RESEARCH ASSIGNMENT

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Title of article

A cross sectional survey investigating the prevalence of preoperative anxiety in children, and if this is associated with cultural and socio-economic background at Rahima Moosa Mother and Child Hospital, South Africa.

Keywords:

preoperative anxiety; children; induction of anaesthesia; parental presence; premedication

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"Declaration

I, the undersigned, hereby declare that the work contained 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.

Signature: Date: 2011.10.20"

Abstract

Background: A significant number of children appear to experience anxiety in the preoperative period, which may lead to maladaptive postsurgical behaviour. The aim of this study was to conduct a survey to determine the prevalence of preoperative anxiety in children, and to investigate any associations with cultural and socio-economic factors. The study also aimed to determine the need for additional interventions to reduce preoperative anxiety and whether socio-economic and cultural factors allowed for the identification of children at particular risk of anxiety.

Methods: The sample included 113 participants, aged 2-12 years, undergoing minor elective surgery under general anaesthesia at Rahima Moosa Mother and Child Hospital in Johannesburg. All eligible children were included in the survey and were not separated from their parents in the waiting area or operating theatre. Anxiety levels were measured in the waiting room, on entering the operating theatre, and at induction of anaesthesia, using the modified Yale Preoperative Anxiety Scale (m-YPAS). Demographic and socio-economic details were obtained via a short questionnaire.

Results: m-YPAS scores of >30 are considered to demonstrate high anxiety. Children were significantly ($p<0.01$) more anxious on entering theatre (m-YPAS median score of 41 [23-55]), and on induction of anaesthesia (46 [23-61]), than in the waiting area (23 [23-41]). m-YPAS scores were >30 in 30% of children in the waiting area, 52% of children on entering the operating theatre, and 56% of children at induction of anaesthesia. Older children experienced less anxiety, which was statistically significant (correlation with age $r = - 0.48$, $p <0.01$). Demographic and socio-economic factors (sex of the child, race, language, nationality, parent's education, parent's employment, parent's income, and single parenthood) were not shown to have a significant association with an increase in anxiety in the child at induction of anaesthesia.

Conclusion: Children experienced significant anxiety in the preoperative period particularly during induction of anaesthesia, which is comparable with previous studies, despite maintaining parental presence. Socio-economic and cultural factors do not appear to predict anxiety, although the sample size was not adequately powered to draw conclusions. Reduction of preoperative anxiety therefore requires further consideration in our setting for selected children, which may involve the use of additional psychological or pharmacological techniques.

Introduction

Several studies already indicate that anxiety is a significant problem in the preoperative period in children. "It is estimated that 50% to 75% of children undergoing surgery will develop extreme anxiety and distress during the perioperative period".[1] Induction of anaesthesia appears to be the most stressful period. Preoperative anxiety in children may lead to maladaptive behaviours in the postsurgical period and negative responses to future medical care.[2-6]

In 1958, a link was recognized between 'unsatisfactory anaesthetic inductions' and negative behaviour changes postoperatively in a retrospective study of over 600 children. From the 1960's to 1970's interventions such as parental presence and preoperative preparation were investigated, but no validated or reliable measures of child anxiety were in use. Research into preoperative anxiety in children appeared in the anaesthetic literature from the 1990's, along with the development of anxiety measures specifically used at induction of anaesthesia, such as the m-YPAS (modified Yale Preoperative Anxiety Scale) and STAIC (State-Trait Anxiety Inventory for Children).[5]

A number of risk factors for perioperative anxiety in children have already been established, including age, separation anxiety, child temperament, previous hospital experience, parental anxiety, mode of anaesthetic induction, and extreme anxiety in the child during induction of anaesthesia.[4] Psychological stress adds to the global stress response of surgery, which includes endocrine and autonomic responses, which may then contribute to negative clinical and psychological outcomes post surgery. Clinically there may be increased postoperative pain, poor wound healing, postoperative immunosuppression, and slowed recovery.[4] The most common postoperative behavioural problems include: nightmares, waking up crying, eating problems, disobeying parents, separation anxiety, temper tantrums, apathy/withdrawal, increased fear of doctors, and new onset enuresis.[4,5,7-9]

Studies investigating the link between preoperative anxiety and negative postoperative behaviour found that 'preoperative anxiety was an independent predictor for the development of postoperative negative behaviour'[5] A child with increased anxiety prior to surgery was 3.5 times more likely to be at risk of postoperative negative behaviour compared with less anxious

children. There is a correlation between anxiety at induction of anaesthesia and postoperative excitement in the recovery room. The frequency of negative behaviours tends to decrease with time after surgery.[5,8] However, research addressing behavioural outcomes in the first few weeks postoperatively appears to be inconsistent. There is wide variability in the incidence of behaviour changes reported at 2 weeks after surgery, ranging from 30% to 54% in the literature.[8] Behaviour problems were found to persist for up to 6 months for 20% of children, and up to 1 year for 7.3% of children. Such preoperative anxiety and fear may also have long term effects on the child's response to later medical care, and potentially interfere with normal development.[5,9]

