

# Multi-morbidity and non-communicable diseases in South African primary health care

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M Med Family Medicine research assignment

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**Declaration**

I, the undersigned, hereby declare that the work in this assignment is my original work and that I have not previously submitted it, in its entirety or in part, at any university for a degree.

The main study was approved by the Health Research Ethics Committee of Stellenbosch University. This assignment was approved as an addendum to the main study.

## **Abstract**

### **Introduction**

Multi-morbidity in non-communicable diseases (NCDs) is becoming more and more recognised phenomenon and this places a huge burden on the healthcare providers as the complexity of managing these patients is multi-fold. Very little research has been done to investigate the extent of multi-morbidity in South Africa.

### **Aim and objectives**

The aim of the study was to evaluate the extent of multi-morbidity amongst patients with NCDs in South African primary health care. Specific objectives included:

- 1) What is the frequency of multi-morbidity in patients with hypertension, asthma, COPD, epilepsy, osteoarthritis and diabetes at a primary care level in South Africa?
- 2) What other conditions are co-morbid with these NCDs?
- 3) What acute diagnoses are made in patients with these NCDs?
- 4) What percentage of patients with NCDs are being seen by CNPs and what percentage are being seen by doctors?
- 5) What is the age and gender distribution of patients presenting with these NCDs?

### **Methods**

Analysis of a dataset obtained from a previous morbidity survey of South African primary health care that has already been published. Using an Excel spread sheet it was possible to analyse the frequency of the following variables for each of the targeted NCDs (hypertension, asthma, COPD, epilepsy and diabetes): age distribution and mean age, gender distribution, presenting complaints and diagnoses of acute illness, other co-morbid diseases and whether the consultation was with a nurse or a doctor. Finally it was possible to calculate the percentage of patients with different numbers of co-morbid conditions for each index condition.

### **Results**

Altogether 18856 consultations were included in the dataset and generated 31451 reasons for encounter and 24561 diagnoses. Hypertension was the most common diagnosis encountered (12%) followed by type 2 diabetes (3.9%), asthma (2%), epilepsy (1.9%) and COPD (0.6%). Mean age of patients in diabetes was 56.6 (SD 12.9) years, hypertension 56.4 (SD 13.3) years, epilepsy 37.9 (SD 16.4) years, osteoarthritis 56.9 (SD 13.1) years, asthma 45.5 (SD 18.1) years and COPD 56.8 (SD 10.1) years. Females were in the majority apart from in epilepsy and COPD. 67% saw a clinical nurse practitioner and 33% a doctor. Co-morbidity with other chronic diseases was found in 69% of patients with diabetes, 56% with osteoarthritis, 51% with COPD, 39% with asthma, 34% with

hypertension and 22% with epilepsy. Out of all the patients with NCDs only 1% were found to also have HIV or TB and only 0.4% depression or anxiety.

## **Conclusion**

Multi-morbidity is common particularly in patients with diabetes, osteoarthritis and COPD. Levels of multi-morbidity however are substantially lower than reported in more high income countries. Co-morbidity with HIV was very low. There was a lower than expected relationship between NCDs and mental health problems.

## Introduction

The treatment and management of chronic diseases places a huge burden on the health care system globally. It is estimated that 50% of global healthcare costs go to the treatment of chronic conditions.<sup>1</sup> Non communicable diseases (NCDs) are the leading cause of mortality globally.<sup>2</sup> In 2008 NCDs accounted for 36 million of the 57 million deaths worldwide.<sup>2</sup>

The prevalence of NCDs in low and middle income countries is rising because of increasing life expectancy and changing environmental factors that drive poor lifestyle choices.<sup>4</sup> Environmental factors that are contributing to the development of NCDs include relatively reduced costs of high energy foods containing fat, sugar and salt as well as relatively high costs of healthier foods.<sup>4</sup> High energy foods are promoted by the globalised food industry and are more accessible in urban environments.<sup>3</sup> Urbanisation is also associated with more sedentary lifestyles as a result of changes in occupation, transportation (increase use of cars), lack of access to green spaces, a lack of space for outdoor activities like cycling and walking, and concerns about safety.<sup>5</sup> Work and leisure activities have also been impacted on by the use of computers, computer games and television. A recent study in Nigeria identified the aesthetics of poor neighbourhoods, high traffic volumes, safety concerns, poorly maintained pedestrian paths and a malodorous environment as risk factors for being overweight.<sup>5</sup>

In Sub-Saharan Africa, communicable diseases like HIV and TB have been the leading cause of death in the past.<sup>6</sup> However, because of the prevention and treatment of communicable diseases, specifically AIDS, life expectancy is increasing and enabling the development of NCDs in middle age.<sup>6</sup> There has also been a change in the disease pattern in certain areas where NCDs have overtaken communicable diseases as the leading cause of morbidity and mortality.<sup>6</sup> Communicable and non-communicable diseases are also inter-connected and there is evidence of a relationship between HIV/AIDS and its treatment with cardio-metabolic disorders; between smoking, diabetes and tuberculosis; and between smoking, tuberculosis and chronic obstructive pulmonary disease.<sup>7</sup>

The South African health care system faces a quadruple burden of disease, characterised by HIV/AIDS and TB, injury and violence, maternal and child health issues and NCDs.<sup>1</sup> Currently NCDs are estimated to contribute 28% to the total burden of disease and this is predicted to increase substantially in South Africa over the next few decades if measures are not taken to combat the trend.<sup>1</sup> Cardiovascular diseases, respiratory diseases, diabetes mellitus and cancers together contributed 12% to the overall disease burden, and neuro-psychiatric disorders another 6%.<sup>1</sup> The WHO estimates the burden of NCDs to be 2-3 times higher in South Africa than in high income countries.<sup>7</sup> The distribution of NCDs displays socioeconomic disparities, with the heaviest burden amongst poor communities in urban areas. The rising morbidity and mortality related to NCDs has major implications for the delivery of both acute and chronic health-care services.<sup>1</sup> NCDs also have economic consequences for individuals, households and society and are therefore also a developmental challenge.<sup>8</sup>

Primary health care is the foundation of the health care system and this is where the majority of patients with NCDs are managed.<sup>8</sup> The most common and important NCDs encountered in clinical practice in low and middle income countries are hypertension, diabetes, asthma, COPD and

epilepsy.<sup>4</sup> In Sub-Saharan Africa, NCDs are generally poorly managed.<sup>8</sup> Poorly managed health care systems and intermittent interruption of drug supplies as well as a lack of competency of health workers all add to the morbidity and mortality of patients with NCDs<sup>9</sup>

Research suggests that health workers can manage NCDs at a primary care level well.<sup>10</sup> In Ethiopia, community-based care and education, primarily but not exclusively driven by nurses, was shown to be an effective and cost efficient method of managing chronic disease.<sup>10</sup> A study performed in Cameroon implemented and assessed the effectiveness of nurse-led protocol-driven care for hypertension at a primary care level. The intervention significantly reduced blood pressure levels with a mean reduction of 11.7mmHg for systolic blood pressure and 7.8mmHg for diastolic blood pressure.<sup>15</sup> Nurse-led care has been identified as a promising way of delivering care for hypertension. Patients followed up by nurses were more likely to be prescribed BP-lowering treatment and to adhere to medication.<sup>11</sup>

The management of NCDs in South Africa remains a challenge for various reasons.<sup>6</sup> Managing patients with HIV/AIDS has diverted resources, time, and energy away from NCDs. As a result of a lack of resources, unreliable delivery of medication and supplies, many patients with NCDs are not well controlled and suffer the consequences thereof.<sup>6</sup> The life expectancy of patients with NCDs such as diabetes in Sub-Saharan Africa is lower than in high income settings.<sup>9</sup> It is therefore likely that patients accessing the primary health care system in Sub-Saharan Africa with NCDs are at a disadvantage.<sup>9</sup>

