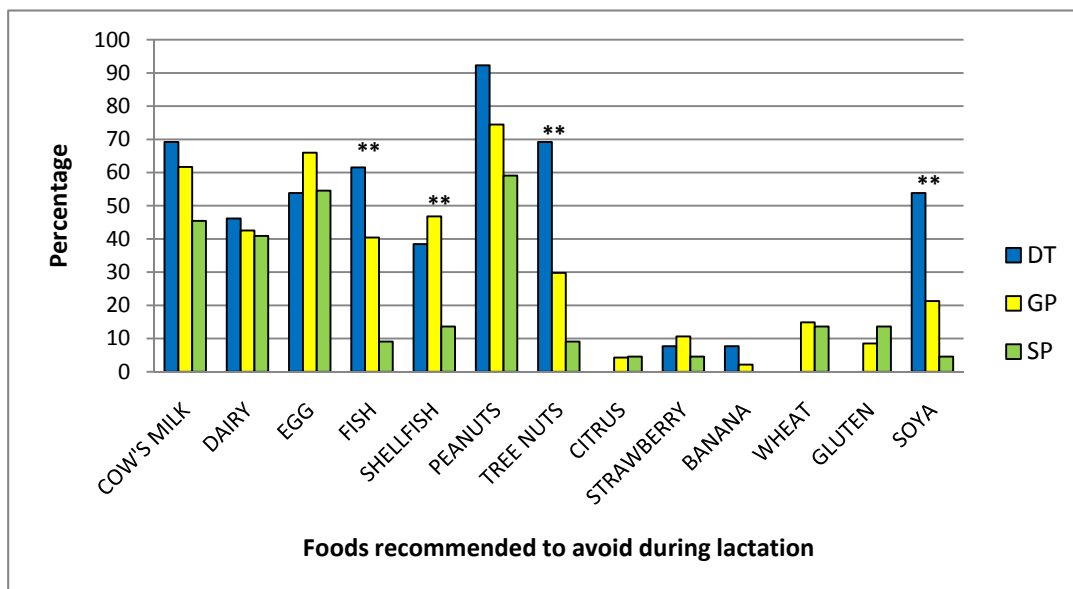
The mean time frame of avoidance for all the foods recommended for elimination by the three categories was 9 months i.e. the duration of the pregnancy.

3.10.5. Dietary advice during lactation for high risk mothers

Food avoidance was recommended to breastfeeding mothers, regardless of the allergic clinical picture of the infant, by a near statistically significant number of respondents when observed frequencies are analysed using the ML chi-square test – 78.7% General Practitioners ($N=37$), 92.3% Dietitians ($N=12$) and 59% Medical Specialists ($N=13$) ($p=0.06$).

The majority of participants (50% or more from each group) recommended the avoidance of cow's milk and dairy, egg and peanuts ($p=0.07$). Advice for elimination of peanut during lactation was nearing significance between the three categories. Medical practitioners and Dietitians were more likely to also recommend dietary elimination of fish ($p=0.002$), shellfish ($p=0.019$) and tree nuts ($p<0.001$) while breastfeeding. These recommendations were found to be significant between the three categories. The Dietitians (53%, $N=7$) were again the predominant group who recommended avoidance of soya ($p=0.003$) for lactating mothers. This was also statistically significant. All these values were analysed by means of 2-way summary tables and ML chi-square tests.

There were again respondents from each group (mainly General Practitioners and Medical Specialists) who recommended avoidance of foods such as strawberries, citrus, bananas, wheat and gluten from the diets of lactating women. (Figure 3.20) The time period recommended for all food avoidance during lactation by each of the three categories was found to be 9 months.



DT - Dietitians

GP - General Practitioners

SP - Medical Specialists

** Differences per professional category statistically significant (ML chi-square test) (fish $p=0.002$, shellfish $p=0.019$, tree nuts $p<0.001$, soya $p=0.003$)

Figure 3. 20: Foods recommended to avoid during lactation by professional category

3.10.6. Understanding of the terms cow's milk versus dairy

There appeared to be a discrepancy amongst respondents from the three categories recommending cow's milk avoidance and avoidance of dairy products. No significant difference was found between the 3 professional categories. (Table 3.13)

Table 3. 13: Differences in advice for elimination of cow's milk and dairy products according to profession

Professional group	Avoidance for allergy prevention		Avoidance during pregnancy		Avoidance during lactation	
	%(<i>N</i>)		%(<i>N</i>)		%(<i>N</i>)	
	Cow's milk	Dairy	Cow's milk	Dairy	Cow's milk	Dairy
Dietitians	92 (12)	84 (11)	30.7 ()	0	69 (9)	46 (6)
General Practitioners	87 (41)	53 (25)	53 (25)	27.7 (13)	62 (29)	42.5 (20)
Medical Specialists	82 (18)	72.7 (16)	36.4 (8)	36.4 (8)	45.5 (10)	40.9 (9)

3.10.7. Vitamin and mineral supplementation

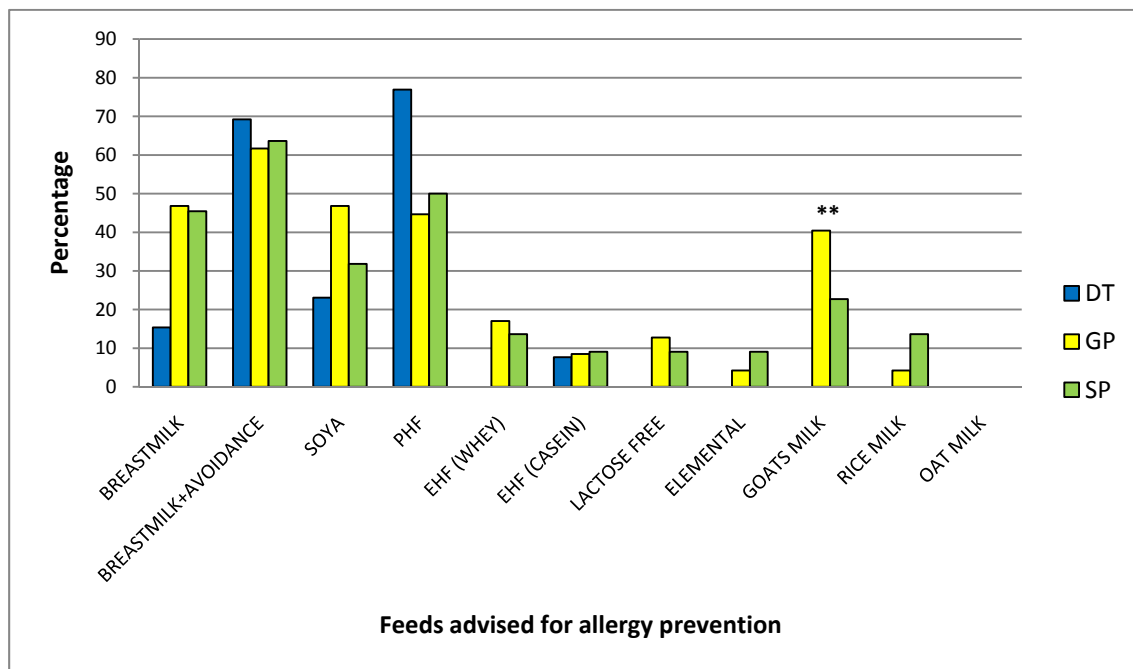
Dietitians were the group most likely to prescribe a vitamin and mineral supplement for an infant, child, pregnant or lactating woman on a restriction diet – 92%, *N*=12. By comparison only 43% (*N*=20), 36% (*n*=17) and 38% (*N*=18) of general practitioners considered vitamin and mineral supplementation in infants/ children, lactating and pregnant women respectively on restriction diets. Medical Specialists were slightly better and reportedly 36% (*N*=8) prescribed supplementation for infant/ children, 27% (*N*=6) each for lactating and pregnant mothers on elimination diets.

Only a third of all participants (33%) defined the term 'probiotic' correctly – General Practitioners 38% (*N*=18), Dietitians 38.5% (*N*=5), Medical Specialists 18% (*N*=4). Despite this, there were a number of medical doctors and Dietitians in particular, who reported they would consider probiotics for food allergy treatment [General Practitioners 15% (*N*=7), Dietitians 39% (*N*=12), Medical Specialists 9% (*N*=2)] and prevention [General Practitioners 17% (*N*=8), Dietitians 31% (*N*=4), Medical Specialists 18% (*N*=4)]. A few participants also said they would recommend omega 3 supplementation for both prevention [General Practitioners 2% (*N*=1), Dietitians 8% (*N*=1), and Medical Specialists 14% (*N*=3)] and treatment [General Practitioners 4% (*N*=2), Dietitians 8% (*N*=1), Medical Specialists 14% (*N*=3)] of food allergy. All these results were not found to be significantly different when analysed in cross tabulation with the robust ML chi-square testing.

3.10.8. Infant feeding advice for allergy prevention in high risk infants

Contingency tables to compare data between the three categories of current practice regarding infant feeding recommendations were analysed using ML chi-square tests. No significant differences were found for recommendations of various feeds from birth for allergy prevention except in the case of goat's milk ($p=0.002$). Up to 40% of general practitioners (*N*=19) and 23% of medical specialists (*N*=5) currently advise goat's milk as an appropriate breast milk substitute for allergy prevention in infants. (Figure 3.21)

Surprisingly, only 15% of Dietitians ($N=2$) recommended breastmilk without maternal dietary avoidance as an appropriate infant feed for allergy prevention. The majority of respondents from each group recommended breastmilk with avoidance of common food allergens (cow's milk, egg, peanut, tree nut, soya, fish, shellfish and wheat) from the diet. Partially hydrolysed infant formula was also considered for allergy prevention by a large number of respondents from each group, especially from the Dietitians (77%, $N=10$). A fifth of Dietitians (23%, $N=3$), a third of medical specialists (32%, $N=7$) and almost half of General Practitioners (47%, $N=22$) inappropriately recommended soya infant formula in high risk infants for allergy prevention. Rice milk was being recommended as an appropriate breastmilk alternative in infants by 14% of Medical Specialists ($N=3$).



DT - Dietitians

GP - General Practitioners

SP - Medical Specialists

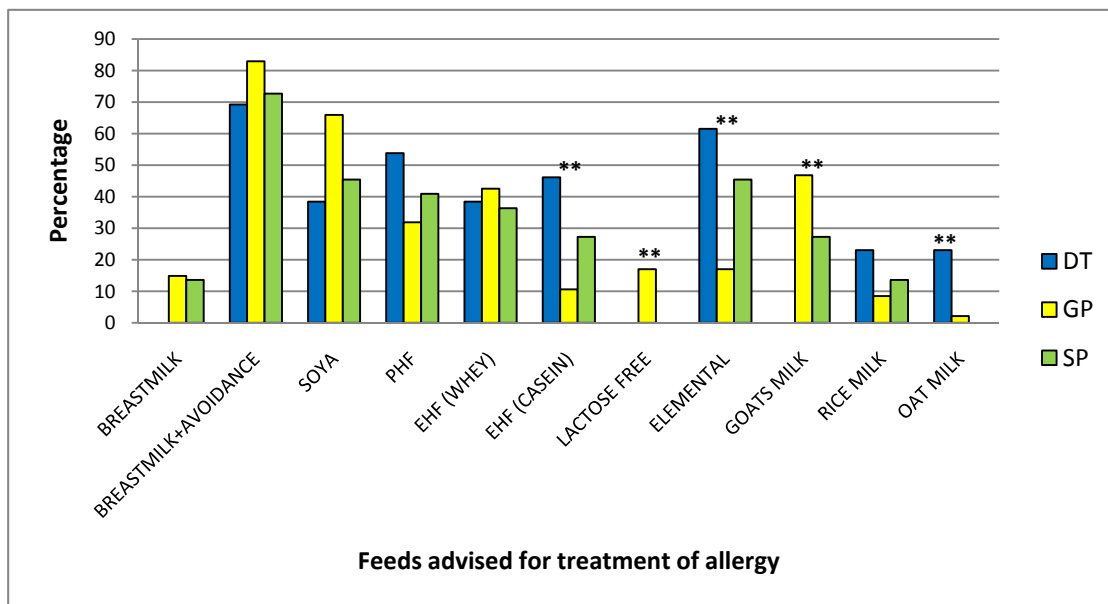
** Differences per professional category statistically significant (ML chi-square test) (goat's milk $p=0.002$)

Figure 3. 21: Infant feeds recommended for allergy prevention per professionals category

3.10.9. Infant feeding advice for treatment of specific food allergy

Feeds of choice recommended during infancy by a large proportion of medical doctors and Dietitians for the treatment of a specific food allergy e.g. cow's milk allergy, included breastmilk with maternal avoidance of common food allergens (not specific foods), soya infant formula, partially hydrolysed infant formula and extensively hydrolysed infant formula. Significant differences between the three categories were found with regards to extensively hydrolysed casein dominant infant formula ($p=0.017$), lactose free formula ($p=0.008$), elemental infant formula ($p=0.002$), goat's milk ($p<0.001$) and oat milk ($p=0.016$). Extensively hydrolysed whey dominant infant formula was recommended more than extensively hydrolysed casein dominant infant

formula, except by the Dietitians (Casein dominant formula 46% versus whey dominant formula 38%) for allergy treatment. Elemental infant formula was recommended more frequently by Dietitians and Medical Specialists. Goat's milk was recommended for treatment of food allergy by nearly half of the General Practitioners group (47%, $N=22$) as well as 27% of medical specialists ($N=6$). Almost a quarter of Dietitians recommended rice milk (23%, $N=3$) and oat milk (23%, $N=3$) as an appropriate breastmilk substitute in infants with a food allergy and 17% of General Practitioners ($N=8$) recommended a lactose free infant formula (cow's milk based). All the data above was analysed statistically using 2-way summary tables and then ML chi-square tests. (Figure 3.22)



PHF - Partially hydrolysed formula

EHF - Extensively hydrolysed formula

DT - Dietitians

GP - General Practitioners

SP - Medical Specialists

** Differences per professional category statistically significant (ML chi-square test) (EHF-casein dominant $p=0.017$, lactose free formula $p=0.008$, elemental infant formula $p=0.002$, goat's milk $p<0.001$ and oat milk $p=0.016$)

Figure 3. 22: Infant feeds recommended for treatment of food allergy by professional category

3.10.10. Understanding of different types of infant formula

3.10.10.1. Extensively hydrolysed infant formula

There was similar feedback between the three categories of professionals regarding possible reaction to an extensively hydrolysed infant formula – only 55% of General Practitioners ($N=26$), 39% of Dietitians ($N=5$) and 45.5% of Medical Specialists ($N=10$) correctly believed that a child with cow's milk allergy could react to an extensively hydrolysed infant formula. More than three quarters of all respondents (77%, $N=63$) said they were

not aware of an age-appropriate, nutritionally complete, extensively hydrolysed or elemental formula, available in South Africa, for treatment of children older than 1 year with cow's milk allergy. Of those who said they were aware (23%, $N=19$), none of the respondents correctly identified an appropriate formula (17% General Practitioners, 46% Dietitians, 23% Medical Specialists). Instead, various different and inappropriate infant formulas were named.