Anxiety is a subjective feeling of tension, apprehension, nervousness and worry which may be expressed in different ways. This may include fear, trembling, panic, crying, reluctance, refusal and combativeness.[4] Identifying children at risk for preoperative anxiety may help to address the issue of how to target appropriate interventions. The degree of anxiety experienced by the child in the waiting room and during anaesthetic induction includes factors related to the child, the anaesthetic, and the surgery. These may include:

Age

Perioperative separation may precipitate confusion and anxiety in the child. Separation anxiety usually begins at 7-8 months of age and peaks at around 1 year of age. The intensity of separation declines with age as cognitive abilities and memory capacity increases. However toddlers and preschoolers may still become distressed by separation. Children aged 1-5 years are at the highest risk for developing extreme anxiety. Children deprived of attention in the home are at increased risk for separation anxiety. The extent of anxiety may reflect adaptive responses influenced by genetics, personality, parenting, and previous life experiences.[4]

When considering interventions to alleviate anxiety, it is worthwhile considering the following:

- 1-3 years of age - children are significantly bonded to their parents, and may be too young to accept explanations, but respond to distraction and comforting measures.
- 4-6 years of age - children want more explanations and need to feel in control of events.
- 7-12 years of age - children may want to be involved in decision making, which is best discussed preoperatively and not in a stressful situation.

- 13 years and over / adolescents - may fear losing face or failure to cope, and need more independence and privacy.[5]

Research addressing age and anxiety in the preoperative period has had varying results.
It has been found that the younger the child, the more anxious the parents tend to get. In one study, anxiety in children increased with age, with children over 7 years displaying high anxiety in the waiting room.[6] Other studies found younger children to be more anxious at induction of anaesthesia than older children, with greater separation anxiety, and less co-operation.[5]

Gender

Gender does not appear to affect preoperative anxiety or postoperative behavioural problems.[5,6]

Temperament

Shy or inhibited children, impulsive children, and children with high intelligence but lacking in good adaptive abilities, demonstrate higher levels of anxiety.[4,5] Children who were more anxious in the waiting room, tended to be more anxious at induction of anaesthesia.[6]

Previous hospital experience

Previous surgery or hospitalization and poor response to doctor visits are predictors for preoperative anxiety.[4,5]

Parental anxiety

Parental anxiety is a predictor of the child's anxiety in the preoperative period.[4,6]

Mode of anaesthetic induction

A study looking at the effect of mode of induction on anxiety and postoperative behaviour found that inhalation anaesthesia resulted in the least stormy inductions, followed by rectal induction, with the worst outcomes in the intravenous group. Postoperative behaviour changes showed no differences between the groups, although more children had negative memories of inhalation induction compared with the other two methods.[5]

Surgery

A survey found no difference between elective and emergency surgery, but a validated measure was not used. A meta-analysis found surgical category did not affect postoperative behaviour.[5] Most studies have been conducted in high income countries, and some of these studies take into account child temperament, but do not consider other factors that may affect preoperative anxiety in children, such as current life stressors, socioeconomic circumstances, and different culture and customs.

At Rahima Moosa Mother and Child Hospital in Johannesburg, avoidance of separation anxiety by maintaining parental presence in the waiting area and in theatre is current practice. However there is no additional routine use of premedication or other non-pharmacological preparation or distraction techniques to reduce preoperative anxiety. Furthermore no studies have been conducted in this setting, considering the unique cultural and socioeconomic challenges these children face.

A wide range of pharmacological and non-pharmacological interventions for the reduction of preoperative anxiety and postoperative behaviour problems in children have already been investigated. These investigations have lead to a broader understanding of the effects of preoperative anxiety in children, when the anxiety is occurring, where interventions may be failing, and how this affects outcomes. Findings in the literature are as yet controversial, with no agreement amongst anaesthetists as to which are the most effective techniques for reduction of anxiety in the preoperative period.

A study evaluating children's response to induction of anaesthesia where one parent was present in the operating theatre, found that 40% of children aged 2-10 years displayed some distress behaviour during induction, with 17% displaying significant distress, and 30% resisting the anaesthetist.[2]

Interventions aim to reduce this stress response. They include:

- Psychological – parental presence, preoperative preparation programs, and distraction techniques e.g. the use of clowns, music, toys, and hand held video games.[6,9-13]

- Pharmacological – sedative premedication. A common approach is the use of midazolam, which is an anxiolytic, amnestic and sedative in the preoperative period, and generally effective at induction of anaesthesia, although non-responders and paradoxical responses may be seen. Postoperative behaviour outcomes, however, remain inconsistent.[7-9,14,15]

It is important to consider parental anxiety and parental satisfaction as contributing factors. Parental anxiety may lead to increased anxiety in the child. It has been demonstrated that parental preoperative anxiety decreased after viewing educational videotapes. Increased trust and satisfaction occur when parents are given information and prepared for what to expect.[4]