The management of NCDs in rural and urban South Africa at a primary care level is the responsibility of both clinical nurse practitioners (CNPs) and doctors. In the 1970's, due to a shortage of doctors and the fact that doctors were seeing very large numbers of patients, the concept of CNPs was introduced. It was also felt that doctors working at a primary care level were over-trained and that the economy could not afford to carry the burden of having to train the doctors.<sup>35</sup> Doctors working at the primary care level were also finding the burden of having to deal with large numbers of patients too great. CNPs were therefore introduced to see patients with minor ailments so that doctors could be freed up to see patients with more complex presentations. The majority of healthcare workers at a primary care level are now nurses and about 80% of consultations are with nurses.<sup>12</sup>

CNPs receive post basic training that enables them to make diagnoses and treat common conditions in primary care. Much of their decision making and management is protocol based through the use of the Standard Treatment Guidelines and Essential Drug Lists, such as the PALSA PLUS programmes and the Integrated Management of Childhood Illnesses Guidelines. PALSA PLUS training is offered on site by a trained supervisor, and nurses are trained to manage uncomplicated respiratory diseases. In the case of asthma and COPD, this may involve initial treatment with a bronchodilator and, in the case of asthma, a low dose of inhaled corticosteroids for one month, while the patient is referred to a doctor for confirmation of the diagnosis.<sup>13</sup> PALSA PLUS has now been extended to include all the NCDs in a new guideline called Primary Care 101.

CNPs have enjoyed much success in the management of NCDs with the use of protocols when treating one disease at a time. In Hlabisa district, Kwazulu-Natal in South Africa, it was found that nurses working alone could achieve control of 68% of patients with hypertension, 82% of those with

type 2 diabetes mellitus and 84% of those with asthma.<sup>14</sup> The results showed that using a stepwise diagnostic and treatment protocol, nursing staff managed to control most patients with hypertension, diabetes and asthma with the help of a consulting doctor for the more complicated cases.<sup>14</sup> Another study in rural KwaZulu Natal concluded that diabetes care that is guided by a simple protocol and which includes patient education can be successfully introduced and run by nurses. The study showed that medium-term glycaemic improvements were excellent and the service was well received.<sup>15</sup>

The reality is NCDs do not necessarily occur in isolation, and that this may hamper the use of simple protocols at a primary care level that focus on the management of a single disease rather than a whole person. The complexity of managing patients with multi-morbidity may therefore make it even more difficult for CNPs with limited training to offer quality care. It is clear from the literature that the management of multi-morbidity in NCDs poses numerous problems and challenges to the health care provider. The practice of medicine relies on a system of diagnostic classification which is paralleled by the ways that professions and health services are often organised into vertical disease-focused silos. However, diseases or morbidities occur in individuals who may experience none, one or several simultaneously.<sup>16</sup>

There is no doubt that patients with multiple NCDs place an untold burden on the primary health care system. Patients with more than one NCD tend to have more hospital admissions, spend more money on healthcare and access primary healthcare more often.<sup>17</sup> With the complexity of multi-morbidity in NCDs, this may limit the role that CNPs play at a primary health care level.

Clinical decision making in patients with multi-morbidity is often very difficult as clinicians struggle to balance the risks and benefits of multiple recommended treatment guidelines.<sup>17</sup> Patient preference and economic circumstances may also play a major role in the eventual outcome of the consultation.<sup>17</sup> Trying to follow multiple single disease guidelines may not be a financially acceptable option to patients. Poly-pharmacy often also ensues when more than one guideline is used, which plays more of a risk for drug interactions and side effects, particularly in the elderly, frail patients or those with cognitive impairment. In a cross sectional study performed in George, South Africa, it was found that potential drug interactions increased as the number of drugs that were prescribed increased. Various scripts were analysed by the author and it was found that in patients with NCDs, there was a high rate of potential drug interactions.<sup>18</sup> For example, in patients with hypertension, 72.7% of scripts analysed had potential drug-drug interactions with 6.7% of them having potentially severe drug-drug interactions. In patients with diabetes, 81% of patients had potential drug-drug interaction and 12.1% of scripts had potentially severe drug-drug interactions.<sup>18</sup>

Effective management of multi-morbidity and NCDs may require a shift from problem-orientated to goal-orientated care. A qualitative study showed that general practitioners agreed that treatment of patients with multi-morbidity must be tailored to each individual patient, that the patients' socio-economic circumstances and preferences should be taken into account and that protocols should not be blindly followed.<sup>18</sup> Furthermore general practitioners felt that using single disease focussed approaches was not adequate as multiple conditions and their recommended treatment need to be brought together and priorities established, which was a complex task.<sup>17</sup> In people with multi-

morbidity, some decisions will still be made within a single disease framework, but decision making will often require balancing competing considerations.<sup>11</sup>

At any one moment, there may be a single condition which dominates the clinical picture in a patient with multi morbidity, but over time what matters most to individuals will often change. Additionally, where a patient has many conditions, then single disease guideline recommendations are sometimes discordant. Different courses of action may be contradictory, for example prescribing a short course of steroids to a patient with asthma and diabetes. In this situation the individual person's multi-morbidity creates complexity that requires clinical judgment beyond what is anticipated in the guidelines.

Multi-morbidity in NCDs is common and the prevalence increases with advancing age. Figure 1 shows the percentage of people with multi-morbidity in Scotland. Of the 1 751 841 people in the dataset, 405 496 (23.1%) had at least two chronic conditions, and 237 798 (13.6%) had at least three.<sup>16</sup> The number of chronic conditions that people had increased rapidly with age. From age 65, over half the population were multi-morbid (defined as having two or more chronic conditions) and almost three-quarters by age 75.<sup>16</sup>