3.10.10.2. Goat's milk

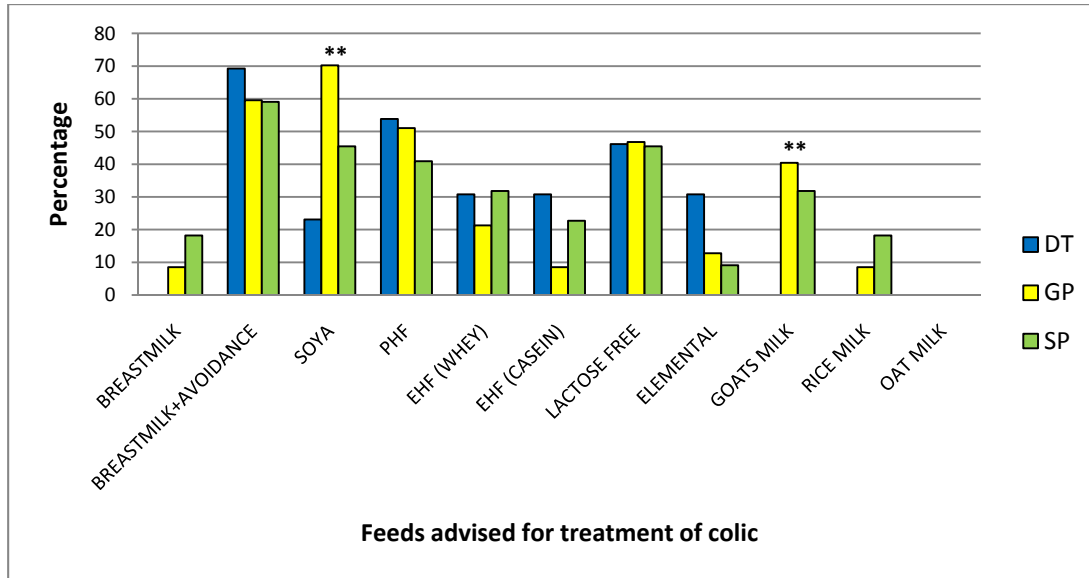
Goat's milk was considered an appropriate replacement for cow's milk in cow's milk allergy by 39% of all participants - 49% of General Practitioners ($N=23$), 36% of Medical Specialists ($N=8$), 8% of Dietitians ($N=1$). This was found to be statistically significant between the three categories ($p=0.013$) when analysed by contingency tables with the ML chi-square test. Comparisons between work place and use of goat's milk were also analysed. Surprisingly, more professionals in public (50%, $N=17$) than private (31%, $N=15$) health care believed goat's milk was an appropriate alternative for infants with cow's milk allergy, although differences were not found to be significant ($p=0.08$).

3.10.10.3. Soya milk

There was a significant difference between the three professional categories in terms of the percentage of cow's milk allergic patients believed to also be allergic to soya milk ($p<0.01$). The average (SD) percentage of each of the three categories was 13% (9.4) by General Practitioners, 20% (18) by Medical Specialists and 35% (26) by Dietitians. Estimates were predominantly based on personal experience however those who based their answer on the literature were more likely to be correct with the mean (SD) percentage of cow's milk with concomitant soya allergy calculated as 34% (18.6) compared to 14% (14.4) for personal experience ($p<0.01$). Analyses were done by means of non-parametric ANOVA tests, the Kruskal-Wallis test and the Mann-Whitney test respectively.

3.10.11. Infant feeding advice for treatment of colic and colic-like symptoms

Approximately 54% of all participants (53% General Practitioners, 54% Dietitians and 55% Medical Specialists, $p=0.91$) thought colic-like symptoms may 'always' be related to food allergy while 43% thought it was only 'sometimes' related to food allergy (45% General Practitioners, 38% Dietitians, 41% Medical Specialists). In all these cases, dietary intervention by means of altering the infant's formula was considered appropriate practice. (Figure 3.23)



PHF - Partially hydrolysed formula

EHF - Extensively hydrolysed formula

DT - Dietitians

GP - General Practitioners

SP - Medical Specialists

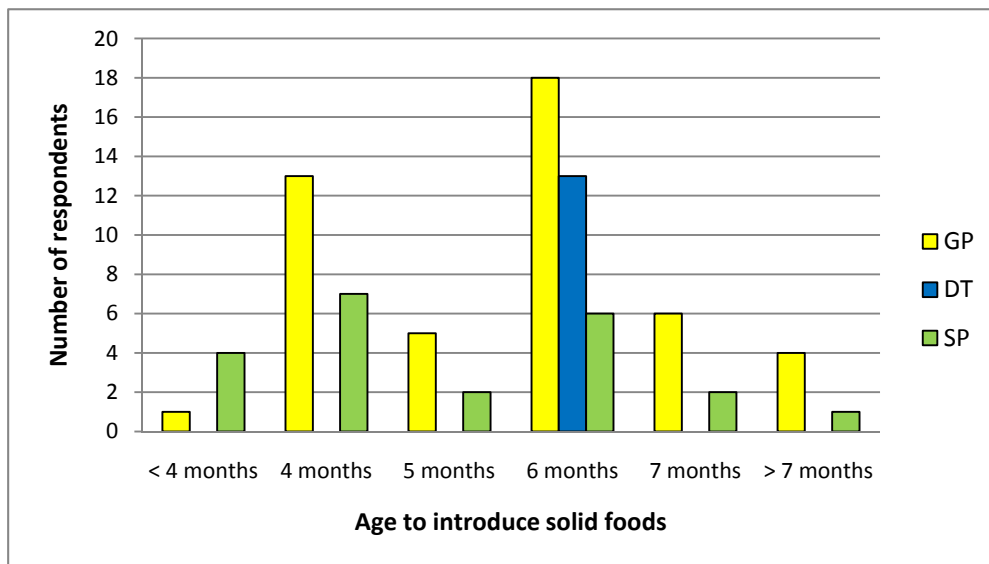
** Differences per professional category statistically significant (ML chi-square test) (soya formula $p=0.004$, goat's milk $p=0.003$)

Figure 3. 23 Infant feeds recommended by profession for management of colic-like symptoms

No Dietitians recommended breastmilk without avoidance of common food allergens (cow's milk, egg, peanut, tree nut, soya, fish, shellfish and wheat) from the mother's diet for infants with colic-like symptoms. Very few of the medical doctors recommended this either (General Practitioners 9%, Medical Specialists 18%). Breastmilk with maternal dietary restriction of common food allergens was the feed of choice for most Dietitians (69%, $N=9$) and Medical Specialists (59%, $N=13$) while more General Practitioners recommended soya infant formula for infants with colic (70%, $N=33$). There was a significant difference between the three categories in terms of recommendation of soya infant formula for managing colic ($p=0.004$). Partially hydrolysed infant formula were also recommended as an appropriate alternative by 51% General Practitioners ($N=24$), 41% Medical Specialists ($N=9$) and 54% Dietitians ($N=7$). Extensively hydrolysed whey dominant infant formula appeared to be recommended more than the casein dominant alternatives available. Almost half the respondents from each group (47% General Practitioners, 45% Medical Specialists and 46% Dietitians) recommended a lactose free infant formula for infants with colic-like symptoms. Goat's milk was recommended again by 40% of General Practitioners ($N=19$) and 32% of Medical Specialists ($N=7$) – findings were found to be significant ($p=0.003$) when observed frequencies were analysed using 2-way summary tables and the ML chi-square test. Dietitians were the group most likely to advise an elemental formula to manage colic-symptoms (31%, $N=4$) and 18% of Medical Specialists ($N=4$) believed rice milk to be appropriate for infants with colic. (Figure 3.23)

3.10.12. Age recommended for weaning and introduction of solid foods

The average (SD) age recommended by all three categories for introduction of solid foods was 5 (1.3) months. A significant difference was found between the three professions and the age advised for introducing solid foods ($p=0.04$). These analyses were all done based on non-parametric ANOVA, and confirmed with the Kruskal–Wallis test. Analysis of the data was also done by means of cross tabulation and the ML chi-square test and was again found to be significant between the three categories of health professionals ($p<0.001$). All the Dietitians ($N=13$) recommended solid foods be introduced from '6 months'. The 2 medical categories were more likely to advise introduction of solid foods at '4 months' (General Practitioners 28%, $N=13$ and Medical Specialists 32%, $N=7$) and at '6 months' (General Practitioners 38%, $N=18$ and Medical Specialists 27%, $N=6$). Of concern was the 6% of medical doctors recommended solid foods before 4 months of age (2% General Practitioners, $N=1$ and 18% Medical Specialists, $N=4$) and 16% recommended introduction of food later than 6 months (21.3% General Practitioners, $N=10$ and 14% Medical Specialists, $N=3$). (Figure 3.24)



GP - General Practitioners

DT - Dietitians

SP - Medical Specialists

** Differences per professional category statistically significant (Kruskal Wallis test and ML chi-square test) $p=0.04$ and $p<0.001$ respectively

Figure 3. 24: Percentage of respondents per category and age advised for introduction of solid foods in infants

3.10.13. Recommendations for introduction of allergenic foods in high-risk infants with no allergy

In high-risk infants, without clinical food allergy, extensive food avoidance of common allergens (cow's milk, egg, wheat, gluten, shellfish, fish, peanuts, tree nuts, soya) was advocated for the first 12 months by the majority of health professionals. Between 20-30% advised avoidance of shellfish, tree nuts and peanuts for up to 24 months. Recommendations for introduction of the following foods were significant between the three

categories based on the non parametric ANOVA test, the Kruskal Wallis test: cow's milk ($p<0.01$), soya ($p<0.01$), peanuts ($p=0.02$), tree nuts ($p<0.01$) and gluten ($p=0.04$), while recommendations were nearing significance for shellfish ($p=0.08$) and egg ($p=0.06$). (Table 3.14) The Dietitians were again the group who recommended the most restrictive food avoidance in infants regardless of the presence of atopic disease.

Table 3. 14: Age for recommended introduction of common allergens into the diet of *an infant with no allergies*

Professional group	Recommended mean (SD) age of food introduction (in months)								
	Cow's milk**	Soya**	Peanut**	Tree nuts**	Egg*	Fish	Shellfish*	Wheat	Gluten**
Dietitians	15 (6.3)	15 (6.4)	22 (14.6)	14 (6.7)	16 (6.9)	14 (4.8)	16 (5.8)	9 (3.1)	9 (3.1)
General Practitioners	10 (3.6)	9 (4)	17 (6.8)	15 (6.5)	11 (4.5)	13 (8.2)	15 (9.3)	9 (4.6)	8 (5)
Medical Specialists	10 (2.7)	7 (4.7)	13 (8.8)	9 (10.2)	13 (9)	11 (8.3)	11 (8.2)	7 (4.6)	6 (4.6)
TOTAL	11 (4.3)	9 (5.3)	17 (9.3)	13 (8)	12 (6.6)	12 (7.8)	14 (8.6)	8 (4.4)	8 (4.8)

* Differences per professional category nearing statistical significance (Kruskal Wallis test) (shellfish $p=0.08$, soya $p=0.06$)

** Differences per professional category statistically significant (Kruskal Wallis test) (cow's milk $p<0.01$, soya $p<0.01$, peanuts $p=0.02$, tree nuts $p>0.01$, gluten $p=0.04$)

3.10.14. Recommendations for introduction of allergenic foods in infants with confirmed food allergy

Children presenting with confirmed food allergy were advised to avoid all the major food allergens (cow's milk, egg, soya, wheat, gluten, fish) for up to 12 months by most respondents (50% or more). More professionals advocated avoidance of certain allergens up to 24 and 36 months for these children (with confirmed food allergy), namely for introduction of peanuts, tree nuts, shellfish and egg. Recommendations for introduction of the following foods were found to be significantly different between the three categories, again based on the non parametric ANOVA test, the Kruskal Wallis test: soya ($p<0.01$), tree nuts ($p<0.01$) and wheat ($p=0.02$), while recommendations for introduction of gluten neared significance ($p=0.06$). (Table 3.15)

Table 3. 15: Age for recommended introduction of common allergens in the diet of an *infant with allergic disease*

Professional group	Recommended mean (SD) age of food introduction (in months)								
	Cow's milk	Soya**	Peanut	Tree nuts**	Egg	Fish	Shellfish	Wheat**	Gluten*
Dietitians	17 (8.4)	17 (8.4)	34 (28.5)	34 (28.5)	24 (9.8)	27 (19)	27 (29)	13 (5)	13 (5)
General Practitioners	15 (8.7)	14 (5.9)	24(8.9)	21(9.3)	18 (9.3)	17 (9.8)	19 (10.7)	14 (7.5)	13 (8)
Medical Specialists	15 (11.3)	9 (8)	23 (13.9)	13 (12.2)	20 (14)	15 (9.5)	16 (13.7)	10 (7.5)	11 (13.4)
TOTAL	16 (9.3)	13 (7.3)	25 (15.2)	21 (15.9)	20 (10.9)	18 (14.8)	19 (15.8)	13 (7.3)	13 (9.4)

* Differences per professional category nearing statistical significance (Kruskal Wallis test) (gluten p=0.06)

** Differences per professional category statistically significant (Kruskal Wallis test) (soya p=<0.01, tree nuts p>0.01, wheat p=0.02)

Again, Dietitians appeared to advocate the most stringent food avoidance recommendations for infants with confirmed food allergy (in terms of the number of foods and the length of time advised for avoidance).

3.11 Professional Contribution to Educating and Monitoring Food Allergy Patients

3.11.1. Allergy and nutrition information

Only 46% of Dietitians ($N=6$) reported to have had training to implement a balanced restriction diet for infants and children with food allergy. For implementing a balanced restriction diet in lactating mothers with a food allergic child, 62% of Dietitians ($N=8$) felt confident to do so.

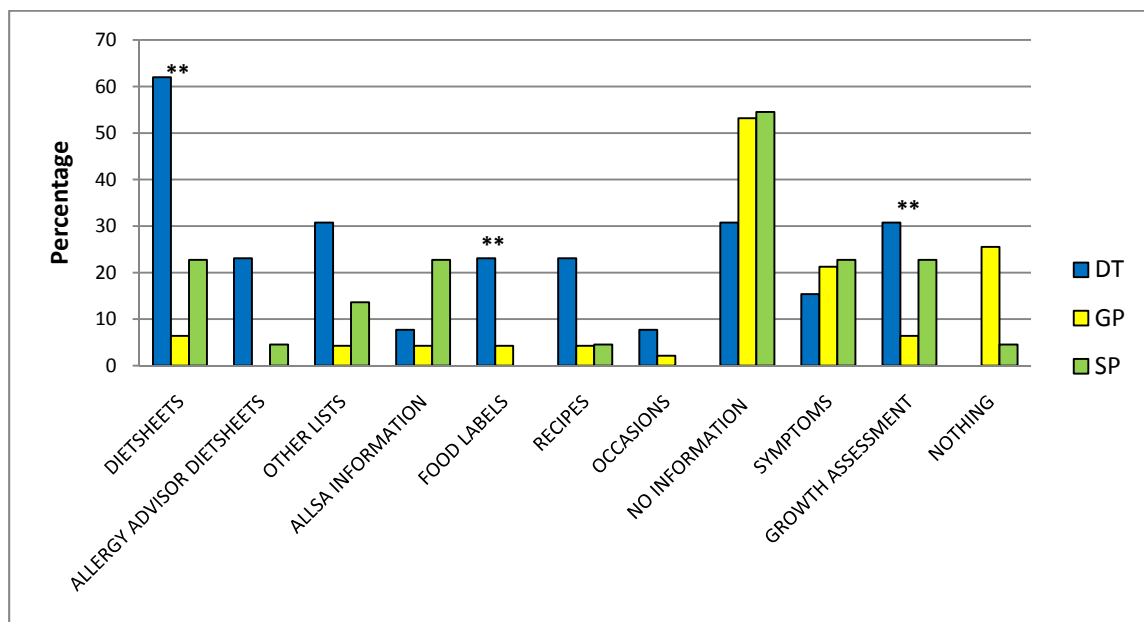
Appropriate information considered necessary to provide food allergy patients and their parents to ensure good adherence to elimination diets was extremely poor from all three categories. (Figure 3.25)

As a group, the Dietitians provided more appropriate information overall, however the extent of this guidance and support was very limited. Only 23% gave recipe suggestions ($N=3$) and information regarding food labels ($N=3$) and 8% ($N=1$) advised on how to cope with various situations and occasions. They were also the group most likely to give diet sheets (whether their own or with the help of an allergy software programme) to patients – 61.5% ($N=8$) compared to only 6% General Practitioners ($N=3$) and 22.7% Medical Specialists ($N=5$) ($p<0.001$). Provision of food label information was found to be significantly different between the three categories ($p=0.029$). The Medical Specialists as a group made the most use of the Allergy Society of South Africa (ALLSA) information sheets (23%, $N=5$). At least half of General Practitioners (53%, $N=25$) and Medical Specialists (55%, $N=12$) and approximately a third of Dietitians (31%, $N=4$) didn't give any information sheets to the patient and only broadly mentioned what foods to avoid. A quarter of General Practitioners (26%, $N=12$)

provided no information whatsoever. This was found to be significantly different compared to the other categories ($p=0.006$) according to contingency tables and the ML chi-square test. (Figure 3.25)