Most of the non-pharmacological interventions such as parental presence, clowns, music, and toys produce distraction and comfort in the waiting room, but research demonstrates mixed findings regarding the effectiveness of these interventions at induction of anaesthesia.
It is known that in general parents and children prefer to stay together during medical procedures, and that this reduces anxiety in most although not all children.[4,5,9,16] Benefits include eliminating separation anxiety, minimizing premedication use, increasing child cooperation, enhancing parental satisfaction with medical care, fulfilling parents' perceived sense of duty to be present. Objections to parental presence include the possibility of parental anxiety or adverse reactions by the parent increasing the child's anxiety, disruption of operating room routine, crowding the operating room, increased staff workload in caring for the parent as well as the child, increased child behaviour problems, increased stress of the anaesthetist, and legal implications of having a parent present.[4,9]
Difficulties with parents during induction of anaesthesia however have not been found to be common or severe.[16] Avoidance of separation from parents during hospitalization has been considered beneficial to the child for decades. However, the practice of parental presence during induction of anaesthesia differs significantly in different countries, for example in the UK it is common practice, whereas in the USA it is not. The difference in attitude between countries may be due to fear of litigation, and where induction takes place.[5] The role of parents during the induction process should also be considered, for example parents may be taught to be more proactive using distraction techniques.

Preoperative preparation programs have evolved since the 1960's and include orientation tours, role rehearsal, videos, coping skills, play therapy, and printed material. Only coping skills have shown any benefit, and only in the waiting area, therefore the cost effectiveness of these interventions requires justification.[4] It was found that children over 6 years of age benefit most if they participate in a preparation program >5 days before surgery, and benefit least only 1 day before surgery. It was also found that children who had previously undergone surgery or been hospitalized, may develop exaggerated emotional responses to information-based preparation programs.[4]

This study will serve to investigate the prevalence of preoperative anxiety in children in our community, taking into consideration different cultural backgrounds, socioeconomic status, and immigrant communities. This may provide useful information for future study, and provide thought for future interventions that may reduce preoperative anxiety in children in ways that are culturally sensitive, cost effective and implementable in our setting, given available resources.

Often medical problems and misunderstandings occur in relation to people where different language, culture and customs are poorly understood. What is frequently seen in South Africa when cultural needs are not taken into consideration is a tendency to withdraw from treatment and retreat back to traditional means. For example, often the whole family rather than the individual may need to be involved in consent to treatment, which may often be difficult for a doctor to understand who is trying to administer urgent life saving treatment.
People of different cultures and immigrant communities often have particular needs, and are educated with different beliefs and customs. The cumulative effect of these social and cultural factors impact on the child, and often influence the response of parents and children to what may be the somewhat foreign concept of modern biomedical medicine.

As demonstrated from previous research, there is still a lot of varying opinion, controversy, and differing results as to what the best interventions are for managing preoperative anxiety and postoperative behaviour outcomes in children, and whether these in fact provide any benefit. There have been no studies on preoperative anxiety in children in our setting, considering our unique demographics and socioeconomic problems. Most studies do not consider current life

stressors, socioeconomic factors or cultural influences when determining preoperative anxiety in children. This study will aim to establish the prevalence of preoperative anxiety in children in our community. Based on the scale of the problem, this information will be used to assess whether socio-economic and cultural factors contribute to identifying children at risk, and the need for additional interventions and where best to target these in the future.

Aim and objectives

Aim

The aim of this study was to investigate the prevalence of preoperative anxiety in children, and if this is associated with cultural and socio-economic background at Rahima Moosa mother and child hospital, South Africa.

Objectives

The objectives of the study were derived from the hypothesis that preoperative anxiety in children is an independent risk factor for maladaptive postoperative behaviour, and possible negative future reactions to medical care. Preoperative anxiety may be reduced through a range of behavioural and pharmacological interventions. The period which appears to be most stressful is induction of anaesthesia. It has already been shown that in most cases it is better to avoid separation anxiety in young children, and parental presence is already common and accepted practice at Rahima Moosa hospital. Therefore in this study parental presence will remain a constant variable across the study participants.

The objectives included:

1.) To determine the prevalence of preoperative anxiety in children in the waiting area, on entering the theatre, and on induction of anaesthesia.

2.) To test for any associations between culture and socioeconomic status, and whether these factors can predict preoperative anxiety.

3.) To make recommendations on the need for additional interventions to address preoperative anxiety.

Methods

Study design

A descriptive cross sectional survey.

Setting

The study was conducted at Rahima Moosa Mother and Child Hospital in Johannesburg, South Africa. This is a public hospital providing care for a range of women and children mostly from lower socioeconomic backgrounds, who are generally not on private medical aid, often from previously disadvantaged communities, and also foreigners from other African countries.

Children underwent the usual anaesthetic preparation which was not changed in any way by the study. Usual care included arrival on the day of the surgery, assessment by the anaesthetist in the waiting area, no premedication, and the parent remaining with the child in the waiting area, and then accompanying and providing comfort for the child in the operating theatre until the child lost consciousness. Induction of anaesthesia was by standardized mask inhalational techniques, with smaller children initially sitting on the parents lap. Oxygen and sevoflurane was used for inhalational induction, with or without the addition of nitrous oxide. This was followed by intravenous access once the child was unconscious, and only then by additional intravenous induction agents and intubation.

Selection of participants

The study aimed for a sample size of 90 to 120 participants. The sample size was calculated based on the number of cases routinely undergoing surgery in our hospital, time available for the study, staff, and cost constraints. Data was collected for the study over a three month period between May and August 2011, and finally included 113 participants.