**Figure 1: Multimorbidity by age group in Scotland<sup>15</sup>**

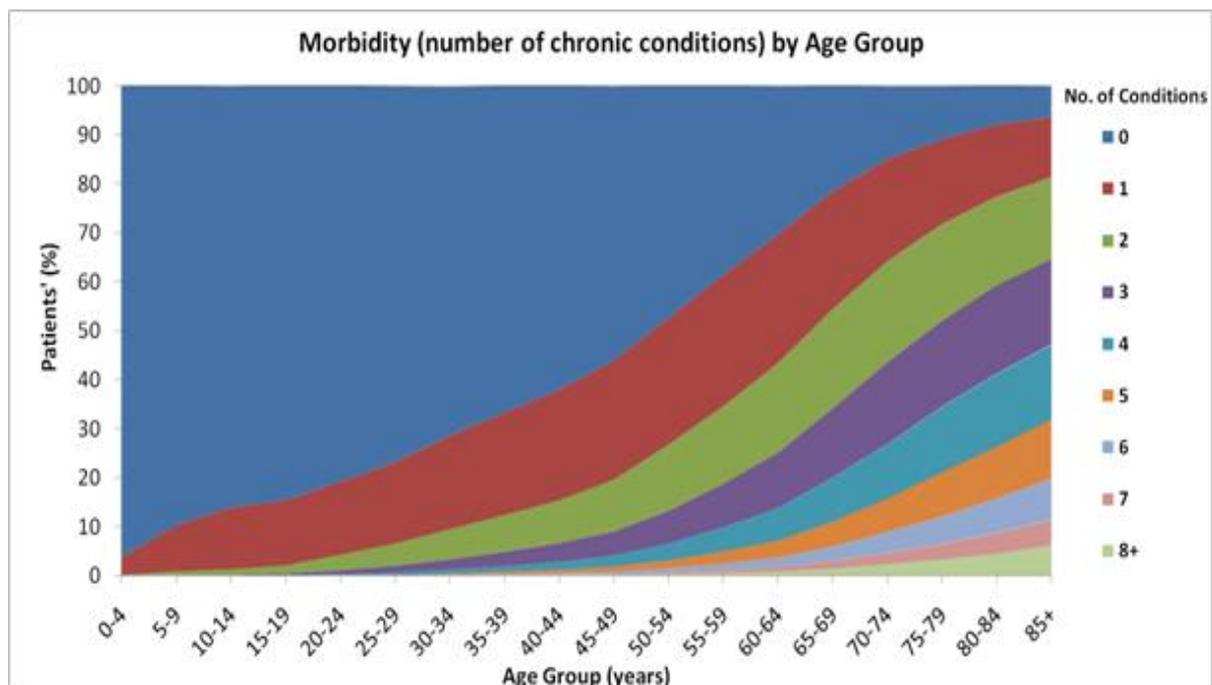
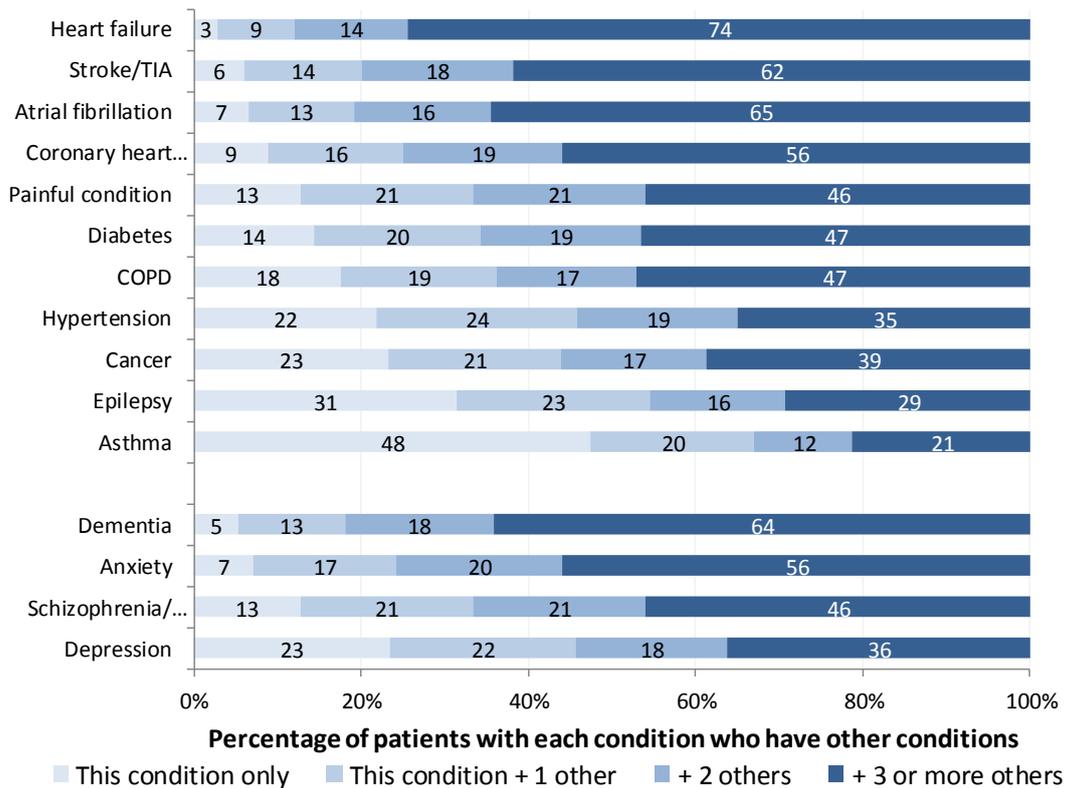


Figure 2 shows the proportion of people in Scotland with selected, common chronic conditions who had other diseases. It is clear that people with single chronic diseases are the minority, except in children and younger adults.

**Figure 2: Multi-morbidity with different index conditions in Scotland<sup>16</sup>**

As far as it is known there are no similar published studies in the South African primary care context. Recent data from a South African morbidity survey provides an opportunity to address this issue.<sup>12</sup> In addition this dataset allows us to examine co-morbidity of NCDs with HIV/AIDS and also to look at what the common complaints are amongst patients attending for NCDs in primary care. This study, therefore, aimed to evaluate the extent of multi-morbidity for NCDs and to determine how much of a challenge this is in South African primary care practice. Multi-morbidity has implications for training of CNPs and doctors as well as the design of guidelines and health systems. Multi-morbidity also raises questions about whether a practitioner-centred or a patient-centred approach is more likely to be helpful.

## Aim and objectives

The aim of the study was to evaluate the extent of multi-morbidity amongst patients with non-communicable diseases in South African primary health care. Specific objectives included:

- 1) What is the frequency of multi-morbidity in patients with hypertension, asthma, COPD, epilepsy, osteoarthritis and diabetes at a primary care level in South Africa?
- 2) What other conditions are co-morbid with these NCDs?
- 3) What acute diagnoses are made in patients with these NCDs?

- 4) What percentage of patients with NCDs are being seen by CNPs and what percentage are being seen by doctors?
- 5) What is the age and gender distribution of patients presenting with these NCDs?

## **Methods**

### **Study design and methodology**

The study was a multi-centre prospective cross-sectional survey of consultations in primary care in four provinces of South Africa: Western Cape, Limpopo, Northern Cape and North West. Analysis of a dataset obtained from a previous morbidity survey of South African primary health care that has already been published.<sup>12</sup> The design of the study from which the dataset was derived will be outlined below.

### **Setting and study population**

The original study was implemented in public primary care facilities in the Western Cape, North West, Northern Cape and Limpopo provinces. Sequential ambulatory patients, who presented to primary care practitioners (nurses or doctors) were included in the study. These provinces were chosen because MMed students were available to act as research assistants and because they traversed the country from East to West and North to South.

### **Sampling and sample size**

The sample size was based on two considerations: firstly the number of health care workers a research assistant could train and support across a number of facilities and secondly on ensuring that the secondary reasons for encounter would be encountered in large enough numbers. The sample size per province was therefore the product of the number of health care workers that could be handled (60), the number of sampling days for each health care worker (5) and the number of patients per day (20) resulting in 6000 encounters per province and 24000 overall.

One district was purposefully selected from each Province based on the location of the research assistants. Out of these districts 4 sub-districts were purposively selected and at least one of the sub-districts was an urban area. Urban sub-districts were defined as having a town or metropolitan area and a population of more than 200,000 people. In the Western Cape sub-districts were selected from the Metropolitan and West Coast districts to enable a mix of rural and urban populations.

The sample size required from each sub-district to make up the total of 6000 for the Province was stratified according to the population of the sub-district. The facilities in each sub-district were then listed and divided into community health centres, fixed clinics or mobile clinics. It was assumed that a larger community health centre would have five health workers participating in the survey, a fixed clinic two health workers and a mobile clinic one health worker. It was also assumed that each health worker would see at least 20 patients a day and collect data on 5 separate days. The number of health workers required to deliver the sample size was then determined and distributed between the different types of facilities in proportion to the total number of different facilities in the sub-district. The required number of health centres, fixed clinics and mobile clinics were then randomly

selected. In Tygerberg and Klipfontein sub-districts the City of Cape Town, which runs the clinics, refused permission for the survey and therefore four community health centres were selected.

### **Data collection**

At each selected facility the research assistant explained the project and invited primary care providers, either doctors or nurses, to participate. Health workers were provided with a data collection tool which allowed them to record the age and sex of each patient and up to five reasons for encounter and five diagnoses for that consultation. No distinction was made between primary and secondary or on going diagnoses. Data were collected on all sequential ambulatory patients seen by the health worker on that day. Health workers were expected to be working in general primary care and not a specialised vertical programme or emergency department.