3.11.2. Growth assessment and monitoring

Only 15% of all respondents did growth assessment and monitoring of food allergic children – 6.4% of General Practitioners ($N=3$), 22.7% of Medical Specialists ($N=5$) and 30.7% of Dietitians ($N=4$). This was also significant between the three categories ($p=0.04$). As for the previous analyses, observed frequencies were analysed using 2-way summary tables and ML chi-square tests. (Figure 3.25)



ALLSA - Allergy Society of South Africa

DT - Dietitians

GP - General Practitioners

SP - Medical Specialists

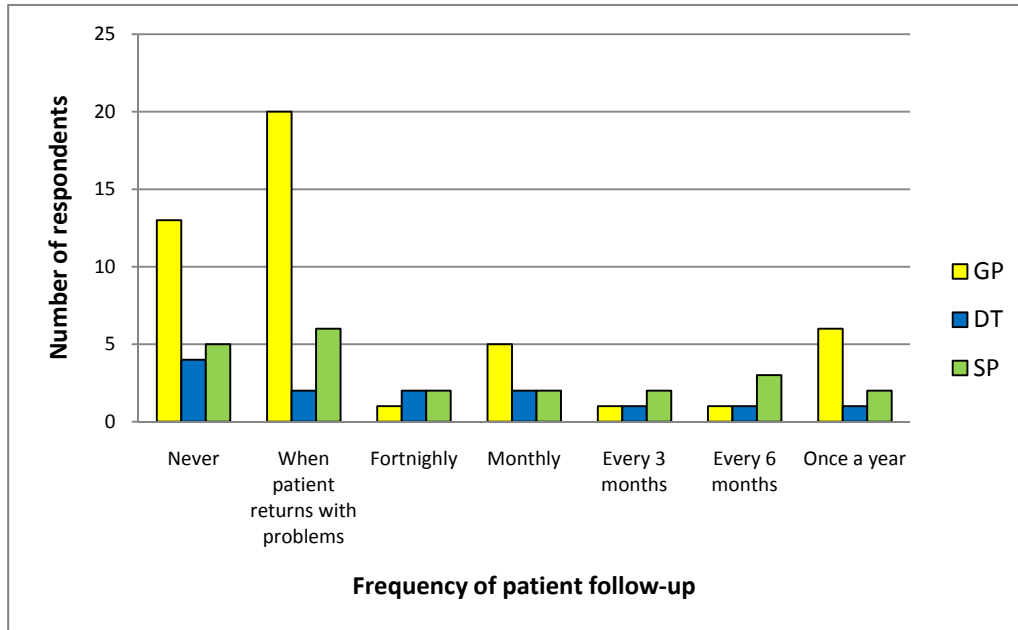
** Differences per professional category statistically significant (ML chi-square test) (diet sheets $p<0.001$, food label information $p=0.029$, growth assessment $p=0.04$)

Figure 3. 25: Food allergy information and advice provided to allergy patients per category

3.11.3. Patient evaluation and follow-up

Differences between the categories in terms of follow up and evaluation of patients on elimination diets was analysed by means of the non-parametric ANOVA test, the Kruskal-Wallis test, as well as cross tabulation with contingency tables and the robust ML chi-square test. Findings were not significant, according to both methods ($p=0.53$ and $p=0.45$, respectively). Amongst all three categories, the time period for follow-up was most frequently described as 'Just when there are problems and the patient returns' – 42.6% General Practitioners ($N=20$), 15.4% Dietitians ($N=2$), 27.3% Medical Specialists ($N=6$). More than a quarter of all

respondents (27%) 'Never' followed up a food allergy patient on a restriction diet. This comprised 27.7% of General Practitioners ($N=13$), 31% Dietitians ($N=4$) and 23% Medical Specialists ($N=5$). (Figure 3.26) There was also no significant difference found in terms of follow up between professionals in private and those in public health care ($p=0.13$). Again, the most frequently reported time period before follow-up of a patient on a restrictive diet for each of the two categories of workplace (private and public) was reported as 'Just when there are problems and the patient returns'. For this analysis the non parametric ANOVA test, the Mann-Whitney test was used.



GP - General Practitioners

DT - Dietitians

SP - Medical Specialists

* Differences per professional category not statistical significance (Kruskal Wallis test and ML chi square test) $p=0.53$ and $p=45$ respectively

Figure 3. 26: Frequency of follow-up and evaluation for patients on an elimination diet by professional category

3.12 Problem Areas and Support Structures

The most common problems experienced by the different health professionals in managing food allergy in South Africa were described as the following:

- Lack of allergy training - both undergraduate and postgraduate
- Limited knowledge especially regarding suitable management options, diagnosis and correct interpretation
- Limited facilities and resources for accurate diagnosis in both rural areas and public health facilities
- A lack of allergy expertise and limited professional support – Allergists, specialist allergy clinics, Dietitians confident to work with food allergies

- e. Financial constraints of patients
- f. Generally expensive food alternatives and milk substitutes with limited affordable alternative products especially in rural areas
- g. Use of expensive, unproven food testing and inappropriate food elimination
- h. Poor adherence from patients in terms of both restriction diet and auto-injectors
- i. Poor patient knowledge, overcautious parents, patient perceptions of food allergies and foods responsible for reactions, a need to better educate the general public

The majority of health professionals were unaware of specialist allergy clinics in South Africa – General Practitioners 66% ($N=31$), Dietitians 69% ($N=9$), Medical Specialists 22.7% ($N=5$). The Medical Specialists were the group most likely to know of an appropriate clinic (77.3%, $N=17$). The differences were statistically significant according to the ML chi-square test ($p=0.001$). Private health care professionals were more likely to know of an appropriate specialist allergy clinic than those working in the public health system – 52% ($N=25$) and 35% ($N=12$) respectively ($p=0.13$).

Allergy information for use in daily practice was mostly obtained from continued professional development initiatives in all three categories ($p=0.76$). (Table 3.16)

Table 3. 16: Sources of information used by each professional category to obtain allergy information

Information source	General Practitioners %(N)	Dietitians %(N)	Medical Specialists %(N)
Undergraduate	25.5 (12)	38.5 (5)	9 (2)
Postgraduate	12.7 (6)	38.5 (5)	50 (11)
CPD ¹	72.3 (34)	69.2 (9)	63.5 (14)
ALLSA ²	10.6 (5)	7.69 (1)	40.19 (9)
NICUS ³	0	23 (3)	9 (2)
Allergy programme ⁴	6.4 (3)	23 (3)	4.5 (1)
Allergy consultancy ⁵	0	30.7 (4)	4.5 (1)
Internet	23.4 (11)	0	36.4 (8)
Magazines	12.7 (6)	0	22.7(5)
Books	6.4 (3)	23 (3)	13.6 (3)

¹ CPD - Continued professional development

² ALLSA - Allergy Society of South Africa

³ NICUS - Nutrition Information Centre (University of Stellenbosch)

⁴ Allergy Advisor

⁵ Food and Allergy Consulting and Testing Services (FACTS)

As many as 98% percent of all respondents (General Practitioners 97.8%, $N=46$; Dietitians 100%, $N=13$; Medical Specialists 95.4%, $N=21$) believed they would benefit from additional education and training on different aspects in the management of food allergies ($p=0.61$). Continued professional development activities

($p=0.079$), workshops ($p=0.02$), and journal articles ($p=0.046$) were considered the best modes for providing education to professionals amongst the three categories.

All but one respondent from the General Practitioner category (99%, $N=81$, $p=0.57$) thought there was a need for standardising allergy care and evidence-based consensus guidelines in South Africa.

CHAPTER 4

DISCUSSION

The aim of this survey was to determine aspects of food allergy related knowledge and practices of Medical Doctors (General Practitioners and Specialists) and Dietitians. This was the first such study in South Africa. A number of key findings of the study were identified for Medical Doctors and Dietitians alike. These included a poor existing knowledge regarding appropriate diagnosis of IgE and non-IgE mediated hypersensitivity reactions; common allergens; symptoms associated with allergies; dietary intervention; natural progression of food allergies; allergy prevention strategies; available allergy expertise and support networks.

The survey found limited cooperation between the health professionals. Excessive and inappropriate dietary restriction were being inappropriately advocated for prevention of food allergy in high risk infants, pregnant and lactating women as well as children with confirmed food allergy. Dietitians were the group most likely to advise strict food elimination for prolonged periods of time. Both Medical Doctors and Dietitians provided patients with incorrect advice regarding appropriate introduction of complementary foods and breast milk substitutes for food allergy prevention and treatment. There was poor patient follow up. Overall information regarding dietary management and growth assessment for allergic infants and children were minimal. Respondants identified gaps in allergy education and training and an overwhelming need was identified for standardised allergy care and evidence-based guidelines for practitioners in South Africa.

In interpreting the data however, it is necessary to recognise at the outset that the poor response from the selected categories of health professionals make it difficult to draw conclusions from any significant results as they cannot be considered truly representative of the population. The data is however extremely valuable in gaining a better understanding of how Medical Doctors and Dietitians approach their management of food allergic children and to identify areas of concern for providing better education and training. It is especially useful to have a point of reference, particularly in the South African context, as to the type of food allergy care provided by a number of different health professionals and whether it is in accordance with evidence-based approaches. This could directly influence the recognition that a need exists for better allergy care to ensure specific minimum requirements of the patient are ultimately met.

Recent surveys have been performed in the USA attempting to evaluate the food allergy knowledge, attitudes and beliefs of primary care physicians as well as the approach to management of food allergy by General Practitioners, Physicians and Specialists (allergists and non-allergists).^{26,28-32,179,183} There appears to be no literature to date assessing knowledge and current practices of Dietitians in particular with regards to food allergy management. There is also no comparison available of current clinical approaches between General Practitioners, Medical Specialists and Dietitians, in context of the latest evidence-based recommendations.

4.1. Total Questionnaire Response

An obvious limitation of the study, as mentioned before, was the poor response rate from the various categories of health professionals. Generally, a webmail survey tends to be more cost effective (no printing and mailing needed), time efficient (data is already in electronic format for analysis) and may provide a better response rate in populations who use the internet regularly.²⁰⁸ A mixed mode strategy (mail and web surveys) has been suggested in order to exploit the advantages of web surveys and minimise non-response.²⁰⁸ This strategy was used for the survey in order to encourage a better response rate.

In an attempt to reach as many individuals as possible with the current study, particularly those in rural areas with limited access to the internet, questionnaires had been sent by means of postage as well as electronically through email. A self-addressed, stamped envelope was enclosed for convenience of the participant and reminders were sent out via email and post all in an attempt to achieve a better response rate. The questionnaire was formatted in such a way to allow for easy answering whether through marking an 'X' in the appropriate block or by means of electronic imputing of answers. 'Time constraints' was however included as a reason for not responding. The length of the questionnaire, requiring a maximum of 15-20 minutes of time to complete, may have also been a limiting factor and contributed to the poor response rate.

It was also necessary to obtain information from individuals in practice who may be fearful of the internet due to limited knowledge and computer adeptness or those weary of receiving electronic 'junk mail' or 'spam', thus reiterating the need for postage. These respondents could also include those individuals who qualified long ago, who have been in practice for longer. This survey identified that the longer the health professional had been in practice, the less likely he or she was to have received any basic allergy training at all or at the undergraduate level, it was therefore necessary to ensure response from older professionals for establishing where allergy education and training is lacking.

It is possible that the questionnaire attempted to assess too many different areas of knowledge and practices. A somewhat abbreviated questionnaire that included only the most relevant questions pertaining to the study aim and objectives may have improved the response rate.

4.2 Professional Demographic Information

In trying to further understand why so few Doctors and Dietitians responded, the question of a general lack of interest in food allergies must be posed. It is possible that only a few Medical Doctors and Dietitians have a real interest in food allergy. On the other hand, perhaps only those with strong opinions about the topic cared to respond. Also, a lack of response may indicate an overall lack of confidence in managing food allergy patients. One of the reasons given by non-responses returned to the researcher was "I don't know enough about food allergy". This is an important insight in itself. Many health practitioners may have averted responding so as not to implicate their current approaches and expose a limited knowledge or poor and outdated clinical practices. Although anonymity had been emphasized at the outset of the study and in the

explanatory covering note, those selected for the survey may still have had a concern for revealing their own knowledge and practice methods and the questionnaire may have been construed as an assessment of professional capabilities or lack thereof.

Health professionals were asked to comment on allergy management of paediatric patients. The exclusion of health professionals who predominantly treat adults may have contributed to the poor response rates. Again, a number of professionals may have felt intimidated and inadequately equipped to respond to questions relating to the paediatric population.

The study population did not include nurses and clinic nursing sisters. These health professionals are also closely involved in the monitoring of infants and young children and are responsible for parent education and dissemination of information on early infant feeding practices to mothers. Much of this information may be sound although outdated, unsubstantiated practices do exist and are often advocated by various health professionals including nurses.²⁵ A number of misperceptions, particularly dietary, continue to be passed down through the generations of nursing sisters and many mothers tend to rely solely on this dietary advice. In relation to food allergy these could include the question of food avoidance during pregnancy and lactation, appropriate breastmilk substitutes (infant formulas), when to introduce solid foods and what foods to introduce as well as food avoidance recommendations for allergy prevention.²⁵ Although nurses were not included in the study population, it could be hypothesized that they too provide patients with information similar to that of other health practitioners, particularly general practitioners. The information obtained from this study could therefore also be helpful in motivating for better allergy education and training across a wide range of health disciplines.

The study did not include all the provinces in South Africa. Due to financial constraints and limited resources, it focused on the three provinces with not only the greatest population numbers in South Africa, but also the best resourced in terms of allergy care. Two of the provinces (Gauteng and Western Cape) are predominantly urban so higher rates of allergic disease would be expected than in rural areas as well as more expertise to manage the condition. The rationale was that should problems exist in these provinces with regard to knowledge and clinical approach in management of food allergy, current training and education and availability of resources, by implication, they will also exist within the other provinces where even less allergy care is available to the public. It would however still be useful to obtain a better understanding of knowledge and practices in the whole country, to gauge where exactly the problems exist.

Another weakness identified in the study was the fact that it did not distinguish those working specifically in rural or urban areas. Allergic sensitisation^{209,210} and prevalence of allergic disease tends to be significantly lower in rural as opposed to urban areas.²⁰⁹⁻²¹² This has been demonstrated in several population studies, particularly with regard to respiratory symptoms (allergic rhinitis, wheeze and asthma)²¹² and eczema.²¹³ Regardless of this fact, one would expect allergy expertise and resources may be poorer further away from the main centres. Based on the feedback from the respondents on 'support structures', limited dietary and allergy

expertise was considered a problem, experienced specifically by those in rural areas and smaller communities in South Africa.

4.3 Allergy Education and Training

This study highlighted the urgent need for better allergy education and training at both undergraduate and postgraduate level with 88% of all respondents acknowledging a lack of time dedicated to allergy care in their professional training and 98% believed additional education and training would be beneficial. Of major concern was that almost a third of Dietitians (31%) received no allergy training. As a group, they identified a deficiency in training and expertise with regard to implementing a balanced elimination diet in infants and young children with a food allergy. This lack of confidence within the profession, particularly for a condition where dietary management should form the mainstay of treatment, may contribute to a general lack of trust between health professionals and patients who are aware of this uncertainty. In part, this could be a reason for poor referral from some medical doctors as well as patient dissatisfaction, seeking alternative approaches, due to potentially inappropriate care.

The literature confirms that general practitioners, paediatricians and specialists in other fields of medicine tend to be the first points of contact for many patients suffering from food allergies yet allergy education and training is not offered in many training programmes.^{20,44,46,133,198} In a study by Baptist et al., allergy rotations in the USA have been shown to improve diagnosis of allergic disorders and result in more appropriate referral across different medical disciplines.¹⁹⁹ In our study, referral to Dietitians in particular was poor with only 8.5% of General Practitioners and 4% of Medical Specialists referring every allergy patient requiring an elimination diet to a Dietitian. Only 15% of Dietitians worked with medical doctors in managing every allergy patient. Again this emphasizes the need to better inform professionals on appropriate management strategies.