The study included well children aged 2-12 years scheduled for outpatient elective minor surgery under general anaesthesia, who were classified as physical status I–II according to *American Society of Anaesthesiologist* (ASA) standards. Children with a history of prematurity, chronic illness, developmental delay, or previous anaesthetic experience were excluded from the study, in order to eliminate previous exposure or possible behavioural issues from a physical or

developmental aspect from resulting in bias in the study. Minor surgery included ENT, dental and orthopaedic procedures.

All consecutive children who met the inclusion criteria were included in the survey. Altogether 148 children were considered for the study, the final sample included 113 as 35 children were excluded: 7 refused participation, 18 had previous anaesthetic experience, 2 had a chronic illness, 2 had developmental delay, and 6 children were cancelled on the day.

Data collection tools

The Modified Preoperative Anxiety Scale (m-YPAS) was used to evaluate the behaviour of the child in the waiting area, on entering the theatre, and on induction of anaesthesia. The YPAS was specifically developed to assess anxiety in children undergoing induction of anaesthesia, and modified (m-YPAS) to include the assessment of anxiety in the waiting area, and has been used in multiple research studies since its development. The m-YPAS has been shown to be a statistically valid and reliable measurement tool for assessing children's anxiety in the preoperative period, when validated against other global behaviour measures of anxiety such as the "gold standard" State-Trait Anxiety Inventory for Children (STAIC).[17] The m-YPAS appears to be more sensitive than global measures such as the Clinical Anxiety Rating Scale (CARS) and Global Mood Scale (GMS).[5] All m-YPAS categories demonstrate good to excellent inter-rater and intra-observer reliability.[17]

The m-YPAS is an observational tool that can be used in children older than 2 years of age, and is completed in less than a minute. It consists of 27 items in 5 categories of behaviour indicating anxiety in young children:

- General Activity (1 to 4)
- Emotional Expressivity (1 to 4)
- State of Arousal (1 to 4)
- Vocalization (1 to 6)
- Need of the Parent (1 to 4)

The m-YPAS score ranges from 22.5 to 100, with scores greater than 30 indicating significant anxiety levels in children.[17]

A brief questionnaire looking at demographic details and socio-economic status of the child and parent/guardian was also completed. The questionnaire was standardized, and clearly and correctly worded in order to produce consistent and reproducible results. It was written in English, but the subject was interviewed in their home language if South African. Foreigners were interviewed in English. The data collection tools were piloted for 2 weeks prior to commencing the trial, to test their suitability and reproducibility in the given environment.

Data collection process

The data collection tools were administered primarily by the research assistant, with occasional overview by the principal researcher. The research assistant was a trained community health care worker, with previous experience in data collection and interviewing for medical research. She received specific training in the use of the m-YPAS which relies on observation of the child's behaviour, as well as the interview method and ethical issues such as confidentiality. The research assistant was able to speak the predominant languages of the region, and the interviews were conducted in the subject's home language. To avoid interviewer bias, the interviewer did not personally know the patient or parents/guardian.

Once consent was obtained, the research assistant completed the questionnaire with the parent/guardian in the waiting area prior to entering the operating theatre.

The m-YPAS was then used by the research assistant standing at a distance to observe the child's behaviour in the waiting area, on entering the operating theatre, and at induction of anaesthesia. The accompanying parent was left to manage the child's behaviour as they saw fit assisted by the anaesthetic team in the usual manner, but without influence from the researchers. Induction of anaesthesia was measured at the point at which the mask was introduced to the child's face, to avoid confusion with the child entering the secondary excitement phase of anaesthesia which often involves combativeness once the anaesthetic begins to work.

Data analysis

The primary end point of the study was to determine the prevalence of preoperative anxiety in children in the waiting area, on entering the theatre, and during induction of anaesthesia.

A secondary end point was to test for any associations between culture and socioeconomic status, and the development of preoperative anxiety in children.

MS Excel was used to capture the data and STATISTICA version 9 to analyze the data, with the help of the Centre for Statistical Consultation. For descriptive purposes usual summary statistics were used to describe the variables. Distributions of variables were presented as histograms and frequency tables. Data that was normally distributed was presented as a mean ± SD, and skewed data as a median and inter-quartile range (25%–75%). The m-YPAS scores were not normally distributed so non-parametric methods were used. To compare m-YPAS score changes in three locations over time - waiting area, entrance to operating theatre, and induction of anaesthesia, non-parametric repeated measures ANOVA was used (Friedman Rank ANOVA). The relationship between nominal variables was investigated with contingency tables and appropriate chi-square tests. Relationships between two continuous variables were analyzed with regression analysis and the strength of the relationship measured with Spearman correlation as continuous variables were not normally distributed (participant age compared with m-YPAS score). Comparisons of two variables were done using Wilcoxon Matched Pairs Test (m-YPAS scores in two different locations), and to compare scores across a binary categorical variable the Mann-Whitney U test (m-YPAS scores and child sex or single parenthood). Multiple regression analysis using the Kruskal-Wallis test was used to compare multiple input variables (race, language, education, and income), and the strength of the relationship measured with multiple correlation. Comparisons were considered significant if $P < 0.05$, with 95% confidence intervals.