### **Data analysis**

The International Classification of Primary Care Second Edition (ICPC-2) was used to code all reasons for encounter and diagnoses. The ICPC-2 was developed by the World Organisation of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians (WONCA) as a classification system uniquely suited to primary care. The system enables classification of the reasons for encounter and diagnoses using a bi-axial structure. The first axis codes the body system involved by means of a letter derived from 17 possible chapters. The second axis contains seven components related to different aspects of the consultation. Within each component a menu of standardised rubrics are listed with definitions, inclusion and exclusion criteria. These rubrics provide a two-digit numeric code that is combined with the letter to give the final classification. For example HIV/AIDS is coded as B90, type 2 diabetes as T90, tuberculosis as A70.

In this study the data on NCDs was further analysed with the help of a statistician. Using an Excel spread sheet it was possible to analyse the frequency of the following variables for each of the targeted NCDs (hypertension, asthma, COPD, epilepsy and diabetes): age distribution and mean age, gender distribution, presenting complaints and diagnoses of acute illness, other co-morbid diseases and whether the consultation was with a nurse or a doctor. Finally it was possible to calculate the percentage of patients with different numbers of co-morbid conditions for each index condition.

### **Results**

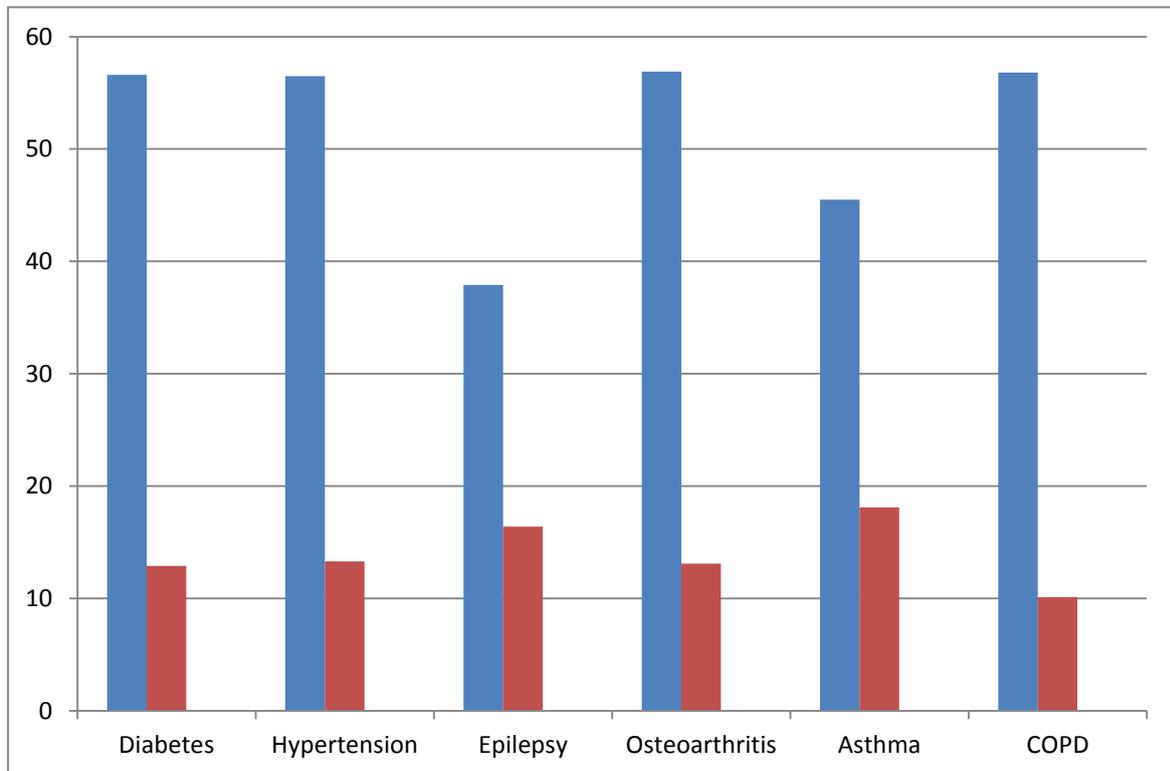
From the original published study, hypertension was the most common diagnosis encountered at primary care level (12%). Type 2 diabetes made up a total of 3.9%, asthma 2%, epilepsy 1.9% and COPD 0.6%. At primary health care clinics these NCDs were all amongst the top 25 diagnoses seen.<sup>13</sup>

### **Demographic profile**

Altogether 18856 consultations were included in the survey and generated 31451 reasons for encounter (RFE) and 24561 diagnoses. Limpopo provided 6678 (35.4%), Northern Cape 1504 (7.9%), North-West 5082 (26.9%) and Western Cape 5592 (29.6%) of the consultations. Women accounted for 12526 (66.6%) and men 6288 (33.4%) of consultations.

Figure 1 illustrates the mean age and standard deviation for patients with the various NCDs. Diabetes was 56.6 (SD 12.9) years, hypertension 56.4 (SD 13.3) years, epilepsy 37.9 (SD 16.4) years, osteoarthritis 56.9 (SD 13.1) years, asthma 45.5 (SD 18.1) years and COPD 56.8 (SD 10.1) years.

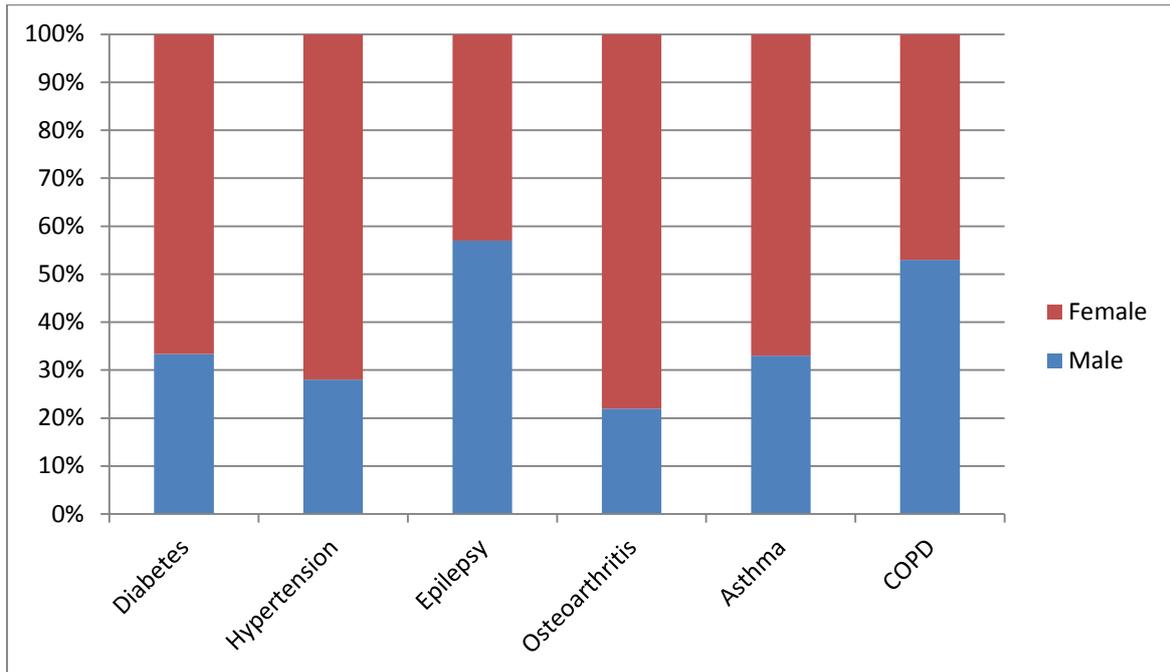
**Figure 1: Mean ages and standard deviations for patients with hypertension, diabetes, epilepsy, COPD, asthma and osteoarthritis**



Blue: Mean age Red: Standard deviation

Figure 2 shows the gender distribution of patients with the different NCDs. Females were in the majority for hypertension, diabetes and osteoarthritis, whereas there were more men with COPD and epilepsy.