In light of the recognition of the field of allergology as a sub-specialty by the HPCSA, more emphasis should be given to education and allergy-related topics for continued professional development. All three categories of professionals identified continued professional development activities, including workshops and journal articles, as useful means of disseminating new information. Also, considering the Medical Specialists as a group were less likely to have had undergraduate training, CPD activities and postgraduate training programs have an important role to play in educating qualified professionals. According to the study by Baptist et al., when medical residents had an allergy rotation they reported greater comfort managing common allergic disorders and referred patients more often to allergists.¹⁹⁹ This reaffirms the fact that allergy education and training at undergraduate level is also essential in providing better care.

4.4 Types of Paediatric Food Allergy Patients Treated

Perceived food allergy is a common phenomenon with 25% of patients self-reporting adverse reactions to food. In fact, only a small percentage of these will be true food allergy.⁹¹ A recent survey in the USA assessing physicians' approach to food allergy, found the proportion of patients with food intolerance seen in allergists'

practices was twice that in non-allergists practices. The number of Allergists' practices were much fewer than the other specialties surveyed and thus most patients evaluated for suspected food allergy would be seen in non-allergists' practices.⁵⁰ In our study, perceived food allergies formed a large part of the paediatric patients managed by all three categories, particularly the General Practitioners and Dietitians. The frequency of parents suspecting food allergy as a reason for their child's behaviour or condition could be considered an important reason for health practitioners to be better equipped to provide them with sound information and also to accurately diagnose or refute the perceived problem. The majority of the respondents in our survey did not have additional allergy training (e.g. the diploma in allergy) and thus enhancing knowledge of medical professionals most likely to treat allergy patients at the outset could help to limit self diagnoses and potentially harmful and unsupervised dietary manipulation by parents. Our respondents believed a number of their patients used CAM either prior to (53%) or in conjunction with (43%) conventional medical management. Better allergy training could also help to instill confidence in conventional medical and dietary practice, and limit a reliance on unproven CAM therapies.

General Practitioners were the group most likely to manage atopic dermatitis regularly (70%). Interestingly, less than half of respondents (46%) from this group believe a link exists between atopic dermatitis and food allergy. The implication in practice could be result in incorrect management of atopic eczema, misdiagnosis of a food allergy and inappropriate referral to an Allergy Specialist and/ or Dietitian. Again, improved primary care strategies and a better understanding of the potential role of food allergy in atopic dermatitis could help facilitate better referral to Allergy Specialists and Dietitians.

Unfortunately, the exclusion of health professionals from all the provinces in South Africa meant few conclusions could be drawn with regard to types of food allergy symptoms being managed in certain areas and whether some allergic manifestations were more frequently seen in certain areas i.e. a possible geographic distribution of allergy symptoms.

4.5 Food Allergy Knowledge

4.5.1. Causative food allergens

Overall, there was limited basic knowledge regarding diagnosis and treatment of food allergy in our study. Gupta et al. as well as Wilson et al. reported a good knowledge from respondents regarding causative food allergens responsible for food-induced reactions with cow's milk, egg and peanuts accounting for most childhood food allergic reactions.^{45,49} The majority of Medical Doctors and Dietitians in this study correctly identified cow's milk, peanut and egg as the foods most commonly associated with food allergies in young children. There appeared to be confusion in our sample, however, as to the possible extent of soya and fish allergy in children (77% Dietitians, 45% General Practitioners and 36% Medical Specialists for fish; 92% Dietitians, 46% General Practitioners and 45% Specialists for soya).

More professionals than expected believed uncommon foods (citrus, strawberries, bananas, legumes, tomato, mushrooms, pork) to be problematic and additives were incorrectly implicated as causing food allergies by as many as a third of all respondents (60% General Practitioners, 39% Dietitians and 32% Medical Specialists). These beliefs could translate in practice into potentially excessive and unnecessary elimination of foods from an infant or young child's diet with suspected food allergy.

Reactions to these foods are in fact considered rare and should thus not be eliminated unless an actual allergy to the specific food is diagnosed and confirmed. Considering the lack of food security found in a large majority of South African homes and the extent of malnutrition amongst young children¹⁵⁴⁻¹⁵⁶, health practitioners need to be conscious of providing patients with sound dietary advice. Closer collaboration with a Dietitian who has a special interest in managing infants and children with food allergies could help to ensure diets are appropriate, affordable and accessible.

4.5.2. Factors believed to influence food allergy

Family history was correctly identified by the majority of our study population (81% General Practitioners, 100% Dietitians and Specialists alike) as the greatest factor which predisposes someone to allergy. Interestingly, all the Dietitians (n=13) also believed 'early weaning and introduction of solid foods' to influence allergy development. This could perhaps explain why as a group, they tended to promote delayed introduction of the common food allergens (beyond 6-12 months of age) into infant's diets which is not evidence-based practice. Additives were again implicated by a number of respondents which could further explain the incorrect perception amongst professionals regarding the role additives play in adverse reactions to food.

4.5.3. Route of exposure to food allergens

Very few professionals had knowledge that possible routes of allergen exposure could include inhalation or contact with the allergen, through breastfeeding, pollen, or contact with non food products which contain the allergen. This has practical implications for effective implementation of an elimination diet where all potential sources of the causative allergen need to be removed. Knowledgeable health professionals could ensure that patients and parents are appropriately educated, a practice that could be assumed would translate into better adherence to a chosen management approach.

4.5.4. Food allergy and atopic dermatitis

Approximately 40% of infants and young children with atopic dermatitis (AD) have food allergy.⁷⁶ Food allergies in AD patients induce eczematous dermatitis and contribute to severity of disease in some patients.²¹⁴ Exclusion of certain food allergens from the patient's diet can therefore lead to significant clinical improvement.^{125,126} Despite the recognized link between AD and food allergy, a large number of medical doctors (26% General Practitioners and 27% Medical Specialists) in our study did not acknowledge this. Almost one third of both General Practitioners (28%) and Dietitians (31%) did not know that the 2 conditions are

linked. These opinions could adversely impact effective treatment and management as well as appropriate referral across disciplines of infants and children who present with eczema. A concern was that the Dermatologists did not acknowledge an association between food allergy and atopic dermatitis ($N=2$). Although the numbers are small, responses could be considered an indication of professional views by some members of the specialisation.

4.5.5. Egg allergy and measles vaccination

The general reluctance of parents and health practitioners to administer measles vaccinations to children with an egg allergy stems from the misperception that the vaccination is made from ovo-albumin.²⁵ Current knowledge is that both the mono-valent measles and MMR vaccines are grown on cultured chick fibroblasts and do not contain hen's egg protein.²⁵ They should thus not pose a risk to children allergic to hen's egg, yet our study determined that there are still a number of doctors testing for egg allergy prior to vaccinating against measles (23% General Practitioners and 9% Specialists). Doctors and the public need to be better informed regarding the importance of vaccinating against measles and made aware of the vaccines where possible risk may exist for vaccinating egg-allergic children such as the influenza and yellow fever vaccines.^{142,143}

4.5.6. Natural progression of food allergy

Allergen specific differences exist in the natural history of food allergy. It is well documented that various food allergies will be outgrown and regular reevaluation is imperative to avoid long term restriction diets and negative implications for the patient and family's quality of life.^{1,5,41,91,118-120} Typically, peanut, tree nut, sesame, fish and shellfish allergies tend to persist with only 20% of peanut allergies and 9% of tree nut allergies resolving by the age of 5 and 7 years respectively.⁹³ Egg allergy is believed to resolve in 75% of children by 7 years of age; cow's milk allergy resolves in 76% of cases by the age of 5 years; wheat allergy will resolve in 80% of cases by age 5; and soy allergy in 67% of cases by the age of 2 years.⁹³ The majority of the respondents in this survey correctly identified cow's milk as being most likely (72% General Practitioners, 85% Dietitians, 86% Specialists) and peanut and tree nut least likely allergies to be outgrown (92% General Practitioners, 77% Dietitians and 91% Medical Specialists; and 87% General Practitioners, 85% Dietitians and 96% Specialists for peanut and tree nut, respectively). There were differing opinions between the three categories concerning the likelihood of egg, soya, wheat, shellfish and fish to be outgrown. As a group, Dietitians were most likely to consider allergies to these foods could be outgrown. Gupta et al. also found primary care physicians to be unaware of the relative frequency with which children outgrow common food allergies.⁴⁵

A better understanding of the natural progression of food allergies by health professionals would facilitate more appropriate patient follow up and reassessment of clinical allergy with the possible development of oral tolerance. These aspects of allergy care were poor in our study and need attention. The majority of respondents only reevaluated a patient 'after a year' (26% General Practitioners, 50% Medical Specialists, 15% Dietitians) or 'after more than 1 year' (27% General Practitioners, 9% Medical Specialists, 31% Dietitians) of

eliminating a food and approximately a quarter of General Practitioners and Dietitians 'never' follow up patients and retest to assess for oral tolerance (26% and 23%, respectively). This could negatively impact on the patient and family's quality of life as well as on the long-term nutritional adequacy of the patient's diet if foods were being unnecessarily avoided.

4.6 Diagnosis

4.6.1. Use of diagnostic tools

An accurate diagnosis of food allergy is extremely important not only to avoid misdiagnosis which can have a number of adverse consequences for the patient, such as being subjected to unnecessary and often expensive diagnostic procedures and therapies, but also to limit over diagnosis.¹⁰⁰ This would impose unnecessary dietary restrictions and anxiety on a patient and his/ or her family as well as not identifying the true cause of the patient's symptoms.⁴⁹ A thorough medical and dietary history in addition to allergy skin testing and/ or in vitro tests are usually needed for accurate identification of the offending food with verification, if indicated, by oral food challenge testing.¹¹⁵ Research in the USA has identified varied approaches to diagnosis of food allergy exist amongst primary care physicians.⁵² Wilson et al. showed non allergists used skin prick and specific IgE testing as well as oral food challenge tests less frequently overall than allergists to confirm food allergy diagnosis. If a test was used, the group preferred using food-specific IgE levels.⁴⁹ Participants in the study by Gupta et al. (primary care physicians) tended to prefer food specific IgE levels as opposed to skin prick testing with few reporting use of oral food challenges as a diagnostic tool.⁴⁵

Interestingly in our survey, only half of the General Practitioners (53%) used diet history as a diagnostic tool on the one hand while less than half of the Dietitians considered patient history (46%) to be an important tool. Medical Specialists appeared to have the best overall understanding of the various diagnostic methods, acknowledging frequent use of both medical and diet history and as a group were most likely to use skin prick testing, serum specific IgE tests and oral challenges as needed compared to the General Practitioners and Dietitians. This corresponds to the findings from previous studies.^{45,49}

All the respondents in our study demonstrated poor knowledge of what specific tests need to be ordered for screening of food and airborne allergens. This could result in incorrect diagnosis and missed allergies at the outset of managing a patient with possible food-induced symptoms. It is clear from the findings that both Medical Doctors (particularly General Practitioners) and Dietitians need to have a better understanding of suitable diagnostic methods for different types of food allergies.

4.6.2. Interpreting diagnostic tests

Many general pathology laboratories in South Africa analyze serum specific IgE levels according to six different classes. Due to the poor specificity of this method of testing, numerical values of specific IgE levels (measured in kU/L) should be considered and interpreted in combination with a patient history.^{100,115} In our survey,

knowledge on interpreting skin prick tests and serum specific IgE tests and when an elimination diet is indicated was poor amongst the respondents, particularly General Practitioners and Dietitians with almost a quarter from each group (23% General Practitioners and Dietitians alike) using 'classes' to interpret tests; recommending food elimination for any value above 0.35kU/L as suggested by the laboratory without considering the patient's individual clinical picture. This reemphasises the importance of better training with regard to diagnosis and interpreting tests. Very few participants knew how to interpret skin prick tests correctly according to the size of the wheal diameter compared to the histamine wheal size (15% General Practitioners, 20% Dietitians, 25% Medical Specialists). Medical Specialists were the group with the better understanding of interpreting skin prick tests but there was general confusion as to what a 'positive histamine control' indicated (23% General Practitioners, 38% Dietitians, 59% Medical Specialists answered correctly). A number of respondents either 'didn't know' or believed it indicated an 'allergy to histamine'.

4.6.3. Sensitisation

The term sensitisation was poorly understood by the majority of respondents with Medical Specialists (50%) most likely to answer correctly.

4.6.4. Non-IgE mediated hypersensitivity

Another key area which was lacking in knowledge was that of non-IgE mediated hypersensitivity reactions. The literature acknowledges the significance of non IgE-mediated food allergy may be underappreciated and it is considered responsible for approximately 30% of delayed immune-mediated reactions to food.⁶⁹ All 3 categories in our survey underestimated the percentage of food-induced reactions considered to be attributed to non-IgE mediated (15.5%, 25% and 12.5% for General Practitioners, Medical Specialists and Dietitians, respectively).

A combination of a thorough medical and diet history, food elimination and challenge testing, CAST and atopy patch testing (APT) are considered useful tools in diagnosing non-IgE mediated reactions.¹¹⁵ Medical Specialists were the group with the best knowledge and use of appropriate diagnostic methods available for testing non-IgE mediated reactions. Less than half of the General Practitioners and Dietitians considered elimination diet (49% and 46%, respectively) and oral food challenge (49% and 39%, respectively) to be useful for diagnosing these food-hypersensitivity reactions and very few considered CAST (6% and 8%, respectively) and APT (4% and 0, respectively) to be helpful tools.

The survey identified that knowledge of non-IgE mediated food hypersensitivity was lacking. The correct identification of symptoms related to these reactions as well as a better understanding of the most suitable methods for diagnosis would be beneficial for all three categories of medical professionals.

4.6.5. Use of unreliable tests in practice

The evidence for use of IgG testing in diagnosis of food hypersensitivity can be summarized as follows: 'IgG antibodies to food are commonly detectable in healthy adult patients and children, independent of the presence or absence of food-related symptoms. There is no credible evidence that measuring IgG antibodies is useful for diagnosing food allergy or intolerance, nor that IgG antibodies cause symptoms. The exception is that gliadin IgG antibodies are sometimes useful in monitoring adherence to a gluten-free diet in patients with histologically confirmed coeliac disease.'^{204,215} Wilson et al. found overall use of unproven tests to be rare but that non-allergists were more likely to use them than allergists. They included leukocytotoxic tests, specific IgG and intradermal testing. All these unproven tests provide no diagnostic value and intradermal testing is contraindicated for food allergy as it may cause systemic reaction in highly sensitive individuals.⁴⁹

A finding of concern in our study was that unproven and unreliable diagnostic methods are actually being used in practice by a number of medical doctors to diagnose non-IgE mediated food reactions in particular. As many as 23% of Medical Specialists and 19% of General Practitioners use IgG testing and 6% of General Practitioners do ALCAT testing. Neither of these tests have been shown to have any predictive value in the diagnosis of allergy and intolerances.¹⁹⁸ They are expensive, result in misdiagnosis and patients become disillusioned with conventional medicine. They can also lead to unwarranted restriction of important nutrients from the diets of infants and children.⁴³

4.6.6. Anaphylaxis

Food induced anaphylaxis accounts for approximately 30 000 anaphylactic reactions, 2000 hospitalisations and 200 deaths each year in the United States.²¹⁶ It is a recognized risk for patients who undergo oral food challenges.