Ethical considerations

All ethical standards for medical research involving human subjects were considered during this study, upholding the World Medical Association's Declaration of Helsinki. The study protocol was approved by Stellenbosch University Health Research Ethics Committee (Reference N11/04/122) and by Rahima Moosa Mother and Child Hospital prior to commencement of the study. Written informed consent was obtained from the parent/guardian of the child in their home language before enlisting the child to the study.

Results

Between May and August 2011, 113 children were enrolled in the survey of whom 47% were male and 53% female, with a mean age of 4.4 ±2.04 years. Child and parent demographic and socio-economic characteristics are presented in Tables 1 and 2.

More mothers than fathers accompanied their children. Most children came from black or coloured families, 52 % spoke an African language at home (27% Zulu, 11% Sotho, 10% other African languages, and 2% foreign languages). The majority (99%) of parents however could speak English, and 62% had matriculated from high school, with 5% having received a tertiary education. Most participants were South African citizens. There was a high rate of single parenthood and unemployment, and even those who were employed fell into a low income category.

Table 1 Demographics of study participants and their parents

Variable	Survey Participants N=113
Child's sex, n (%) : Male	53 (47)
Female	60 (53)
Age of the child, mean ± SD (range)	4.40 ± 2.04 (2–11)
Parent/guardian sex, n (%) : Male	21 (19)
Female	92 (81)
Age of the parent, mean ± SD (range)	32.65 ± 5.38 (21–58)
Race, n (%) : African	68 (60)
White	4 (4)
Indian or Asian	6 (5)
Coloured	35 (31)
Home language, n (%) : English	44 (39)
Afrikaans	7 (6)
African (SA)	59 (52)
African (foreign)	3 (3)
Nationality, n (%) : South African	109 (96)
Foreign	4 (4)

Table 2 Socioeconomic factors of study participants' parents

Variable	Survey Participants N=113 n (%)
Single parent : Yes	49 (44)
No	62 (56)
Education : No schooling	4 (4)
Primary school	6 (5)
High school	95 (86)
Tertiary education	5 (5)
Employment : Unemployed	21 (19)
Part time employment	26 (23)
Full time employment	64 (58)
Income : <R1600	17 (19)
R1601-3200	57 (64)
R3201-6400	10 (11)
>R6401	5 (6)

Primary outcomes of study:

The m-YPAS scores at 3 different time points – the waiting area, on entering the theatre, and during induction of anaesthesia, are presented in Table 3. Because the data was not normally distributed, a difference is noted between the mean and median distribution of central locations (Figures 1-3). The median values were taken to be more accurate.

Anxiety levels were low in the waiting area, with high levels of anxiety (>30 m-YPAS score) occurring on entering theatre and on induction of anaesthesia. m-YPAS scores were >30 in 30% of children in the waiting area, 52% on entering theatre, and 56% at induction of anaesthesia.

A significant difference in anxiety was observed when comparing the 3 different time points ($p<0.01$). Furthermore the Wilcoxon Matched Pairs Test demonstrated statistically significant differences between the waiting area and induction of anaesthesia ($p <0.01$), and on entering theatre and induction of anaesthesia ($p <0.01$). A negative Spearman correlation ($r = - 0.48$, $p <0.01$) demonstrated that with increasing age of the participants anxiety levels tended to decrease, which was statistically significant.

Table 3 m-YPAS scores at different time points

Variable	m-YPAS score mean ± SD (range)	95% CI (mean)	m-YPAS score median and inter-quartile range (25%–75%)
Anxiety in the waiting room	31 ± 13 (18 - 68)	29 - 34	23 (23 - 41)
Anxiety on entering operating theatre	40 ± 13 (23 - 96)	37 - 43	41 (23 - 55)
Anxiety on induction anaesthesia	43 ± 19 (23 - 96)	39 - 47	46 (23 - 61)