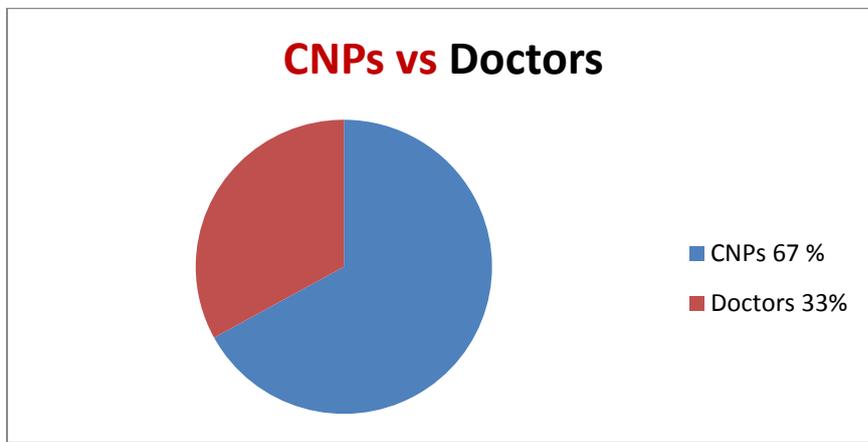
**Figure 2: Gender distribution of patients with NCDs**



### Type of practitioner

The total number of patients with NCDs included in this study was 5695 of which 3811 (67%) were seen by CNPs and 1884 (33%) were seen by doctors. Figure 3 demonstrates this graphically.

**Figure 3: Pie-chart showing difference in the number of consultations by doctors and CNPs**



## Co-morbid conditions

Table 4 and 5 illustrate the top ten conditions, in descending order of occurrence, that were co-morbid with each NCD.

**Table 4: Conditions that were co-morbid with the NCDs**

Code	Hypertension	Frequency N 3215 (%)	Code	Diabetes	Frequency N 945(%)	Code	Epilepsy	Frequency N 375 (%)
T90	Diabetes	587 (18)	K86	Hypertension	597 (63)	K86	Hypertension	54 (14.4)
L91	Osteoarthritis	256 (8)	L91	Osteoarthritis	41 (4.3)	L91	Osteoarthritis	9 (2.4)
R96	Asthma	116 (3.6))	T93	Lipid disorder	14 (1.4)	A70	Tuberculosis	5 (1.3)
R95	COPD	67 (2)	S88	Sleep disorder	13 (1.3)	U71	Psychosis	3 (0.8)
K76	Ischaemic heart disease	66 (2)	B90	Dermatitis contact/allergic	10 (1)	P98	Acute otitis media	3 (0.8)
N88	Epilepsy	55 (1.7))	P72	HIV infection/AIDS	8 (0.8)	H71	Schizophrenia	3 (0.8)
T93	Lipid disorder	54 (1.6)	L18	Schizophrenia	8 (0.8)	P20	Memory disturbance	2 (0.5)
K77	Heart failure	48 (1.4)	K76	Muscle pain	7 (0.7)	P72	Headache	2 (0.5)
N29	Neurological symptom	3 (0.09)	U71	Ischaemic heart disease	6 (0.6)	N01	Intellectual disability	2 (0.5)
U07	Oesophagus disease	3 (0.09)	N88	Epilepsy	5 (0.5)	K90	Stroke	2 (0.5)

**Table 5: Conditions that were co-morbid with the NCDs**

Code	Asthma	Frequency N 485 (%)	Code	COPD	Frequency N 140 (%)	Code	Osteoarthritis	Frequency N 528 (%)
K86	Hypertension	139 (28)	K86	Hypertension	67 (47)	K76	Ischaemic heart disease	12 (2.2)
L91	Osteoarthritis	28 (5)	L91	Osteoarthritis	17 (12)	K77	Heart failure	9 (1.7)
T90	Diabetes	26 (5)	T90	Diabetes	13 (9.2)	D87	Stomach function disorder	6 (1.1)
R78	Acute bronchitis	23 (4.7)	A70	Tuberculosis	9 (6.4)	T92	Gout	5 (0.9)
R97	Allergic rhinitis	15 (3)	N88	Epilepsy	5 (3.5)	N94	Peripheral neuritis	4 (0.7)
A70	Tuberculosis	11 (2.2)	K76	Ischaemic heart disease without angina	5 (3.5)	L90	Osteoarthrosis of the knee	4 (0.7)
N88	Epilepsy	6 (1.2)	A70	Tuberculosis	3 (2.1)	L88	Rheumatoid arthritis	4 (0.7)
R83	Respiratory infection	5 (1)	T93	Lipid dysfunction	3 (2.1)	K90	Stroke	2 (0.3)
P06	Sleep disturbance	3 (1)	P17	Tobacco abuse	3 (2.1)	N07	Convulsions	2 (0.3)
L03	Lower back symptoms	3 (1)	K74	Ischaemic heart disease with angina	3 (2.1)	A09	Sweating problem	2 (0.3)

Table 6 and 7 shows the top 5 acute conditions that patients with NCDs presented with.

**Table 6: Co-morbid acute conditions in patients with osteoarthritis, asthma and hypertension.**

Code	Osteoarthritis	Frequency N 528(%)	Code	Asthma	Frequency N 485 (%)	Code	Hypertension	Frequency N 3215 (%)
R74	Upper respiratory infection acute	10 (1.8)	R78	Acute bronchitis	23 (4.7)	R78	Acute bronchitis	28 (0.8)
K85	Elevated blood pressure	8 (1.5)	R97	Allergic rhinitis	15 (3)	R97	Allergic rhinitis	22 (0.6)
D70	Gastrointestinal infection	8 (1.5)	D84	Oesophagus disease	6 (1.2)	S88	Dermatitis acute/contact	22 (0.6)
R78	Acute bronchitis	8 (1.5)	R74	Upper respiratory infection acute	5 (0.9)	D84	Oesophagus disease	10 (0.3)
S88	Dermatitis acute/contact	5 (0.9)	D73	Gastroenteritis presumed infection	4 (0.7)	R74	Upper respiratory infection acute	10 (0.3)

**Table 7: Co-morbid acute conditions in patients with diabetes, COPD and epilepsy**

Code	Diabetes	Number of patients N 945 (%)	Code	COPD	Number of patients N 140 (%)	Code	Epilepsy	Number of patients N 375 (%)
R78	Acute bronchitis	9 (0.9)	R78	Acute bronchitis	8 (5.7)	R97	Allergic rhinitis	4 (1)
S88	Dermatitis acute/contact	9 (0.9)	S88	Dermatitis acute/contact	3 (2.1)	D73	Gastroenteritis presumed infection	2 (0.5)
L18	Muscle pain	7 (0.7)	K77	Heart failure	2 (1.4)	D84	Oesophagus disease	1 (0.2)
R74	Upper respiratory infection acute	7 (0.7)	B82	Anaemia	2 (1.4)	R74	Upper respiratory infection acute	1 (0.2)
R97	Allergic rhinitis	4 (0.4)	F93	Glaucoma	2 (1.4)	R78	Acute bronchitis	1 (0.2)

In COPD 23% of patients had complaints that could be directly linked to COPD (cough, respiratory symptoms, shortness of breath and wheezing), 10% of patients had complaints that were linked to possible infection of the respiratory tract and the remainder were not clearly related to COPD.