Ideally, this method of diagnosing food allergy should be conducted in a controlled environment capable of dealing with cardiopulmonary emergencies, by experienced health practitioners, particularly if a serious reaction is suspected and has occurred before. The literature identifies knowledge base deficits in properly recognizing and treating food-induced anaphylaxis amongst physicians and paediatricians.^{45,51,203} In our study, there were very few doctors who performed oral food challenges in practice - 23% general practitioners ($N=11$) and 19% of Medical Specialists ($N=9$). A major concern was the fact that limited resuscitation equipment was available to General Practitioners in the facilities where the challenges were performed compared to Medical Specialists - 5 General Practitioners versus 9 Medical Specialists. This could have major implications and would need to be addressed as all facilities where food challenges are carried out need to be adequately equipped for anticipating and correctly managing near-fatal reactions.⁹¹

4.7 Use of Complementary and Alternative Therapies

Complementary and alternative medicine (CAM) therapies present an increasing challenge for medical doctors and Dietitians as they are being used widely for allergies by the general public. Nearly 40% of patients may be using and another 50% may be considering use of CAM as part of their healthcare regimen. This has implications not only for the health care system and health policy but also is associated with considerable costs to the patient.^{215,217,218}

Unfortunately, many health care workers have limited knowledge on the subject of CAM and this may be perceived by patients as a derogatory attitude towards other therapies.²¹⁶⁻²¹⁸ The result may be limited disclosure by the patient of alternative medicines being used, which could potentially adversely affect the benefit and risk of conventional medicines. Although mainstream health practitioners have confidence in the safety and efficacy of evidence-based medicine, patients seeking CAM treatment tend to be distrustful of these practices and are usually prepared to expend large sums for 'natural therapies' with their vast unsubstantiated claims of success despite the limited evidence of actual efficacy and safety.^{215,216-219} A well recognized danger of CAM therapies and unproven diagnostic methods is inappropriate allergy diagnosis possibly leading to damaging dietary restrictions, increased costs and the risk of misdiagnoses. Also, if complementary therapies result in failure to use approaches of proven efficacy, long-term suffering and the potential for acute exacerbation is increased.²¹⁹

A large number of patients seen by our study population had sought alternative therapies for diagnosis and management of the allergic condition (53%) prior to seeking conventional treatment while as many as 43% of all respondents believed their patients were using complementary and alternative treatments in conjunction with their conventional medical care. This reaffirms what has been documented in the literature with a number of patients seeking alternative treatment options.^{25,43,53,217-219} Considering the large number of Doctors and Dietitians shown in our survey to be providing inconsistent information and care in South Africa, and the use of unreliable diagnostic tests in some medical practices it can be assumed that the problem of patients seeking alternative approaches will continue unless the issue is addressed. This sort of practice would have serious implications for the health care system with regard to effective management of allergy patients.

4.8 Food Elimination Practices and Dietary Advice for Prevention and Treatment of Food Allergy

Dietary management by means of avoidance of a food/s identified as allergenic to a patient is the only treatment available for food allergy.⁸⁷ Few clinical studies have been designed to assess the nutritional effects of extensive exclusion diets. The main concern remains growth, as children with allergies may lag developmentally, particularly those with atopic dermatitis. It is still unclear whether the disease itself, a restricted diet, genetic factors, or a combination of factors are responsible for delayed growth.^{87,174-178} Diets for infants and children with food allergy require individualised, careful formulation with evaluation of various nutritional aspects.⁸⁷ There is consensus that 'extensive elimination diets should be used as a diagnostic tool only for a short defined period of time' and that 'it is crucial to provide a balanced diet which contains sufficient proteins, energy, trace elements, and vitamins.'⁹¹ Ignoring these principles could lead to inappropriate diets, sometimes with potentially deleterious consequences.^{174,176,179}

An elimination diet may be fraught with various practical problems including potential contamination, the ability to identify minute amounts of the food as an ingredient, the form in which the food is tolerated, exposure to the allergen other than ingestion (contact or inhalation), the nutritional value and widespread use of the allergenic protein.⁸⁷ Inappropriate execution of the diet may result in malnutrition of the allergic child and associated growth and developmental delays. It could also place strain on both the family and child with the risk of poor adherence to the diet.^{23,128,133} It is thus important that the creation, execution and re-evaluation of the restriction diet, as well as regular growth assessment be done in consultation with the expertise of a registered Dietitian.

Our study highlighted a number of concerns regarding the current approach to dietary management, all of which were not in line with evidence-based allergy care. (Table 4.1) The Dietitians were the group most likely to prescribe elimination diets for allergy prevention - in high risk infants (85% Dietitians, 77% Medical Specialists, 66% General Practitioners) and pregnant women (54% Dietitians, 23% Medical Specialists, 38% General Practitioners). This is despite the current lack of evidence to support these practices and the growing evidence to support earlier exposure of small amounts of common allergens in providing a basis for the development of oral tolerance.^{22,56,57,150}

Table 4. 1: Approach to food allergy prevention and treatment by health professionals in South Africa compared with current recommendations

Allergy preventive strategy	Approach being practiced in South Africa	2008 AAP ¹ Recommendations
Diet of high risk infants	Avoidance of all common food allergens avoid until 1 year, especially cow's milk, egg, peanuts, soya, fish, wheat and shellfish	Lack of evidence for avoiding common food allergens for allergy prevention
Pregnancy avoidance	Avoid common food allergens for duration of pregnancy (9 months) especially peanuts, soya, fish and shellfish	Lack of evidence - avoidance unlikely to reduce risk of developing allergies; may adversely affect maternal and fetal nutrition
Avoidance of allergens during lactation	Avoidance of common food allergens for at least 9 months regardless of atopy in infant	Some evidence for reduced atopic dermatitis. Special avoidance diets not recommended unless specific allergy identified
Breastfeeding 'exclusively' until	Poor breastfeeding promotion. Breastfeeding encouraged with food allergen avoidance for prevention	Exclusive for 3-4 months; continue until 4-6 months while introducing solid foods
Infant feeding - breastmilk substitutes for prevention	Poor knowledge of appropriate feeds Goats milk, soy formula and cow's milk based lactose free feeds recommended. Extensively hydrolysed whey and elemental feeds	Compared with whole cow's milk protein, evidence for certain extensive hydrolysates (casein) and partial hydrolysates; not cow's milk, soy, goat's milk or elemental formula
Introduction of solid and complementary foods - when and what?	Doctors still advising before 4 months and after 6-7 months. Allergenic foods still being advised for extended periods e.g. cow's milk - 12 months, eggs - 24 months, peanuts - 36 months	Evidence to wait 4-6 months; lack of convincing evidence for avoidance of specific allergenic foods

¹AAP - American Academy of Pediatrics

4.8.1. Dietary advice for allergy prevention

Our study supported the literature that there are still a number of nutritional misconceptions being practiced by both Dietitians and Medical Doctors.²⁵ Avoidance of the most common food allergens was still part of everyday practice for allergy prevention in high-risk infants, regardless of clinical allergy, and in both pregnant and lactating mothers. Both categories of Medical Doctors and Dietitians advised dietary avoidance in these patient groups. Current consensus is that this practice is both inappropriate and not evidence-based.^{56,57,144,147,149-151} Early, gradual exposure of foods in small and incremental amounts, first in utero and then through breastfeeding and introduction of solid foods (appropriate variety at the critical age) is considered necessary to induce oral tolerance.^{63,145}

In our survey, many health professionals were advising food avoidance more in line with the USA recommendations (American College of Allergy, Asthma, and Immunology, 2006 and American Academy of Pediatrics, 2000) which are no longer considered to be evidence-based. These suggest avoidance of cow's milk until 12 months, egg until 24 months and peanuts, tree nuts, fish and shellfish until 36 months.^{10,220} More than

50% of our respondents from each group advocated avoidance of all the common allergens for the first 12 months of age in infant at risk for development of allergy. Dietitians were more likely to advise avoidance of soya and fish in high risk infants (100% and 84% for fish and soya respectively) for allergy prevention. Consequences of these practices could include the development of food allergies due to a lack of tolerance induction to various potential allergens^{56,63,144}, malnutrition due to unnecessary long-term food avoidance^{179,192,194} and feeding difficulties e.g. fussy eating¹⁸⁸ and neophobia¹⁷⁵.

Breastfeeding plays an important role in immune modulation and early exposure to food allergens⁶³ yet it was not the feed of choice for the majority of health professionals. Dietitians were identified as the group most likely to advocate unsubstantiated dietary restrictions during pregnancy and lactation and recommended the most stringent diets in infants regardless of the presence of allergic disease. They also advised the most lengthy periods of elimination for all the common food allergens. Evidence suggests these are inappropriate practices with potentially deleterious consequences of restriction diets during pregnancy and lactation to both mother and infant.^{150,151} This group was surprisingly poor at promoting breastfeeding (without dietary restriction) as the feed of choice in high risk infants.

Another cause for concern was the number of professionals also advising avoidance of unusual allergens including citrus (21% General Practitioners, 27% Specialists, 23% Dietitians), strawberry (19% General Practitioners, 18% Specialists, 15% Dietitians) and banana (13% General Practitioners, 13% Specialists, 15% Dietitians).

Approximately three quarters of all participants advised food avoidance (for an average of 9 months) to pregnant (77% General Practitioners, 85% Dietitians, 73% Medical Specialists) and lactating women, regardless of presence of atopic disease (79% General Practitioners, 92.3% Dietitians and 59% Medical Specialists). In a country where nutritional inadequacies constitute a major health problem for a large portion of the population¹⁵⁴⁻¹⁵⁶, these extreme and unsubstantiated approaches to dietary management and allergy prevention could place a number of women and infants at further nutritional risk.

4.8.2. Treatment of food allergy

Possibly one of the most alarming findings of our study was the lack of confidence, due to limited or no training, amongst the Dietitians to implement a balanced elimination diet for a lactating mother or treating food allergy in an infant or young child (54% and 38%, respectively). An opportunity has been identified for training institutions and organisations to provide a better foundation in dietary management of food allergy.

4.8.3. Infant feeding advice

All three categories demonstrated a poor knowledge regarding appropriate infant formulas and breastmilk substitutes for allergy prevention and treatment. Multiple different infant formulas were being recommended for prevention of food allergy, treatment of food allergies and management of colic. Breastfeeding promotion

without avoidance of certain foods, was found to be poor amongst health professionals. Breastfeeding with avoidance of common allergens (62% General Practitioners, 64% Specialists, 69% Dietitians) was considered appropriate for allergy prevention by more respondents than breastmilk without allergen avoidance (47% General Practitioners, 45% Specialists, 15% Dietitians).

Current consensus regarding infant soy formula is that it should be avoided in healthy and high-risk infants for atopy prevention and is not recommended for treatment of cow's milk allergy (unless IgE mediated cow's milk allergy identified and financial constraints of the patient warrant its use).^{56,84,85,144,147,161,162} A number of respondents in this survey inappropriately recommended soya infant formula for prevention (47% General Practitioners, 64% Specialists, 69% Dietitians) and treatment (66% General Practitioners, 45% Specialists, 38% Dietitians) of food allergy.

Elemental formulas are recommended for treatment of cow's milk and multiple food allergies but not for prevention of food allergies.^{22,148,152} Medical Specialists and General Practitioners advised the use of elemental formulas (4% and 9% respectively) for allergy prevention, a practice which is not evidence-based.¹⁵² Goat's milk is inappropriate for preventing and treating cow's milk allergy and is considered nutritionally unsuitable as a breast-milk substitute for infants¹⁶³⁻¹⁶⁵ yet it was still being advocated by General Practitioners and Medical Specialists in our study group for prevention (40% and 23%, respectively) and treatment (47% and 27%, respectively) of food allergy. Rice and oat milk was inappropriately recommended by Medical Specialists (14% recommended rice milk for prevention and treatment) and Dietitians in particular (23% recommended both rice milk and oat milk for treatment). These milks are not nutritionally adequate for feeding an infant (whether as a sole source or major source of nutrition).²²¹ They are particularly low in protein and fat. Although commercial brands may be fortified with vitamins A and D, some B vitamins, calcium and iron, these are generally inadequate quantities to meet the nutritional needs of infants and toddlers. Rice and oat milk do not comply with regulated requirements for a product to be classified as an appropriate breast-milk substitute. They should only be considered as a cow's milk substitute in children older than a year, when given in appropriate amounts in combination with a nutritionally balanced diet.²²¹ In a country where nutritional deficits and financial constraints are common place these incorrect recommendations would be detrimental to patients in terms of providing inappropriate nutrition and unsuitable, expensive alternatives.

4.8.4. Understanding of the terms cow's milk versus dairy

Our respondents reported conflicting recommendation for avoidance of cow's milk and dairy products. This is likely to be due to a lack of knowledge and appropriate training of food composition and appropriate alternatives. A cow's milk-based lactose free infant formula was inappropriately recommended to treat cow's milk allergy by 17% of general practitioners and for allergy prevention by 13% General Practitioners and 9% of Medical Specialists. Gupta et al. also documented a poor understanding of the terms with approximately a quarter of respondents believing milk-based yoghurts and cheeses were safe for children with IgE-mediated cow's milk allergy.⁴⁵

4.8.5. Introduction of solid foods - when and what?

Complementary feeding (i.e. solid foods and liquids other than breast milk or infant formula and follow-on formula) should not be introduced before 17 weeks and not later than 26 weeks according to recent ESPGHAN recommendations.¹⁴⁹ There is no convincing scientific evidence that avoidance or delayed introduction of potentially allergenic foods, such as cow's milk, fish and eggs, reduces allergies, either in infants considered at increased risk for the development of allergy or in those not considered to be at increased risk. It is also considered prudent to continue breastfeeding while gradually introducing allergenic foods in increasing quantities to an infant's diet.^{56,57,144,145,147,149,153,168,171}

In our study, all the Dietitians recommended introduction of complementary foods at 6 months of age which is in line with WHO recommendations.¹⁴⁹ A number of General Practitioners and Medical Specialists advised either early introduction (< 4 months) (2% General Practitioners, 18% Medical Specialists) or delayed introduction of solid foods (> 6 months) (21.3% General Practitioners, 14% Medical Specialists) despite the evidence confirming this may contribute to the development of allergy.¹⁴⁹ Also common allergens (cow's milk, egg, wheat, gluten, shellfish, fish, peanuts, tree nuts, soya) were generally restricted in high-risk infants by all three categories of professionals regardless of clinical evidence of allergic disease for the first 12 months of age. Between 20-30% advised avoidance of shellfish, tree nuts and peanuts for up to 24 months. Again, these are not evidence-based approaches.

In children with a confirmed food allergy, most respondents from the three categories advised avoidance of all the major allergenic foods for up to 12 months. More professionals advocated avoidance of certain allergens up to 24 and 36 months for these children, namely in the case of introduction of peanuts, tree nuts, shellfish and egg.

4.9 Multidisciplinary Care and Referral Between Professions

Management of food allergy requires a multidisciplinary approach, including input from dietitians for assistance with food elimination diets and food challenge tests. The overwhelming message in much of the literature is the need for multidisciplinary care in managing food allergies and specifically the importance of a qualified Dietitian in ensuring appropriate nutritional care and to assess growth monitoring.^{48,205-207} Surprisingly, the majority of General Practitioners and Medical Specialists implemented elimination diets in food allergic children without dietetic evaluation and consultation.

Lack of communication and limited collaboration between the various disciplines in managing food allergy was clear in our survey and highlighted the need for Doctors and Dietitians alike to have a better understanding of where each discipline can play a role in managing a food allergic patient. Education and training should also provide a more practical grounding for management of food allergy.

4.10 Patient Education and Monitoring

Dietary elimination of any of the major allergens such as cow's milk, egg, peanuts, wheat or soya, requires education and close attention to food labels and food composition. Instructing patient and family to read all food labels to avoid hidden sources of the suspected food and to avoid hidden sources of contamination is critical. Effective education is necessary to support the development of a child/family that is not only nutritionally sufficient but allows them to master the necessary skills needed to cope with and minimise the level of uncertainty in their lives. Education empowers children and allows them to achieve some degree of control of their lives. Again, eliciting the assistance of a qualified Dietitian for a child with food allergies and multiple food allergies in particular, is essential to formulating an adequate diet to promote appropriate growth and development despite the elimination of one or numerous foods.^{23,128,191}

This study showed poor growth monitoring and nutritional assessment by all three categories (6.4% General Practitioners, 23% Medical Specialists and 31% Dietitians). Also, the quality and amount of nutritional information and advice being given to patients and their parents regarding appropriate implementation of elimination diets was very poor. An alarming number of Medical Doctors either gave no information at all (26% General Practitioners, 5% Medical Specialists) or only broadly mentioned the foods needing to be eliminated from the diet without providing appropriate alternatives and substitutes in the diet or explaining the practical implications for the child and family (53% General Practitioners, 55% Medical Specialists).