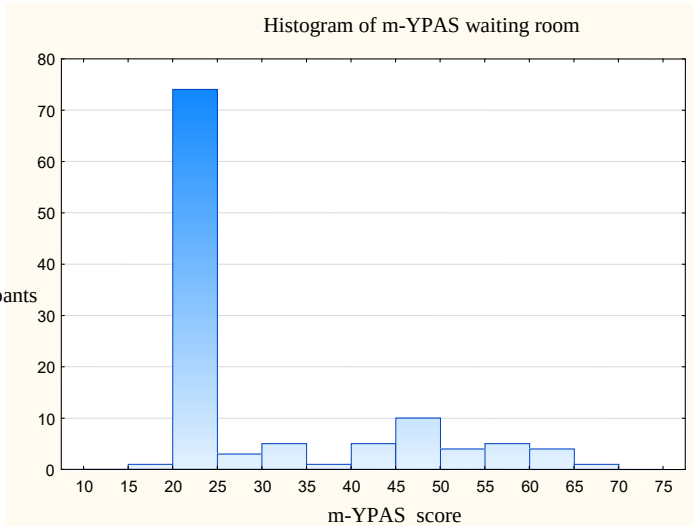

Figure 1: m-YPAS scores in the waiting room per number participants

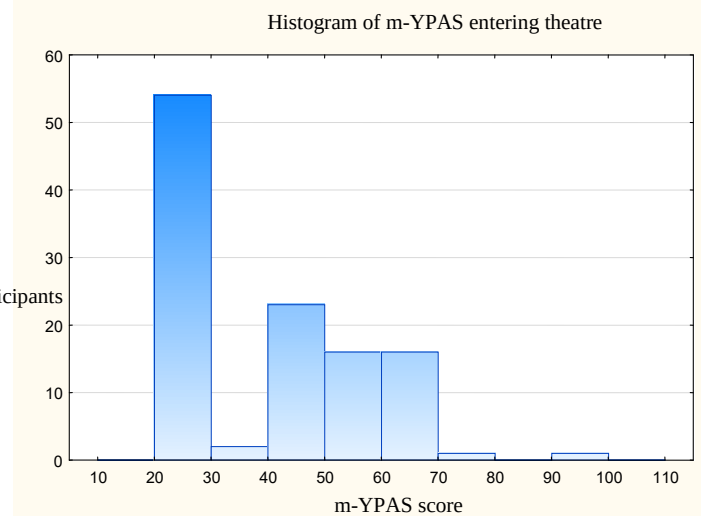

Figure 2: m-YPAS scores on entering theatre per number participants

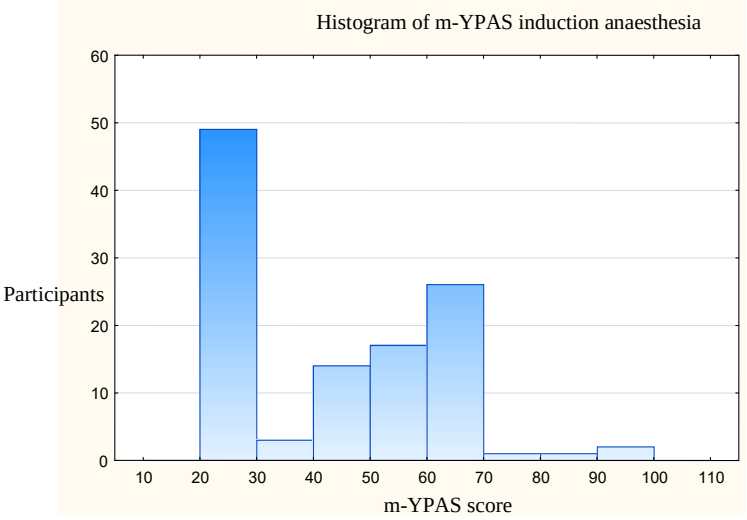

Figure 3: m-YPAS scores on induction of anaesthesia per number participants

Secondary outcomes of study:

In order to test for any associations between culture and socioeconomic status and the development of preoperative anxiety in children, a number of variables pertaining to the parent and child were compared with anxiety levels in the child at induction of anaesthesia, as illustrated in Table 4. Induction was the time point chosen as this is when most anxiety tends to occur. No significant differences were demonstrated between male and female children, and whether the mother or father accompanied the child, or the age of the parent. No significant differences were found when comparing the child's anxiety at induction of anaesthesia with race, language, parents education, parents employment, parents income, parents nationality, or whether the parent was single or not. However there were some trends to suggest lower median m-YPAS scores for anxiety in black participants and where parents were employed part-time, with higher median m-YPAS scores occurring when parents had a tertiary education or no schooling. A larger sample size would be required to test these hypotheses as some of the subgroups were small relative to others, particularly for those variables almost reaching statistical significance such as parents education (Figures 4 and 5).