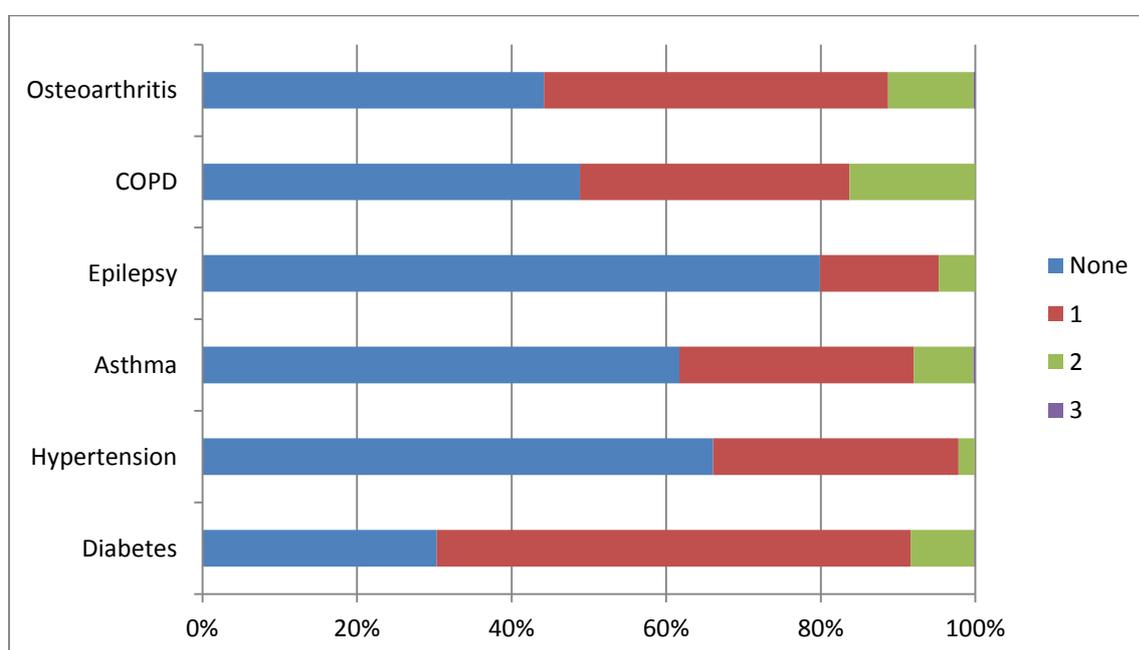
In epilepsy 12% of patients had complaints that could be directly related. Musculo-skeletal complaints (back symptoms, leg complaints and pain in multiple sites) that could be related to seizures made up 1.8%. The rest of the presenting complaints were unrelated to epilepsy.

In diabetes 70% of the acute complaints could be directly related to diabetes (headache, general weakness, leg complaints, cough, foot or toe symptoms, pruritis and dizziness).

## Multi-morbidity in NCDs

Figure 8 illustrates the presence of multi-morbidity in NCD and Table 9 presents the underlying results.

**Figure 8: The extent of multi-morbidity in patients with NCDs**



**Table 9: Multi-morbidity in NCDs**

Number of co-morbid diseases	0	1	2	3
<b>Hypertension N=3215 n (%)</b>	2121(66)	996(31)	64(2)	1 (0.04)
<b>Diabetes N=945 n (%)</b>	283 (30.3)	576(61.3)	76 (8.2)	1 (0.1)
<b>Asthma N=485 n (%)</b>	295(61.7)	145(30.3)	33(7.7)	1 (0.2)
<b>Epilepsy N=375 n (%)</b>	296 (79.8)	56(15.4)	15(4.7)	0 (0)
<b>COPD N=140 n (%)</b>	67(48.4)	47 (34.8)	22(16.2)	0 (0)
<b>Osteoarthritis N=528 n (%)</b>	232 (44.15)	232 (44.56)	58 (11)	1(0.2)

When looking at co-morbidity with HIV, of the 4455 patients with NCDs 4405 (98.9%) were HIV negative and only 50 (1.1%) were identified as co-infected with HIV. Of the patients with NCDs only 43 (1.0%) were identified as co-infected with TB. The data also showed that of the patients with NCDs only 18 (0.4%) were also diagnosed with depression and only 2 (0.04%) with anxiety disorders.

## Discussion

### **What is the frequency of multi-morbidity in patients with hypertension, asthma, COPD, epilepsy, osteoarthritis and diabetes at a primary care level in South Africa?**

Multi-morbidity in people with NCDs presents a problem that all South African health care workers should be cognisant of. Multi-morbidity with NCDs ranged from 69% of people with diabetes to only 22% of people with epilepsy and out of these groups most had only one co-morbid condition.

In the Scottish study multi-morbidity was more prevalent than in this South African based study. For example 47% of patients with diabetes in the Scottish study had three or more co-morbid NCDs compared with only 0.1% of patients in this study. The same findings hold true for hypertension (35% in Scotland versus 0.04% in South Africa), osteoarthritis (47% in Scotland versus 0.2% in South Africa), asthma (21% in Scotland versus 0.2% in South Africa) COPD (47% in Scotland versus 0% in South Africa) and epilepsy (29% in Scotland versus 6.46% in South Africa). Possible reasons for the vast differences in multi-morbidity between the two populations mentioned could be a more elderly population in Scotland leading to greater multi-morbidity. Better access to and quality of primary care in Scotland may also have led to better diagnosis and documentation of co-morbid conditions, for example, mental health disorders. The mean age of patients in South Africa was 52 years (with the mean age in the Scottish study being 42 years).

Barnett et al describe an association between multi-morbidity and socio-economic deprivation.<sup>20</sup> In this case, the lack of multi-morbidity among the population in this study is surprising especially in the context of the poor socioeconomic circumstances which prevail in the population using the

public health sector. However age is likely to be a stronger determinant of multi-morbidity than socio-economic status in this comparison. A study conducted in Burkina Faso echoed this finding. The study showed a definite relationship between NCDs and age. Their study suggested that in developing countries, the age of onset of NCDs was younger than people in developed countries, and because of the early age of onset, the NCDs proved to be more lethal.<sup>35</sup>

In South Africa, as in many other developing countries there seems to be an underestimation of the prevalence and impact of NCDs on both the country's population and economy.<sup>5</sup> It is argued that as South Africa develops the life expectancy of its population will increase and with it the prevalence of NCDs and multi-morbidity. There is limited screening for the possibility of multiple NCDs occurring together. The use of single disease protocols that do not take screening for other NCDs into account and a lack of training of healthcare workers to screen for co-morbid NCDs may be important contributing factors. Patients should be able to have all their conditions and problems managed in a comprehensive way at one visit and not be expected to attend separate clubs or clinics on different days. If they have more than one chronic condition then one should not be neglected at the expense of the other if they attend a disease-orientated club. For example if one attends a clinic for epilepsy, but also have hypertension, both conditions should receive adequate attention. Being comprehensive and patient rather than disease centred is an important feature of medical generalism in primary care. Medical generalism, understanding and practice of seeing a patient as an entirety and managing not only the disease but rather managing the person, the disease as well as their lives is becoming more and more important in delivering health and social services to people in the 21<sup>st</sup> century.<sup>23</sup> The PC101 primary care guideline that is being piloted in the Western Cape is one example of a more integrated approach.

Improved training, especially when it comes to prescribing will have to occur in South Africa as multi-morbidity in NCDs increases. Clinicians often find it difficult to balance the benefits of certain medications with the potential risks of the specific medication or the interaction it may have with existing medications.<sup>24</sup> Guidelines take into account individual conditions, but combining recommendations can be potentially harmful in patients with several NCDs. The question thus arises, are CNPs and junior doctors adequately trained to manage the potentially complicated patient with numerous NCDs? The evidence tends to suggest that CNPs do well when using protocols to manage single diseases, but no real evidence exists to suggest the same when it comes to multi-morbidity.