Patient follow-up was very limited. More than a quarter of all respondents (27%) 'Never' follow up a food allergy patient (28% General Practitioners, 23% Medical Specialists, 31% Dietitians). The average respondent reported follow-up 'Just when there are problems and the patient returns' (43% General Practitioners, 15% Dietitians and 27% Medical Specialists).

Dietitians and Medical Doctors should be mindful of the fact that a confirmed food allergy requiring food elimination as well as parentally perceived food allergy may also negatively affect the development of healthy eating habits in the child.^{175,186} Regular follow up and reviewing of all dietary interventions and avoidance strategies should therefore form a crucial part in patient care as many infants will cease to clinically react to foods as they move into their toddler years.^{175,186}

4.10 Problem Areas and Support Structures

Each group believed knowledge regarding diagnosis and appropriate interpretation of tests as well as suitable intervention strategies was lacking. This feedback corresponds with much of the literature where the knowledge and practices of physicians and paediatricians specifically have been limited regarding diagnosis and treatment aspects of food allergy.^{16,24,45,46,49-52} Yu et al. found areas of deficiency in healthcare providers regarding food allergy included identification of potentially life threatening food allergies, food allergy diagnosis and education of patients about treatment, particularly food avoidance and epinephrine use.²⁰³

Our study identified the need for education, specifically directed at those less recently qualified health professionals who have been in practice for longer. The need for better food allergy education and training at both undergraduate and post graduate level was identified by all three categories. Continued professional development activities was believed to be the preferred method of disseminating information. This differed from the study by Yu et al. where small-group, on-site training was the most requested mode of education.²⁰³

Dietitians also reported inadequate training for implementing a balanced restriction diet in infants and children specifically but also for pregnant and lactating mothers. Improved curricula for undergraduate education and training are necessary for Medical Doctors and Dietitians regarding allergy and specifically food allergy.^{198,201}

The other issue identified by respondents as a problem area in providing appropriate care was the limited availability of resources and allergy expertise. There is a paucity of allergy expertise in South Africa.²⁷ A large proportion of health professionals (particularly General Practitioners and Dietitians) were unaware of specialist allergy clinics in South Africa. There are centres of excellence for allergy care in South Africa, however, these will not be appropriately utilised if health professionals do not know of their existence. Patients with allergic symptoms and suspected food allergy tend to initially consult a General Practitioner or Dietitian for management²⁰ but as shown in the study, an understanding of suitable allergy care is limited within the various professions. It is essential that these categories understand when to refer the patient to a Specialist and where the expertise can be found.

The problem of insufficient allergy expertise is recognised worldwide and highlights the importance for establishing appropriate care structures.^{48,93,200,201,207} In 2010, an expert panel sponsored by the National Institute of Allergy and Infectious Diseases published guidelines for diagnosing and managing food allergies in the USA. The guidelines provide concise clinical recommendations for healthcare professionals on how to diagnose and manage food allergy and how to treat acute food allergy reactions. They are intended as a resource to guide clinical practice and help with developing educational materials for patients, their families, and the public. The guidelines combines existing scientific knowledge with clinical expert opinion to generate recommendations for use by healthcare professionals.^{21,22}

Almost all the respondents in our survey (98%) felt that evidence based guidelines for managing food allergies in South Africa and better support structures are necessary and would be beneficial. A more standardised approach to allergy care based on current scientific evidence and in line with guidelines published internationally, but also specific to South Africa's unique situation would help instill confidence in health practitioners to management food allergies. It would provide a platform to develop minimum levels of competency and ensure consistent, better quality care and happier patients and families. This in turn would have the knock-on effect of providing reassurance in conventional medicine from the patient's point of view.

Allergy information for clinical practice was mostly obtained from continued professional development initiatives in all three categories. What was interesting was the affiliation of health professionals with key associations in South Africa, including the South African Medical Association (SAMA) and the Association for Dietetics in South Africa (ADSA). These organizations publish journals which would be useful sources for disseminating important information regarding new trends of allergy care. It would also provide a broad base for continued professional development activities. The Allergy Society of South Africa and its journal, *Current Allergy and Clinical Immunology*, appear to have a minimal impact presumably due to poor readership and low membership amongst the health professionals. This is an area that could be improved on.

Key findings of the study which require urgent attention are summarised in Table 4.2.

Table 4. 2: Summary of important findings of this study

Key Finding	Medical Doctors	Dietitians
Inappropriate infant feeds recommended for allergy treatment and prevention	Goats milk recommended as a breastmilk substitute for allergy prevention and treatment Soy formula for allergy prevention and treatment	Poor advice regarding appropriate choices. Limited promotion of breastfeeding for allergy prevention Soy formula for allergy prevention and treatment
Feeds for treatment of colic	Breastmilk with food avoidance, soy, partial hydrolysate, extensive hydrolysate (whey or casein), elemental formula, lactose free (cow's milk based), goat's milk and rice milk	Breastmilk with food avoidance, soy, partial hydrolysate, extensive hydrolysate (whey or casein), elemental formula, lactose free (cow's milk based)
Inappropriate dietary advice	Restriction of common food allergens for allergy prevention in high risk infants, pregnant and lactating women Early (<4months) and late (>6months) introduction of solids. Late inclusion of common allergens into infant's diet	Restriction of common food allergens for allergy prevention in high risk infants, pregnant and lactating women Late inclusion of common allergens into infant's diet Lack of knowledge and confidence to implement a balanced elimination diet in infants and children
Use of alternative and complementary therapies	Use of alternative and complementary therapies by patients prior to and in conjunction with conventional medicine	Use of alternative and complementary therapies by patients prior to and in conjunction with dietary management
Use of alternative diagnostic methods	IgG ¹ and ALCAT ² testing	
Oral food challenge testing	Lack of resus training and equipment	
Patient follow up	Poor, infrequent patient follow up and reevaluation	Poor, infrequent patient follow up and reevaluation
Nutritional assessment, growth monitoring	Poor nutritional assessment and growth monitoring	Poor nutritional assessment and growth monitoring
Dietary information and guidance for patient	Limited to no information provided for successful and balanced food elimination	Limited to no information provided for successful and balanced food elimination
Multidisciplinary collaboration	Limited referral to dietitians	Limited communication and working with medical doctors
Support	Limited knowledge of specialist allergy units	Limited knowledge of specialist allergy units

¹ IgG - Immunoglobulin G

² ALCAT - Antigen leukocyte cellular antibody test

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

Research in recent years has led to a better knowledge regarding food allergy and its diagnosis as well as a change in approach to allergy prevention and dietary intervention. The study attempted to determine various aspects of food allergy management in infants and children by Medical Doctors and Dietitians in South Africa.

The survey did identify and describe a number of aspects regarding the current knowledge and practices of Medical Doctors and Dietitians managing children with food allergy in South Africa. Small numbers of respondents unfortunately limited the statistical impact of the study and its relevance to the rest of the population. It did, however, provide useful insights into food allergy knowledge, current approaches with regard to diagnosis, food allergy prevention and dietary intervention as well as collaboration amongst health professionals.

Knowledge:

- Gaps within allergy knowledge were identified particularly with regard to appropriate diagnosis and correct interpreting of available tests; nutritional management; allergy prevention strategies; available expertise and support structures.
- A need for better education and training at under- and post-graduate level as well as for South African-specific evidence-based guidelines and allergy support networks was clearly identified by Medical Specialists, General Practitioners and Dietitians. Continuous professional development was considered the best way to disseminate information. Better resources in terms of allergy expertise were considered necessary by both medical and dietetic professionals.

Practice:

- Dietary management consisted of strict avoidance diets regardless of the presence of allergic disease for high risk infants, pregnant and lactating women. Inappropriate infant feeding practices such as choice of infant formula or correct introduction of complementary foods were advocated for allergy prevention and treatment in clinical practice. Incorrect diagnostic tests and even unproven alternative methods were used by some practitioners. Patient follow up and assessment was poor.
- Another problem area requiring attention was the limited interdisciplinary collaboration and communication between the various health professionals, particularly medical doctors and dietitians for implementation of elimination diets.

The overall approach to allergy care by Medical Doctors and Dietitians in South Africa was not in line with the latest evidence-based guidelines and recommendations for allergy management and prevention.

5.2 Recommendations

Although the limited responses for this survey mean the data may not accurately reflect what is actually being practiced, the findings are useful and provide valuable insights that can be used for planning educational food allergy programs for various health care professionals.

In light of the limited education and training identified in the study and the recognition of the field of allergy by the HPCSA, there is an urgent need for curriculum reform to accommodate the existing deficits in allergy management. These should specifically address food allergy knowledge, manifestations of allergic disease, diagnosis of food hypersensitivity and interpreting results, dietary treatment, practical implementation. Improved curricula should be considered for Dietitians, Medical Students and Medical Specialists.

Objectives of training should be endorsed by ALLSA and be set in accordance with internationally recognised core curriculum specialty training in allergology and clinical immunology. The information obtained from this study could provide a motivation for ALLSA to approach various training institutions around the country to update curricula and include updated, evidence-based lectures and practical training to accommodate deficits identified in allergy management.

The findings of the survey could serve as a guide of relevant topics needing to be addressed for the ALLSA Masterclass currently offered to health professionals enrolled for the Diploma in Allergology and those who have a interest in practical Allergology.

There is an opportunity for an organization such as the Allergy Society of South Africa (ALLSA) to play a greater advisory role as well as create more of an awareness amongst health professionals and the public. Education and training can be offered in the form of more regular continued professional development activities, particularly through the journals affiliated to ADSA and SAMA in order to reach the majority of health professionals. ALLSA has a website available to the public. Health professionals and the public alike need to be made aware of this as it could provide an effective medium for communicating relevant allergy information. It is also a link to various internationally recognized allergy support networks such as the Food Allergy and Anaphylaxis Network (FAAN) which provides health professionals and patients with up-to-date practical advice and guidance in managing food allergies.

Standardised, evidence-based guidelines for food allergy diagnosis and management should be considered in light of the overwhelming need for their establishment. Through collaboration with the Department of Health, evidence-based practice guidelines could be created to ensure a standard approach to allergy care and ultimately better, more consistent allergy care for the patient. The 2010 NIAID-Sponsored Expert Panel Guidelines for Diagnosis and Management of Food allergy in the USA could be used as a foundation and adapted for use in South Africa. There is also a real opportunity to motivate for additional positions in the healthcare system for Allergy Specialists.

The public also needs to be made aware on scientifically sound allergy information regarding reliable tests, specialist allergy clinics and correct approach to confirming allergy and implementing a balanced restriction diet. Newspapers and popular magazines (particularly pregnancy, children's and women's health magazines) should be approached to highlight the unexpected findings from the study. This would provide a platform for education of the public on food allergies and the management thereof.

It would be helpful to carry out a survey for the whole of South Africa, with specific inclusion of rural and urban areas, to determine current approaches to dietary management compared to evidence-based guidelines. This should include Medical Doctors, Dietitians as well as Clinic Sisters and Nurses. Other useful research would be evaluating allergy knowledge and approach to management of newly qualified Doctors and Dietitians prior to and after implementing a better food allergy training program.

5.3 Conclusion

In conclusion, despite the overall number of respondents being low, the insights from this study are extremely helpful in understanding the calibre of allergy information being provided to patients and their parents by some General Practitioners, Medical Specialists and Dietitians in South Africa. It highlights the urgent need in South Africa for better education and training in the field of food allergy particularly with regard to diagnosis, interpretation of tests and dietary management. The study has also identified a general lack of allergy knowledge and expertise amongst various health practitioners as well as limited number of allergy specialists within the South African health care system. There is an enormous cavity in communication which exists between Medical Doctors and Dietitians, poor referral and limited collaboration between the disciplines in effectively managing patients suffering from food allergies, requiring balanced restriction diets. There is also an opportunity to educate the public with sound evidence-based information regarding various aspects of the management of food allergy.

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ADDENDA

Addendum A: Abstract²⁶

A Retrospective evaluation of nutritional status of atopic children and effectiveness of nutritional intervention

G Stear, Prof C Motala

Dietetic Department and Allergy Clinic, Red Cross War Memorial Children's Hospital

Background

The incidence of food hypersensitivity reactions is increasing worldwide. Approximately 2.5% of the general population and up to 6 - 8% of children less than 3 years of age develop food allergies. At the same time, prevailing undernutrition and micronutrient malnutrition have become increasingly worrying problems in developing countries and SA, in particular. The WHO estimates that one third of the world's children remain undernourished, almost all of whom live in developing countries. The National Food Consumption Survey (1999) found 1 in 10 and 1 in 5 children in SA to be wasted and stunted respectively.

The incidence of food allergies in South Africa is uncertain however, in a prospective study at Red Cross Children's Hospital from 1997-1999 (*Motala et al.*), 10% of children referred to the Allergy Clinic presented with food allergies. There is a need to assess the impact of food allergies and elimination of vital and often affordable nutrients from the diet, on the growth of atopic children.

Aim:

To assess the nutritional status of patients referred to the Dietetics Department from Allergy or Dermatology Clinic and the effect of nutritional intervention on these children. In addition, we sought to identify the types of food allergens within age groups and the most common symptoms experienced.

Method:

A retrospective study of 76 patients referred to the Dietitian from either the Allergy or Dermatology Clinic between January 2000 and June 2003. The symptoms, food allergens to be eliminated, if any, income and weight and height of the first and most recent visits were recorded.

Weight and height measurements were plotted on NCHS growth charts. Percentage expected weight-for-age, weight-for-height and height-for-age were calculated and assessed according to reference values used to classify degrees of underweight, overweight, wasting and stunting. A comparison was made between the first and most recent/ last visit to the dietitian to evaluate improvement in nutritional status after nutritional intervention. The group was also divided into two, according to median income (R1750/ month) and the nutritional status and effect of nutritional intervention between the two groups were compared.

Results:

More than half of our sample demonstrated stunting/chronic undernutrition. More children were overweight from the higher income group. Wasting, due to acute undernutrition was more prevalent in the lower income group. The severity of undernutrition, whether wasting/ stunting, was also greater in this group. The major food allergens patients reacted to included cow's milk (50%), egg (49%), peanut (49%), soya (26%), wheat (21%) and fish (12%), all of which constitute vital and usually more affordable energy and protein sources yet they would require elimination for effective management. Children less than three years had a higher incidence of allergies to the major food allergens. 45 patients had multiple food allergies (more than 1 food allergy), 15 had a single food allergy and 16 had no food allergies. Interestingly, of the atopic children without actual food allergies half were stunted, over 40% wasted and almost a fifth of the patients were overweight. The nutritional status in both children with and without food allergies (single/ multiple) improved after dietetic intervention, however the extent of improvement in those with multiple food allergies was relatively less than that demonstrated by the children with no or a single food allergy. This is most likely due to the more aggressive elimination of vital nutrients from the diets. Of those patients that presented with a sub-optimal nutritional status those from the higher median income group showed better improvement in nutritional status after intervention.

Conclusions:

Management of atopic children in our setting needs to be one of extreme caution and balance. Nutritional intervention must be adapted to accommodate patients in both first and third world environments. Within lower income groups particularly, adequate nutrition should be provided without unnecessarily eliminating vital, affordable and readily available food sources.

Addendum B: Study questionnaire

Questionnaire to evaluate knowledge and practices in the management of food allergies

Name and Surname:

Contact telephone number:

Email:

Address:

If you do not wish to participate in the research project please state reasons:

***The answering of this questionnaire should take approximately 20-30 minutes of your time.
Please answer ALL questions and mark a cross (X) in the box where appropriate.
Unless otherwise stated, please choose only 1 answer/ option per question.***

SECTION A: BACKGROUND INFORMATION

1. Gender

Male	
Female	

2. In which province and where do you work?

Gauteng	
KZN	
Western Cape	
Where (specify name of suburb, city and clinic, hospital, practice etc.).....	