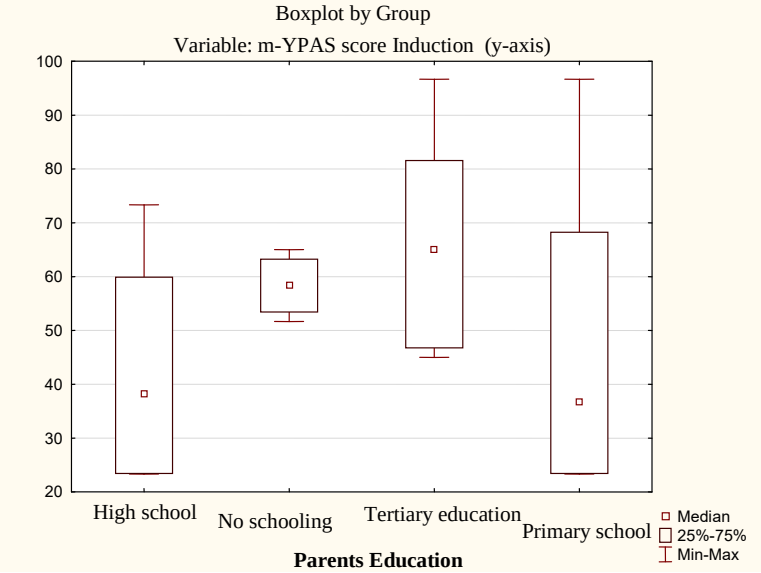

Figure 4: Median m-YPAS scores at induction – Parents Education

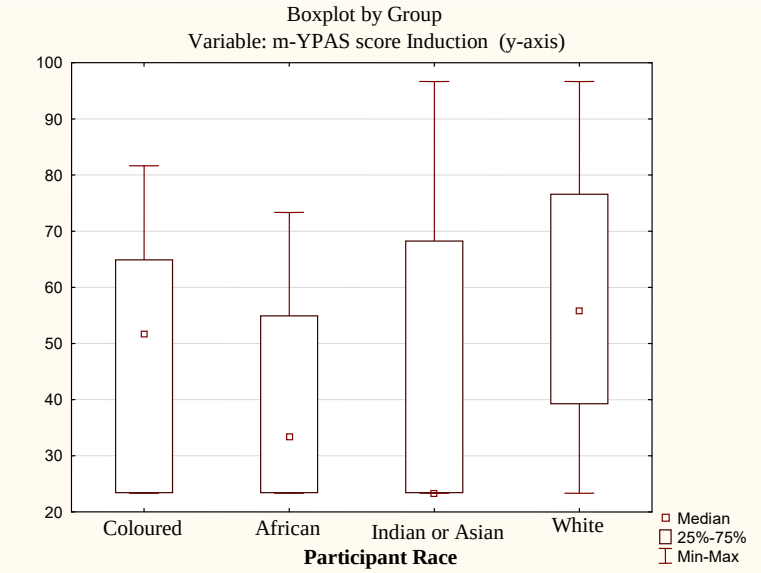

Figure 5: Median m-YPAS scores at induction - Race

Table 4 m-YPAS scores at induction of anaesthesia compared with socio-economic variables

Variable	m-YPAS score at induction Median and inter-quartile range (25%–75%)	P Value (Significant if p <0.05)
Childs sex: Male Female	45 (23 - 60) 50 (23 - 62)	0.901
Parents sex: Male Female	50 (23 - 65) 46 (23 - 60)	0.263
Race: Coloured African Indian or Asian White	51 (23 - 65) 33 (23 - 55) 23 (33 - 68) 55 (39 - 76)	0.184
Language: English Afrikaans African (South Africa) African (Foreign)	50 (23 - 64) 45 (23 - 56) 23 (23 - 60) 45 (33 - 56)	0.381
Nationality: South African Foreign	46 (23 - 61) 48 (45 - 52)	0.779
Parents education: No schooling Primary school High school Tertiary education	58 (53 - 63) 36 (23 - 68) 38 (23 - 60) 65 (46 - 81)	0.058
Parents employment: Full-time Part-time Unemployed	50 (23 - 63) 23 (23 - 55) 51 (23 - 60)	0.311
Single parent: Yes No	50 (23 - 63) 45 (23 - 61)	0.815

Discussion

Key findings

The primary objective of this survey was to establish the size of the problem of preoperative anxiety in children, who were mostly from low socio-economic settings and with different cultural backgrounds, where parental presence is the only current intervention to reduce this anxiety. The median m-YPAS score first taken in the waiting area, demonstrated that the majority of children fell within previously reported ranges of anxiety for the waiting area, which are below levels considered as high anxiety.[17] This study showed a significant increase in anxiety between the waiting room, on entering the operating theatre, and during induction of anaesthesia,

which is similar to findings from high income countries.[1,17] Induction of anaesthesia is a significantly more stressful period when compared with the other 2 time points. Children that were already anxious in the waiting room, tended to be more anxious in the operating theatre, which may be related to intrinsic factors in the child. Although it should be noted that some children became unhappy in the waiting area as they were less able to tolerate hunger and long waiting times. It was also noted that a number of children that remained calm in the waiting area tended to be calm through the whole study period without developing significant anxiety.

The high levels of preoperative anxiety demonstrated in this study therefore place children at risk for maladaptive postsurgical behaviour and a poor response to future medical care. The stress response, particularly at induction of anaesthesia, may represent child related factors, anaesthetic related factors, or environmental conditions within the operating theatre.

Known child related factors include age and separation anxiety, as well as developmental maturity, previous experience with medical procedures and illness, temperament and ability to regulate affect, and parental anxiety.[1] The results of this study were similar to several previous studies that found younger children to be most at risk for anxiety during induction of anaesthesia, even when cooperative prior to this point.[3,5] However, it should be noted that only gross signs of distress were measured which may underestimate the stress of anaesthesia and surgery experienced by older children, who may be anxious without crying or resisting. It should also be noted that 'crying in young children at induction of anaesthesia may be a fairly fleeting and normal response, and may be a similar response to other events that may provoke tears on a daily basis in young children'.[3] The actual significance of this upset in the child and potential for long term psychological disturbance will depend on the child and family involved.
Parental presence was a constant variable in this study with one parent remaining with the child until induction of anaesthesia. Baseline anxiety levels may have been higher in the absence of parental presence, and this should be considered when comparing levels of anxiety with children from higher socio-economic backgrounds.

Inhalational induction with sevoflurane was used in this study, which is a pleasant smelling and non-pungent gas, and results in a relatively short induction time. Despite this, most distress occurs early in the induction sequence before the anaesthetic begins to work.

Environmental factors that may contribute to anxiety in the operating room include noise, equipment, monitors and instrument preparation, and a number of well meaning staff stimulating and interacting with the child. The child may receive conflicting messages or become startled, which further activates the sympathetic nervous system, resulting in anxiousness.