### **What other conditions are co-morbid with these NCDs?**

Very little nationally representative data exists in South Africa when it comes to the prevalence of psychiatric disorders. Stein et al showed that the life time prevalence for anxiety disorders was 15.8%, mood disorders was 9.8% and substance induced disorders was 30.3%.<sup>21</sup> One would have thus expected a higher number of patients in the sample population to have a psychiatric condition as a co-morbid condition. Only 0.4% of patients with NCDs had co-morbid depression and 0.04% of patients had co-morbid anxiety in this study. These appear very low especially when a study conducted in South Africa showed the prevalence of a major depressive episode to be as high as 9.7% in the South African population.<sup>20</sup> In the Scottish study it was found that depression was the most common co-morbid psychiatric disorder with the NCDs, followed by schizophrenia, bipolar

disorder and dementia.<sup>16</sup> Further the study shows that 39.6% of patients with multi-morbidity had a co-morbid psychiatric disorder.<sup>16</sup>

Hypertension and diabetes individually are potent risk factor for the development of cardio-vascular disease (CVD), and in combination this risk is potentiated.<sup>30</sup> When the two diseases occur in combination, they may have devastating sequelae, which include renal failure, coronary artery disease, peripheral artery disease and stroke.<sup>25</sup> In this study 18% of patients with hypertension had diabetes as a co-morbid condition and 63% of people with diabetes had hypertension, making these patients susceptible to the above mentioned complications. The presence of co-morbidities in patients with diabetes, particularly depression and arthritis, can markedly influence the patient's self-care activities and may negatively impact adherence to medication.<sup>26</sup> Co-morbid conditions like COPD and chronic back pain may influence the patient's life more than the diabetes itself.<sup>26</sup> In the current data, osteoarthritis and muscle pain both feature strongly in patients with diabetes.

In the literature osteoarthritis has one of the highest rates of co-morbidity, with hypertension being the disease most co-morbid with it.<sup>27</sup> In this study osteoarthritis had the second highest rate of multi-morbidity after diabetes (57%), but the commonest associated conditions were ischaemic heart disease and cardiac failure.

In the United Kingdom, epilepsy was found to be co-morbid with somatisation, dementia, cardiovascular disease and chronic lung disease, none of which featured strongly in this study.<sup>28</sup> A study performed in Malawi, reports an under reporting of the symptoms of epilepsy and as a result under diagnosing of the condition at primary care level in that country. Reasons cited for this is that it is believed that epilepsy is not an organic disease but occurs in patients who are possessed by spirits. This belief may bring shame to the family and their symptoms are not reported.<sup>29</sup> Further, due to financial constraints patients with epilepsy do not attend the clinics regularly, since these patients often have to be escorted to the clinics which is not always possible in financially constrained areas.<sup>29</sup> The extent of multi-morbidity regarding epilepsy in the current study may not be a true reflection of the actual problem in the current population. Another reason women may fail to report their symptoms is due to the fear of not being seen as an eligible partner due to their epilepsy. Instead co-morbidity with psychiatric disorders such as schizophrenia, psychosis and intellectual disability was found.

In the literature asthma is associated with angina, myocardial infarction, osteoporosis and fractures, pneumonia and acute respiratory infections and hypertension.<sup>30</sup> These finding were echoed in the this study with hypertension (28%), acute bronchitis (4.7%), tuberculosis (2.2%), upper respiratory infections (1.05%), pneumonia (0.73%) and respiratory infections (1%) all being among the top 10 co-morbid presentations in patients with asthma.

According to the current data set, only 1% of patients with NCDs were co-infected with HIV. As patients with NCDs are mostly treated in ambulatory primary care, as opposed to the vertical HIV programme, the survey data should give a reasonably valid picture of NCDs. It is likely that if the diagnosis of HIV had been made it would have been recorded in the consultation and survey data. Conversely the co-morbidity of NCDs in patients with HIV cannot be accurately estimated from this study. The low prevalence of HIV in the data set is specific to the data set and not necessarily a reflection of the situation in South Africa. Currently there is interest in integrating chronic care for

HIV and NCDs and to share best practice in terms of effective systems for chronic care. The HIV programme has many lessons that can be replicated in the care of patients with NCDs. However this study does not suggest that there are many patients with NCDs who need integrated care at the level of the patient and there may be risks in bringing these patient populations together. For example exposing patients with diabetes to HIV positive patients with TB would be counter-productive. This situation could change as the HIV positive population ages.

### **What acute diagnoses are made in patients with these NCDs?**

The acute conditions that patients with NCDs presented with in this study were common ailments and not specific to the NCDs. There were some acute diagnoses which were present in all or most of the NCDs. For example, acute bronchitis was present in patients with osteoarthritis (1.5%), asthma (4.7%), hypertension (0.8%), diabetes (0.9%), COPD (5.7%) and epilepsy (0.2%). Other common diagnoses were dermatitis, allergic rhinitis and upper respiratory tract infection. The other acute diagnoses were all different, ranging from gastrointestinal infection to other conditions like glaucoma and heart failure. This further highlights the complexity of treating patient with NCDs. Doctors who see patients with multiple NCDs not only have to consider drug interactions between medications prescribed for the various NCDs, they also have to consider how medication prescribed for the acute conditions may interact with the patient's current chronic medication.

### **What percentage of patients with NCDs are being seen by CNPs and what percentage are being seen by doctors?**

This study showed that most patients with NCDs are managed by CNPs. It is of utmost importance that CNPs are trained to manage patients with multiple NCDs in order to cope with the issue of multi-morbidity.

### **What is the age and gender distribution of patients presenting with these NCDs?**

This study confirmed that the majority of patients with NCDs in primary health care are between the ages of 40 to 60 years (average age of 32 in the general population) and the majority of people were female. An exception does seem to exist in the presentation of epilepsy and COPD, where the majority of patients were males. COPD is more prevalent in males than in females.<sup>33</sup> This is most likely due to the fact that the prevalence of smoking in the past was higher in men than in woman.<sup>33</sup>

The current data set shows that women accessed the primary health care facility more than men. This finding was echoed in research done by Bertakis et al who looked at the gender difference in the utilisation of health care services.<sup>34</sup> They found that woman were more likely to complain of ill health, they were more willing to seek help in times of illness and they were also more willing than men to access health care for the prevention and screening of illnesses than men.<sup>34</sup>

## **Limitations of the study**

Not all the provinces in South Africa were included in the study and as a result, the findings of this study may not be applicable to the entire South African population. Districts and sub-districts were not randomly selected which could influence the results. The sample in the Northern Cape, because of a shortage of staff, was significantly smaller than what was originally anticipated.

The data represents what has been recognised and documented in primary care and not necessarily an accurate picture of multi-morbidity in the community. Various regions in South Africa have better resources available for the screening and diagnosis of NCDs (e.g. Western Cape). The degree of multi-morbidity that is found in these regions may be greater than in other areas because of a better functioning system.

## Implications and recommendations

Guidelines for the management of patients with NCDs should take cognisance of the common co-morbid conditions found in South African primary care.

The degree of multi-morbidity in patients with NCDs needs to be monitored as it is likely that the problem will increase as life expectancy increases.

Further research is needed to evaluate the capability of CNPs and doctors in managing patient with multi-morbidity and to develop care pathways in primary care that include the doctor appropriately.

Recognition of mental disorders in patients with NCDs is likely to be low and attention should be given to better recognition, diagnosis and management of such conditions.

Recognition of acute conditions that patients with NCDs present with and the treatment of these conditions may result in drug-drug interaction. Research into the development of potential drug-drug interactions should be considered.

## Conclusion

The study set out to determine the prevalence of multi-morbidity among patients with NCDs in South Africa. Findings showed a lower prevalence of multi-morbidity relative to that found in more developed countries. Rates of multi-morbidity ranged from 69% of patients with diabetes to 22% of patients with epilepsy. There is a lower than expected relationship between NCDs and psychiatric conditions. Hypertension was strongly co-morbid with diabetes, COPD, asthma and epilepsy. Patients with non-communicable diseases (diabetes, hypertension, asthma, osteoarthritis, epilepsy, COPD) were mostly seen by nurses and were mostly female.

Multi-morbidity is common particularly in patients with diabetes, osteoarthritis and COPD. Levels of multi-morbidity however are substantially lower than reported in more high income countries. Co-morbidity with HIV was very low. There was a lower than expected relationship between NCDs and mental health problems.