3. a. Profession

Medical doctor	
Dietician	

3. b. If you are a medical doctor, please indicate your specialization (choose one):

General practitioner	
Paediatrician	
Dermatologist	
ENT/ pulmonologist	
Gastroenterologist	
Other (specify)	

3. c. Do you hold a diploma in allergy?

Yes	
No	

3. d. Have you had any formal training in allergy e.g. senior registrar?

Yes	
No	

3. e. If you are a dietician, please indicate your main field of interest (choose one):

Cancer	
Diabetes	
Cardiology	
GIT disorders	
Diseases of lifestyle	
Nutrition in the elderly	
Paediatric nutrition	
Allergies	
HIV	
Obesity	
Weight loss	
Eating disorders	
Community nutrition	
Food service	
Other (specify)	

4. What language do you use most often for communication in your area of practice?

5. Please indicate approximately how long (in years) you have been practicing in your profession?

.....

6. a. Are you a member of a medical or dietetic association/ society in South Africa?

Yes	
No	

6. b. If yes, which association/s are you affiliated to:

Association of Dietetics of South Africa (ADSA)	
South African Society of Enteral and Parental Nutrition (SASPEN)	
Nutrition Society of South Africa (NSSA)	
South African Medical Association (SAMA)	
South African Paediatric Association (SAPA)	
Allergy Society of South Africa (ALLSA)	
South African Gastroenterology Society (SAGES)	
Other (<i>please specify</i>)	
.....	
.....	

6. c. Do you receive the ALLSA Journal?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

7. a. Are you a member of any international medical or dietetic associations/ societies?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

7. b. If yes, which association/s are you affiliated to:

British Dietetic Association (BDA)	<input type="checkbox"/>
European Society of Enteral and Parental Nutrition (ESPEN)	<input type="checkbox"/>
American Dietetic Association (ADA)	<input type="checkbox"/>
Food Allergy and Anaphylaxis Network (FAAN)	<input type="checkbox"/>
American Academy of Paediatrics (AAP)	<input type="checkbox"/>
European Academy of Allergology and Clinical Immunology (EAACI)	<input type="checkbox"/>
American College of Allergy, Asthma and Immunology (ACAAI)	<input type="checkbox"/>
American Academy of Allergy, Asthma and Immunology (AAAAI)	<input type="checkbox"/>
Other (<i>please specify</i>).....	<input type="checkbox"/>
.....	
.....	
.....	
.....	

8. a. Which of the following was true for you in terms of the amount of allergy training you received?

No training received	<input type="checkbox"/>
Pre-grad lectures/ allergy block during training	<input type="checkbox"/>
Postgraduate degree, diploma, training or course	<input type="checkbox"/>
Other (<i>please specify</i>).....	<input type="checkbox"/>

8. b. Do you believe there should be more attention paid to allergy care in your professional training?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

8. c. If 'yes', please indicate where you feel the most benefit would be obtained?

During pre graduate training	<input type="checkbox"/>
After pre graduate training – continuous professional development	<input type="checkbox"/>
Both	<input type="checkbox"/>

9. a. Do you attend local and international allergy congresses?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

9. b. If 'yes', please indicate what percentage of sessions is generally dedicated to food allergy compared to respiratory allergy:

	Percentage
Food allergy	
Respiratory allergy	

10. a. How many paediatric patients do you see in a month with allergic disease e.g. allergic rhinitis, conjunctivitis, asthma, atopic eczema/ dermatitis, urticaria, angioedema, allergic enteropathy, allergic constipation/ allergic dysmotility? (Please mark the range of numbers applicable for each condition)

	None	1-5 patients	6-14 patients	15-29 patients	> 30 patients
Allergic Rhinitis					
Conjunctivitis					
Asthma					
Atopic eczema/ dermatitis					
Urticaria					
Angioedema					
Allergic enteropathy					
Allergic constipation/ dysmotility					

10. b. How many paediatric patients do you see in a month with confirmed food allergy? (choose one)

None	
1-5 patients	
6-14 patients	
15-29 patients	
> 30 patients	

10. c. How many paediatric patients do you see in a month with perceived food allergy e.g. parent/ caregiver thinks the child is allergic to a specific food which has not been confirmed? (choose one)

None	
1-5 patients	
6-14 patients	
15-29 patients	
> 30 patients	

11. a. Have many of your patients used complementary and/ or alternative therapy prior to your management?

Yes (please specify type/s of therapy).....	
No	
Don't know	

11. b. Have any of your patients used complementary and/ or alternative therapy in conjunction with your management?

Yes (please specify type/s of therapy).....	
No	
Don't know	

12. Indicate how often you treat and manage the following conditions in your practice?

	Never	Seldom	Regularly
Allergic rhinitis			
Asthma			
Allergic conjunctivitis			
Atopic eczema/ dermatitis			
Medically confirmed food allergy			
Food allergy perceived by parents			
Other (please specify)			

13. a. Do you mostly manage food allergy individually or as part of a team?

Individually	
As part of a team	

13. b. If you answered 'as part of a team', which specialists do you refer to?

Dietician	
Psychologist	
Speech therapist	
Physiotherapist	
Other (please specify).....	

13. c. If you answered 'as part of a team', which specialists refer patients to you?

Dietician	
Psychologist	
Speech therapist	
Pharmacist	
Physiotherapist	
Other (please specify).....	

SECTION B: GENERAL FOOD ALLERGY INFORMATION

1. To your knowledge, which foods or food types are commonly associated with allergy in infants and young children under 5 years? (more than one food can be chosen)

Cow's milk	
Egg	
Soya	
Peanuts	
Tree nuts	
Legumes (beans, peas, lentils, chickpeas)	
Wheat	
Gluten	
Fish	
Shellfish	
Pork	
Citrus fruits	
Strawberries	
Bananas	
Tomatoes	
Mushrooms	
Vegetables	
Sugar	
Additives (<i>please specify which</i>)	
Other (<i>please specify</i>)	

2. To your knowledge, which factor(s) may influence the development of allergies? (more than one factor can be chosen)

Season in which you are born	
Environmental allergen exposure	
Chemical allergen exposure	
Allergen exposure in utero	
Antibiotic treatment in infancy	
Change in cultural and living circumstances	
Family history	
Early weaning and introduction of solids	
Infant formula feeding	
Breast feeding	
Food additives	
Animals at home	
Pollution	
Other (<i>please specify</i>)	

3. True or false: A family history is considered the greatest indicator for allergic predisposition in children?

True	
False	

4. Which of the following allergy symptoms do children younger than 5 years tend to suffer from more frequently in your opinion (more than one can be chosen)?

Atopic eczema/ dermatitis	
Gastrointestinal allergy (diarrhoea, constipation, vomiting)	
Respiratory allergy (allergic rhinitis, asthma, wheezing)	
All of the above can occur	

5. In your opinion, can an infant come into contact with a food allergen through the following routes of exposure?

	Yes	No
Ingestion of food		
Inhalation of fumes from cooking		
Inhalation of pollen		
Contact to food		
Exposure through non food items e.g. lotions		
Breast feeding		
Other (please specify).....		

6. If you are a medical doctor: Do you routinely test for egg allergy prior to measles vaccinations (choose one)?

Yes	
No	
Only if there is a risk of food allergy	
Only if there is a history of previous anaphylactic reaction	

7. Which of the following food allergies in children are likely to be outgrown? (more than one can be chosen)

Food allergy to	Yes	No
Cow's milk		
Egg		
Soya		
Wheat		
Peanut		
Tree nuts		
Shellfish		
Fish		

8. In your opinion, are infants or young children under 5 years with atopic eczema/ dermatitis also likely to have a food allergy?

Yes	
No	
Don't know	

SECTION C: DIAGNOSIS OF ALLERGIES

1. Please indicate which of the following methods you use (if any) to diagnose food allergy?

	Always	Occasionally	Never
Patient history			
Diet history			
Food symptom diary			
Food elimination diet			
Skin prick tests (specific IgE)			
Serum specific IgE tests (CAP RAST)			
Other tests (<i>please specify</i>).....			
Oral food challenges			
Other (<i>please specify</i>).....			

2. a. Do you order serum specific blood tests yourself?

Yes	
No	

2. b. Are you aware of the specific test used to screen for food allergies?

Yes	
No	
If Yes, please name the commonly recommended test	
.....	

2. c. Are you aware of the specific test used to screen for airborne allergies?

Yes	
No	
If Yes, please name the commonly recommended test	
.....	

2. d. How do you tend to interpret serum specific IgE tests (CAP RAST)? (choose one)

I regard a reading above 0 as positive	
Classes (1-6)	
Decision points/ Levels	
I use both classes as well as levels (decision points)	
None of the above	
Other (<i>please specify</i>).....	

2. e. If the blood test showed any of the following result, would you recommend food elimination or not?

	Yes	No	Don't know
Class 1			
Class 2			
Class 3			
Class 4			
Class 5			
Class 6			

3. What is sensitization? (please choose only one)

Extremely elevated levels of IgE in the blood	
Exposure to food allergen resulting in clinical reaction	
Exposure to food allergen and formation of IgE	
All of the above	
None of the above	

4. If you are a medical doctor: Do you administer skin prick tests in your practice?

Yes	
No	

5. a. Please indicate how you interpret a skin prick test (SPT) (please choose one)

I interpret using wheal diameter only	
I interpret using flare diameter only	
I interpret using a combination of wheal and flare diameter	
I interpret according to the size of the wheal diameter compared to the histamine wheal size	
I interpret according to the size of the wheal and flare diameter compared to the histamine wheal size	

5. b. Are you aware of decision points for specific foods as a guide in interpreting skin prick test readings?

Yes	
No	

5. c. Which factor(s) would you consider important when interpreting SPT's? (you can choose more than one)

Wheal size	
Flare size	
Age of the patient	
Medication (<i>specify</i>)	
Extract stability	
Positive predictive value of SPT	
Negative predictive value of SPT	
None of the above	
Other (<i>specify</i>)	

5. d. In your opinion, does the size of a skin prick reaction differ between food allergens?

Yes	
No	

5. e. In your opinion, does the size of a skin prick wheal correlate with the severity of a food allergy reaction?

Yes	
No	

5. f. In your opinion, can a child have a positive skin prick test to a certain food but no reaction on ingestion of the same food?

Yes	
No	

5. g. What does a positive histamine indicate on a SPT result?

6. What percentage of food reactions are non-IgE mediated? e.g. 10%, 20%, 30% etc.
.....

7. a. Which of the following tests are useful for testing non- IgE mediated reactions?
(more than one can be chosen and comments on your specific use for a test are welcome)

	Yes	No	Don't know
Patient history			
Skin prick test			
Serum specific IgE test (CAP RAST)			
Elimination diet			
ALCAT test			
IgG test			
Vega / Best test			
Food challenge			
Cast test			
Patch test			
All of the above			
None of the above			
History alone			
Other (please specify).....			

7. b. In your practice, do you use any of the following tests?

	Yes	No
ALCAT test		
IgG test		
Vega / Best test		
Food challenge		
Cast test		
Patch test		
Other (specify)		

8. What food(s) would you initially eliminate when implementing an elimination diet? (more than one can be chosen)

Food	
Cow's milk	
Egg	
Peanuts	
Tree nuts	
Fish	
Shellfish	
Wheat	
All gluten containing grains (wheat, rye, barley)	
Soya	
Citrus	
Tomato	
Beef	
Pork	
Mushrooms	
Sugar	
Other (<i>please specify</i>)	

SECTION D: FOOD CHALLENGE TESTS

1. Are you aware of a food challenge test?

Yes	
No	

2. a. Do you ever use a food challenge test as part of your assessment of food allergies?

Yes	
No	

2. b. If yes, please specify which type(s) of food challenges do you perform in practice? (can choose more than one)

Open food challenge	
Single blind food challenge	
Double blind placebo controlled food challenge	
I never perform food challenges	
Parents carry out open challenges at home	

2. c. If yes, how long, if at all, will you monitor the child after the food challenge test? (choose one)

I send the child home immediately and don't monitor	
30 minutes	
1-2 hours	
12-24 hours	
24-48 hours	
48-72 hours	
> 72 hours	

2. d. Would you select a food challenge on the basis of a SPT or CAPRAST test? (more than one can be chosen)

Yes, if either test were positive	
Yes, if either test were negative	
No never	
Uncertain	
Other (please specify).....	

3. a. If you carry out food challenges: Have you had training in resuscitation?

Yes	
No	

3. b. If you carry out food challenges: Do you have resuscitation equipment available in your unit?

Yes	
No	

4. **DOCTORS:** Do you work closely with or refer patients to a dietician when considering an elimination diet and food challenge for diagnosing a food allergy?

Yes	
No	

4. **DIETICIANS:** Do you work closely with or refer patients to a doctor when considering diagnosis and management of a food allergy

Yes	
No	

5. Please indicate after what period of food elimination would you consider retesting young children (1-5 years) to evaluate whether a food allergy has improved or been outgrown? (choose one)

Never	
After 1-2 weeks	
After 2-4 weeks	
After 6 months	
After 6-12 months	
After 1 year	
After more than 1 year	

SECTION E: ELIMINATION DIETS

1. For which situation(s) have you considered an elimination diet (the removal of 1 or more foods from the diet) in your practice or unit? (more than one can be chosen)

Treatment of <i>perceived</i> food allergy	
Diagnosis of <i>suspected</i> food allergy	
Treatment of <i>confirmed</i> food allergy	
During <i>pregnancy</i> for prevention of allergy development	
During <i>lactation</i> for prevention of allergy development	
During <i>lactation</i> for confirmed food allergy related to breastfeeding	
Never (Go directly to SECTION F)	
Other (<i>please specify</i>)	

2. What specific food(s) would you advise high risk infants to avoid for allergy prevention and for how long? (more than one can be chosen)

Food	Time period of avoidance (for how long?) in MONTHS
Cow's milk	
Yoghurt and dairy products	
Egg	
Fish	
Shellfish	
Peanuts	
Tree nuts	
Citrus fruit	
Strawberries	
Bananas	
Wheat	
Gluten	
Soya	
Sugar	
None of the above	
All of the above	

3. a. Would you advise a pregnant woman with a personal or family history of allergic disease to avoid specific foods?

Yes	
No	

If you answered 'yes', please answer 3.b.

3. b. Please indicate which food(s) you would advise her to avoid during pregnancy and for how long you would advise her to eliminate these foods? (more than one can be chosen)

Food	Time period of avoidance (for how long?) in <u>MONTHS</u>
Cow's milk	
Yoghurt and dairy products	
Egg	
Fish	
Shellfish	
Peanuts	
Tree nuts	
Citrus fruit	
Strawberries	
Bananas	
Wheat	
Gluten	
Soya	
Sugar	
None of the above	
All of the above	

4. a. Would you advise a breastfeeding mother with a personal or family history of allergic disease to avoid specific foods?

Yes	
No	

If you answered 'yes', please answer 4.b.

4. b. Please indicate which food(s) you would advise her to avoid during lactation and for how long you would advise her to eliminate these foods? (more than one can be chosen)

Food	Time period of avoidance (for how long?) in <u>MONTHS</u>
Cow's milk	
Yoghurt and dairy products	
Egg	
Fish	
Shellfish	
Peanuts	
Tree nuts	
Citrus fruit	
Strawberries	
Bananas	
Wheat	
Gluten	
Soya	
Sugar	
None of the above	
All of the above	

5. DOCTORS:

5. a. Would you implement a restriction diet for the following individuals in conjunction with a registered dietician?

	Yes	No
An infant or young child with a food allergy		
A breastfeeding mother whose child has a food allergy		

If you answered 'No' for either option in 5.a please answer 5. b.

5. b. Do you have experience in implementing a balanced restriction diet for the following individuals?

	Yes	No
An infant or young child with a food allergy		
A breastfeeding mother whose child has a food allergy		

5. DIETICIANS:

Have you had training to implement a balanced restriction diet for the following individuals?

	Yes	No
An infant or young child with a food allergy		
A breastfeeding mother whose child has a food allergy		

6. a. Would you prescribe vitamin and mineral supplementation for a child or parent if on an elimination diet?