Several factors may therefore be linked with high anxiety levels in children at induction of anaesthesia. A secondary objective of this study, however, was to establish if socioeconomic and cultural factors place a child at increased risk of preoperative anxiety. The results of this study indicated that this hypothesis was not valid, as statistical significance was not shown for any of the socio-economic variables when compared with anxiety at induction of anaesthesia.

Strengths and limitations

There was no blinding during this study as we wanted to assess our usual practice. The parent was aware of the nature of the study from the point of inclusion, although the child was unaware of the observation of their behaviour. There is a regular change-over of anaesthetists who followed their normal practice, and were not impacted in any way or aware of the purpose of the study. It is expected that some anaesthetists, nursing staff and even parents will be better at providing distraction and avoiding upsetting the child than others. This may have biased the behaviour of the child, and was not considered in the study design.

The sample size was sufficiently powered to determine significance for the primary outcomes of this study. However, as the number of participants was limited, particularly pertaining to certain subgroups (e.g. race, education, employment status), patterns specific to these subgroups may not have emerged. The numbers of participants in these subgroups were unbalanced and the standard deviations large. Statistical significance was not shown for any of the socioeconomic variables, however conclusions cannot be drawn due to an inadequate sample size. This may be particularly true for variables that approached significance, such as parent education. A future

study might be useful to explore parent education in more depth. Most socioeconomic variables had a p value approaching 1, and are unlikely to show significant differences between groups even with a better sampling strategy.
Further limitations included language barriers with parents, or lack of ability of staff to communicate with the child during the preoperative process due to age and language factors. There may have been lack of honesty in completion of the questionnaire. There is an opinion that some patients may not always be honest about income in order to gain free access to public services, and turn to public services once their medical aid runs out. Some may not be honest about nationality due to fear of stigmatization.

For future study it may be important to establish what difference in anxiety in children is clinically relevant; additional cultural indicators not considered in this study; a better understanding of parents and children's knowledge, cultural beliefs and understanding around medical procedures; previous experiences and parental anxiety around surgery; the role and impact of treating doctors; and the impact of waiting periods and keeping children 'nil per os'.

Implications and recommendations

The data in this study suggests that preoperative anxiety is high in our setting, and is comparable with high income countries. As this is a low resource setting, several appropriate non-pharmacological interventions, further training and awareness of staff, and environmental manipulations, which are low cost could be adopted and provide benefit for many children undergoing anaesthesia. This may include music or toys and adjustments to the operating room environment. It is not cost effective to treat all children with premedication, and anaesthetists would have to predict which children would benefit, e.g. young children and those demonstrating anxiety in the waiting room.

Conclusion

A high prevalence of preoperative anxiety, particularly in younger children, has been demonstrated by this study, requiring further intervention. Socioeconomic factors were not shown to predict anxiety. Optimizing non-pharmacological approaches in a culturally sensitive

way to minimize induction anxiety, combined with selective premedication, may provide a way forward for the future reduction of preoperative anxiety. Further study into which distraction techniques and preparation tools are most effective, considering age group and culture, may still be required.

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Appendix - Modified Yale Preoperative Anxiety Scale (m-YPAS)

Activity

1. Looking around, curious, playing with toys, reading (or other age-appropriate behaviour); moves around holding area / treatment room to get toys or to go to parent; may move toward operating room equipment.
2. Not exploring or playing, may look down, fidget with hands, or suck thumb (blanket); may sit close to parent while waiting, or play has a definite manic quality.
3. Moving from toy to parent in unfocused manner, non-activity-derived movements; frenetic / frenzied movement or play; squirming, moving on table; may push mask away or cling to parent.
4. Actively trying to get away, pushes with feet and arms, may move whole body; in waiting room running around unfocused, not looking at toys, will not separate from parent, desperate clinging.

Vocalizations

1. Reading (non-vocalizing appropriate to activity), asking questions, making comments, babbling, laughing, readily answers questions but may be generally quiet; child too young to talk in social situations or too engrossed in play to respond.
2. Responding to adults but whispers, "baby talk," only head nodding.
3. Quiet, no sounds or responses to adults.
4. Whimpering, moaning, groaning, silently crying.
5. Crying or may be screaming "no".
6. Crying, screaming loudly, sustained (audible through mask).

Emotional expressivity

1. Manifestly happy, smiling, or concentrating on play.
2. Neutral, no visible expression on face.
3. Worried (sad) to frightened, sad, worried, or tearful eyes.
4. Distressed, crying, extreme upset, may have wide eyes.

State of apparent arousal

1. Alert, looks around occasionally, notices or watches what anesthesiologist does (could be relaxed).
2. Withdrawn, sitting still and quietly, may be sucking on thumb or have face turned into adult.
3. Vigilant, looking quickly all around, may startle to sounds, eyes wide, body tense.
4. Panicked whimpering, may be crying or pushing others away, turns away.

Use of parents

1. Busy playing, sitting idle, or engaged in age appropriate behaviour and doesn't need parent; may interact with parent if parent initiates the interaction.
2. Reaches out to parent (approaches parent and speaks to otherwise silent parent), seeks and accepts comfort, may lean against parent.
3. Looks to parent quietly, apparently watches actions, doesn't seek contact or comfort, accepts it if offered or clings to parent.
4. Keeps parent at distance or may actively withdraw from parent, may push parent away or desperately clinging to parent and not let parent go.