## References

- 1) Mayosi BM, Flisher AJ, Lalloo UG, Sitas F, Tollman SM, Bradshaw D. The burden of non-communicable diseases in South Africa. *The Lancet* 2009; 374(9693): 934-947
- 2) South African declaration on the prevention and control of non-communicable diseases 2011 [http://www.doh.gov.za/docs/dcl/2011/draft\\_declaration\\_sa.pdf](http://www.doh.gov.za/docs/dcl/2011/draft_declaration_sa.pdf)

- 3) Smith C. Reducing the global burden of Ischaemic Heart Disease and Stroke. A Challenge for the cardiovascular community and the United States. *Circulation* 2011 124 (1) 278-279
- 4) Coleman R, Gill G, Wilkinson D. Non communicable disease management in the resource-poor settings: a primary care model from rural South Africa. *Bulletin of the World Health Organisation* 1998; 76 (6): 633-640
- 5) Oyeyemi a, Babatunde OA, Oyemimi AY, Deforche B, De Bourdeaudhuij I, Sallis JF. Environmental factors associated with overweight among adults in Nigeria. *Open Access* 2012; 9(32)1-9
- 6) Asmall S, Mahomed OH. Controlling Non Communicable Diseases through health system Strengthening. Available from:  
[http://www.doh.gov.za/docs/misc/2011/through\\_system\\_streng.pdf](http://www.doh.gov.za/docs/misc/2011/through_system_streng.pdf)
- 7) Soriano JB, Visick GT, Muellerova H, Payvandi N, Hansell AL. Patterns of Comorbidities in Newly Diagnosed COPD and Asthma in Primary Care. *Chest* 2005; 128(4): 2099-2106
- 8) South African declaration on the prevention and control of non-communicable diseases 2011  
[http://www.doh.gov.za/docs/dcl/2011/draft\\_declaration\\_sa.pdf](http://www.doh.gov.za/docs/dcl/2011/draft_declaration_sa.pdf)
- 9) Harries A, Jahn A, Zachariah R, Enarson D. Adapting the DOTS Framework for Tuberculosis Control to the management of Non-Communicable diseases in sub-Saharan Africa. *Plos Medicine* 2008; 5(6): 859-862
- 10) Mamo Y, Seid E, Adams A, Gardiner A, Parry E. A primary healthcare approach to the management of chronic disease in Ethiopia: an example for other countries. *Clinical medicine* 2007; 7 (3): 228-231
- 11) Kengne AP, Awah PK, Fezeu LL, Sobngwi E, Mbanya JC. Primary health care for hypertension by nurses in rural and urban Sub-Saharan Africa *The Journal of Clinical Hypertension*. 2009; 11 (10): 564-572
- 12) Mash B, Fairall L, Adejayan O, Ikpefan O, Kumari J, Mathee S, Okun R, Yogolelo W. A morbidity survey of South African Primary Care. *Plos One* 2012; 7 (3): 1-11
- 13) Bateman E, Feldman C, Mash R, Fairell L, English R, Jithoo A. Systems for the management of respiratory disease in primary care – an international series. *South Africa Primary Care Respiratory Journal* 2009; 18(2): 69-75
- 14) Coleman R, Gill G, Wilkinson D. Noncommunicable disease management in the resource-poor settings: a primary care model from rural South Africa. *Bulletin of the World Health Organisation* 1998; 76 (6): 633-640
- 15) Gill G, Price C, Dedicoat M. An effective system of nurse-led diabetes care in rural Africa. *Diabetic Medicine* 2008; 25 (5):606-611

- 16) OECD (2011), Health reform: Meeting the challenge of ageing and multiple morbidities, OECD publishing. Available from: [www.oecd.org/els/health-systems/491511107.pdf](http://www.oecd.org/els/health-systems/491511107.pdf)
- 17) Luijckx HD, Loeffen MJW, Lagro-Janssen AL, Van weel C, Lucassen PL, Schermer TR. GPs' consideration in multimorbidity management: a qualitative study. *British Journal of General Practice* 2012; DOI:10.3399/bjgp12x652373
- 18) Kapp PA, Klop AC, Jenkins LS. Drug Interactions in Primary Healthcare in the George area, South Africa: A Cross-Sectional Study. [unpublished dissertation]. Cape Town: Stellenbosch University, 2011.
- 19) N, Naude S, Sothole G. Legislative Issues Impacting On The Practice of The South African Nurse Practitioner. *Journal of the American Academy of Nurse Practitioners* 2002; 14(1): 11-15
- 20) Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for healthcare, research, and medical education: a cross-sectional study. [www.thelancet.com](http://www.thelancet.com) Available at: DOI:10.1016/S0140-6736(12)60240-2
- 21) Stein DJ, Seedat S, Herman A, Heeringa SG, Kessler RC, Williams D. Lifetime prevalence of psychiatric disorders in South Africa. *British Journal of psychiatry* 2008; 192(2):112-117
- 22) Tomlinson M, Grimsrud At, Stein DJ, Williams DR, Myer L. The epidemiology of major depression in South Africa: Results from the South African Stress and Health study. *South African Medical Journal* 2009; 99(5): 368-373
- 23) Royal College of General Practitioners. Medical Generalism: Impact report, May 2013. Available at: [www.rcgp.org.uk](http://www.rcgp.org.uk)
- 24) Guthrie B, Payne K, Alderson P, McMurdo MET, Mercer W. Adapting clinical guidelines to take account of multimorbidity. *British medical Journal* 2012; 345 e6341 1-5
- 25) Okosun IS, Chandra KMD, Choi S, Christman J, Dever GEA, Prewitt TE. Hypertension and Type 2 diabetes Co-morbidity in Adults in the United States: Risk of overall and regional Adiposity. *Obesity research* 2001; 9:1 -9
- 26) Piette JD, Kerr EA. The impact of Comorbid Chronic Conditions on Diabetes Care. *Diabetes Care* 2006; 29(3):725-731
- 27) Schellevis FG, Van der Velden J, Van de Lisdonk E, Van Eijk J, Van weel C. Co-morbidity of chronic diseases in general practice. *Journal of clinical epidemiology* 1993; 46(5): 469-473
- 28) Gaitatzis A, Carroll K, Majeed A, Sander J. The epidemiology of the Co-morbidity of Epilepsy in the General Population. *Epilepsia* 2004; 45(12): 1613-1622
- 29) Amos A, Wappling L. Research: Epilepsy in Malawi. Available at: WP15\_Epilepsy\_in\_Malawi\_report.PDF
- 30) Soriano JB, Visick GT, Muellerova H, Payvandi N, Hansell AL. Patterns of Comorbidities in Newly Diagnosed COPD and Asthma in Primary Care. *Chest* 2005; 128(4): 2099-2106

- 31) Bruns J, Hauser WA. The epidemiology of Traumatic Brain Injury: A Review. *Epilepsia* 2003; 44 (10) 2-10
- 32) Senanayake N, Roman GC. *Bulletin of the World Health Organisation*. 1993; 71(2): 247–258
- 33) Buist S, Mapp CE. Respiratory diseases in Women. European Respiratory Society Monograph. 2003 25 (1) 50-73
- 34) Bertakis KD, Azari R, Helms J, Callahan J, Robbins JA. Gender Difference in the Utilisation of Health Care Services. *The Journal of Family Practice*. 2000 49(2)147-152
- 35) Miszkurka M, Haddad S , Langlois EV, Freeman E, Kouanda E, Zunzunegui M. Heavy burden of non-communicable diseases at early age and gender disparities in an adult population of Burkina Faso: world health survey. *BMC Public Health*. 2012; 12: 24. Published online 2012 January 10. doi: [10.1186/1471-2458-12-24](https://doi.org/10.1186/1471-2458-12-24)