	Yes	No
Infant or child		
Lactating mother		
Pregnant mother		

6. b. If 'yes', please specify what you would consider to be the most important supplement and its respective dose for each individual? (please write only one supplement per individual e.g. multivitamin – 5ml)

	Type of supplement	Dose
Infant or child		
Lactating mother		
Pregnant mother		

7. DOCTORS: To what extent do you refer or work closely with a registered dietician in the implementation of an elimination diet for an infant (<1 years) or young child (1-5 years)? (choose one)

Never, I implement my own elimination diet plan	
Hardly ever	
I would like to but don't know whom to refer to	
I will only refer if I think it is necessary e.g. for multiple food allergies	
Yes, I refer every food allergy patient	

7. DIETICIANS: To what extent do you work closely with a medical doctor in the implementation of an elimination diet for an infant (<1 years) or young child (1-5 years)? (choose one)

Never	
Occasionally	
I collaborate with a doctor for every food allergy patient	

8. What information, if any, do you provide parents and children with when using an elimination diet? (you can select more than one)

My own diet sheets (doctor)	
My own diet sheets (dietician)	
Diet sheets compiled by means of the software program Allergy Advisor	
Lists with foods allowed and foods to avoid (food alternatives) from sources other than 'my own' or 'Allergy Advisor'	
ALLSA information sheets	
Lists for reading food labels	
Suggested recipes and cooking alternatives	
Guidelines for coping with occasions	
I don't give information sheets and broadly mention which foods to avoid	
Guidance on how to recognize and deal with severe symptoms	
Growth assessment and monitoring	
Nothing	
Other (<i>please specify</i>).....	

9. How frequently, if at all, do you follow up a patient with a food allergy on an elimination diet? (please choose one)

Never	
Just when there are problems and the patient returns	
Every second week	
Once a month	
Once every 3 months	
Once every 6 months	
Once a year	

SECTION F: FEEDING PRACTICES

1. Do you advise mothers with a strong allergic background on appropriate feeding practices for her infant? (You can choose more than one)

Yes, while she is still pregnant	
Yes, once the baby has been born	
I will advise for the next child	
I never advise on feeding practices	
Other (please specify)	

2. What feed(s) of choice would you recommend from birth for allergy prevention: (You may choose more than one)

Breastmilk (mother not advised to avoid food allergens in her diet)	
Breastmilk (mother advised to avoid food allergens in her diet)	
Soya infant formula e.g. Infacare soya, Isomil, Infasoy	
Partially hydrolysed whey formula e.g. Nan HA, Novalac HA, Similac Advance HA	
Extensively hydrolysed whey formula e.g. Alfare	
Extensively hydrolysed casein formula e.g. Nutramigen, Pregestimil, Similac Alimentum, Novalac Allernova	
Lactose free formula	
Elemental formula e.g. Neocate	
Goat's milk e.g. Alpi	
Rice milk	
Oat milk	
Other (please specify).....	

3. What feed(s) of choice would you recommend during infancy for the treatment of a specific food allergy e.g. cow's milk allergy: (You may choose more than one)

Breastmilk (mother not advised to avoid food allergens in her diet)	
Breastmilk (mother advised to avoid food allergens in her diet)	
Soya infant formula e.g. Infacare soya, Isomil, Infasoy	
Partially hydrolysed whey formula e.g. Nan HA, Novalac HA, Similac Advance HA	
Lactose free formula	
Extensively hydrolysed whey formula e.g. Alfare	
Extensively hydrolysed casein formula e.g. Nutramigen, Pregestimil, Similac Alimentum, Novalac Allernova	
Elemental formula e.g. Neocate	
Goat's milk e.g. Alpi	
Rice milk	
Oat milk	
Other (please specify).....	

4. Can a cow's milk allergic child react negatively to an extensively hydrolysed formula e.g. Nutramigen, Pregestimil, Similac Alimentum, Novalac Allernova, Alfare?

Yes	
No	

5. a. What percentage of cow's milk allergic children may also be simultaneously allergic to soy milk? e.g. 5%, 10%, 25% etc.

5. b. Is your answer in 5.a. based on the literature or from personal experience?

Literature	
Personal experience	

6. a. Do you think colic-like symptoms may be related to food allergy?

Yes	
No	
Sometimes	

6. b. If 'Yes', please indicate what feed(s) you will recommend for managing an infant who presents with colic-like symptoms (You may choose more than one):

Breastmilk (mother not advised to avoid food allergens in her diet)	
Breastmilk (mother advised to avoid food allergens in her diet)	
Soya infant formula e.g. Infacare soya, Isomil, Infasoy	
Partially hydrolysed whey formula e.g. Nan HA, Novalac HA, Similac Advance HA	
Lactose free formula	
Extensively hydrolysed whey formula e.g. Alfare	
Extensively hydrolysed casein formula e.g. Nutramigen, Pregestimil, Similac Alimentum, Novalac Allernova	
Elemental formula e.g. Neocate	
Goat's milk e.g. Alpi	
Rice milk	
Oat milk	
Other (please specify).....	

7. a. At what age would you advise parents to introduce solid foods to an allergic infant? (Please choose one)

< 4 months	
4 months	
5 months	
6 months	
7 months	
Older than 7 months	

7. b. In an infant with a strong allergic family history who does not present with allergic disease, please indicate at what age you would recommend the introduction of each of the following foods into the infant's diet?

Food	Recommended age of introduction in MONTHS
Cow's milk (and dairy products)	
Soya	
Peanuts (and peanut butter)	
Tree nuts (and tree nut butters)	
Fish	
Shellfish	
Wheat	
Gluten-containing grains	
Egg	

7. c. In an infant who presents with allergic disease, please indicate at what age you would recommend the introduction of each of the following foods into the infant's diet?

Food	Recommended age of introduction in MONTHS
Cow's milk (and dairy products)	
Soya	
Peanuts (and peanut butter)	
Tree nuts (and tree nut butters)	
Fish	
Shellfish	
Wheat	
Gluten-containing grains	
Egg	

8. a. Are you aware of any nutritionally complete feeds in South Africa appropriate for treating a child older than a year with a cow's milk allergy?

Yes	
No	

8. b. If 'yes', please name the product(s) that you would recommend:

8. c. Do you consider goat's milk to be good replacement milk for an infant or child with a cow's milk allergy?

Yes	
No	

9. a. What is a probiotic (Please mark the correct description)?

a. Resident microflora of bacteria, fungi or other harmless microorganisms found in the healthy large bowel	
b. Non-digestible food ingredients that selectively stimulate a limited number of bacteria to improve health	
c. Living microorganisms in a food that are designed to provide health benefits beyond a food's inherent nutritional value	
d. All of the above	

9. b. Do you prescribe probiotics for the prevention of food allergies?

Yes	
No	

9. c. If yes, which product?

9. d. Dose?

9. e. For how long (in MONTHS)?

10. a. Do you prescribe probiotics for the treatment of food allergies?

Yes	
No	

10. b. If yes, which product?

10. c. Dose?

10. d. For how long (in MONTHS)?

11. a. Do you prescribe omega 3 fatty acid supplements for the prevention of food allergies?

Yes	
No	

11. b. If yes, which product?

11. c. Dose?

11. d. For how long (in MONTHS)?

12. a. Do you prescribe omega 3 fatty acid supplements for the treatment of food allergies?

Yes	
No	

12. b. If yes, which product?

12. c. Dose?

12. d. For how long (in MONTHS)?

SECTION G: SUPPORT STRUCTURES

1. Could you mention any specific problems or challenges which you experience in providing appropriate care to infants and children with allergic disease and food allergies specifically?

.....

.....

.....

2. a. Are you aware of any allergy clinics in your area or in South Africa?

Yes	
No	

2. b. If 'yes', please name the clinic and where it is located (city, suburb, hospital etc):...

.....

3. Where do you tend to obtain allergy information from for use in your daily practice? (you can mark more than one)

Pre grad student notes	
Post grad course work on allergy	
Continued professional development initiatives	
Allergy diploma	
ALLSA	
NICUS	
Allergy advisor	
FACTS	
Internet (<i>specify sites</i>).....	
Magazines (<i>specify</i>)	
Books (<i>specify</i>)	
Other (<i>please specify</i>).....	

4. a. Do you believe that you would benefit from additional education and training regarding the management of food allergies?

Yes	
No	

4. b. If 'yes', in what form should the education and training be done? (You can choose more than one)

Lecture	
Workshop	
Conference	
CPD activity	
Articles	
Journal club	
Professional meeting for case study discussion	
Other (<i>please specify</i>).....	

5. Do you think there is a need for evidence based guidelines for standardising allergy management and care in South Africa?

Yes	
No	

Thank you for your participation in completing the questionnaire.

Addendum C: Cover letters and consent form



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CONSENT TO PARTICIPATE IN A MASTERS RESEARCH PROJECT

Project Title:

Management of food allergies in children in South Africa – determining aspects of the knowledge and practices of dieticians and medical doctors

You are invited to participate in the above mentioned research project which is being conducted as part of a Masters in Nutrition Degree through the Department of Human Nutrition, Faculty of Health Sciences at the University of Stellenbosch.

The study has been approved by the Committee for Human Research, University of Stellenbosch (STUDY REFERENCE NUMBER: NO8/02/03).

Principal researcher: Mrs. G I J Stear
E-✉: stear1@mweb.co.za

The details of the study are as follows:-

Aims and Objectives of the study:

- To gain a better understanding of knowledge and current practices of doctors and dieticians in the management of food allergies in children
- To determine the need for future education and training to ensure minimum competency levels
- To determine the need for South African-specific evidence-based guidelines and allergy support networks.
- To examine interdisciplinary collaboration amongst health professionals managing food allergies

Procedure:

You will be required to complete a questionnaire and return it via the post. A self-addressed, stamped envelope is enclosed and should please be sent to the necessary address as soon as is convenient to you but to reach the enclosed address by **no later than 4 November 2008.**

The questionnaire will attempt to assess your knowledge and practices in the management of food allergies as well as possible ideas you may have for areas requiring further professional development.



Fakulteit Gesondheidswetenskappe • Faculty of Health Sciences



Verbind tot Optimale Gesondheid • Committed to Optimal Health
Division of Human Nutrition • Department of Interdisciplinary Health Sciences
PO Box 19063 • Tygerberg 7505 • South Africa
Tel.: +27 21 938 9259 • Faks/Fax: +27 21 933 2991
Webblad / Web page: www.sun.ac.za/nutrition; www.sun.ac.za/nicus



Completed questionnaires will be posted to the following address (A stamped envelope with the address written below on it is enclosed for this purpose):

Attention: Faheema Losper
Department Human Nutrition
University of Stellenbosch
PO BOX 19063
Tygerberg
7505
Tel: 021 938 9259
Fax: 021 933 2991

Confidentiality:

All information will be used in a thesis, a publication in a professional journal/s and supplied to key role players for formulation of necessary educational material. Your participation in the research will remain strictly confidential at all times. Only the chief investigators will have access to the information. Should the information obtained be used in a publication, the participants will remain anonymous.

Access to findings:

Information on where and how results will be made available may be provided on request.

Voluntary Participation:

Participation in the project is entirely voluntary and ***the return of your questionnaire will be accepted as consent to participate.*** You have the option to refuse to participate by not returning the questionnaire.

Questions:

The principal researcher can be contacted at the above mentioned e-mail address should you have any questions regarding the study.

Thank you for your participation and time in this study. Should you require any further information, please contact me at any time.

Kind Regards

A handwritten signature in blue ink, appearing to read 'G. Stear'.

Gina Stear
Registered Dietician (SA)



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The study has been approved by the Committee for Human Research, University of Stellenbosch (STUDY REFERENCE NUMBER: NO8/02/03).

Principal researcher: Mrs. G I J Stear
E-✉: rgstear@bigpond.com

The details of the study are as follows:-

Aims and Objectives of the study:

- To gain a better understanding of knowledge and current practices of doctors and dieticians in the management of food allergies in children
- To determine the need for future education and training to ensure minimum competency levels
- To determine the need for South African-specific evidence-based guidelines and allergy support networks.
- To examine interdisciplinary collaboration amongst health professionals managing food allergies

Procedure:

You will be required to complete a questionnaire, save it and then return it via email to the following address rgstear@bigpond.com no later than **15 December 2008**.

The questionnaire will attempt to assess your knowledge and practices in the management of food allergies as well as possible ideas you may have for areas requiring further professional development.



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Confidentiality:

All information will be used in a thesis, a publication in a professional journal/s and supplied to key role players for formulation of necessary educational material. Your participation in the research will remain strictly confidential at all times. Only the chief investigators will have access to the information. Should the information obtained be used in a publication, the participants will remain anonymous.

Access to findings:

Information on where and how results will be made available may be provided on request.

Voluntary Participation:

Participation in the project is entirely voluntary and **the return of your questionnaire via email will be accepted as consent to participate**. You have the option to refuse to participate by not returning the questionnaire.

Questions:

The principal researcher can be contacted at the above mentioned e-mail address should you have any questions regarding the study.

Thank you for your participation and time in this study. Should you require any further information, please contact me at any time.

Kind Regards

A handwritten signature in blue ink that reads "Gina Stear". The signature is stylized, with a large, looped initial "G" and a horizontal line extending from the end of the name.

Gina Stear
Registered Dietician (SA)

Addendum D: Email reminder letter



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22nd November 2008

Dear Health professional

You have been randomly selected to participate in the following research project being conducted as part of a Masters in Nutrition degree through the Department of Human Nutrition, Faculty of Health Sciences at the University of Stellenbosch – **Management of food allergies in children in South Africa – determining aspects of the knowledge and practices of dieticians and medical doctors.** The study has been approved by the Committee for Human Research, University of Stellenbosch (STUDY REFERENCE NUMBER: NO8/02/03). Please see attached consent form for detail regarding the study.

By this stage you should have received a questionnaire in the post. Thanks to those who have taken the time to complete it and sent your responses back to me. For those of you who have not managed to do so yet, please may I request that you complete the questionnaire electronically for the benefit of the study. **Your contribution will make the difference in completing the study with sufficient strength on which the recommendations can be based.**

The questionnaire has been formatted to ensure time efficiency. Answering the questionnaire should take approximately 20 minutes of your time. Please answer **ALL** questions and mark with a cross (X) in the box where appropriate. Unless otherwise stated, please choose only 1 answer or option per question. Where prompted, please type in your answer in the space provided.

Please save your completed questionnaire and send it to the following email address – rgstear@bigpond.com. **By completing and returning the questionnaire via email, you will be consenting to voluntary participation in this project.**

May I request that you please send me your completed questionnaire by **15 December 2008.**

Thank you for your participation and time in this study. Should you require further information, please contact me at the above mentioned email.

Kind Regards

Gina Stear, Registered Dietician (SA) – Principal researcher



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Addendum E: Ethics approval



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10 March 2008

Mrs GI Stear
Division of Human Nutrition
Dept of Interdisciplinary Health Sciences

Dear Mrs Stear

RESEARCH PROJECT: "TO DETERMINE ASPECTS OF THE KNOWLEDGE AND PRACTICES OF DIETICIANS AND MEDICAL DOCTORS IN THE MANAGEMENT OF FOOD ALLERGIES IN CHILDREN IN SOUTH AFRICA"

PROJECT NUMBER : N08/02/030

My letter dated 15 February 2008 refers.

At a meeting that was held on 5 March 2008, the Committee for Human Research ratified the approval of the above project by the Chairman.

Yours faithfully

FRANKLIN WEBER
RESEARCH DEVELOPMENT AND SUPPORT (TYGERBERG)
Tel: +27 21 938 9657 / E-mail: fweb@sun.ac.za

Copy to Supervisor/ Head of Department: Prof Labadarius

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Afdeling Navorsingsontwikkeling en -steun • Research Development and Support Division

Posbus/PO Box 19063 • Tygerberg 7505 • Suid-Afrika/South Africa

Tel: +27 21 938 9677 • Faks/Fax: +27 21 931 3352

E-pos/E-mail: rdsinfo@sun.ac.za