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Prevalence of Pre-Operative Anxiety and Predictors among Elective Surgical Patients and Their Pre-Operative Hemodynamic Changes at Muhimbili National Hospital

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Abstract

Background: Surgery is a traumatic process that may subject patients to physiological and psychological responses leading to pre and post-operative effects. Preoperative anxiety, if severe may be associated with several complications including cancellation of surgery, poor intra- and post-operative analgesic control, altered post-operative healing, and longer hospital stays to mention a few. **Objective:** The main purpose was to determine the prevalence and predictors of pre-operative anxiety among elective surgical patients and their hemodynamic changes in these patients in the Surgical department in MNH. **Methodology:** This was a prospective descriptive and analytical study performed at MNH which involved patients admitted for elective surgical procedures from June 2021 to February 2022. Information was gathered in a structured questionnaire along with APAIS scores. **Results:** 169 patients for elective surgery in General Surgery and Urology units were included in the study. Among them, 94 males and 74 females. The overall pre-operative anxiety was 11.8%, 80.5% had moderate to severe Information-Related anxiety, while 26% and 17.2% had moderate-to-severe surgery-related and anesthesia-related types of anxiety respectively. **Conclusion:** Pre-operative anxiety was comparatively lower in our settings as well no factor was found with a significant relation to pre-operative anxiety, hence further and broader evaluation is recommended to result in the assessment and management of patients before elective surgery.

Keywords

Anxiety, Elective Surgery, Predictors, APAIS

1. Background

It is an expectation that often patients experience anxiety, as the whole process of receiving a diagnosis, understanding the disease, communicating with family, etc. is enough to initiate stress. The settings are as well not helpful most often at times, the receiving rooms of our theaters with only a door that countless strangers pass. With nothing but just previous information about the general procedure to be performed, this is easy to be perceived as dangerous.

Anxiety works in producing physical changes by activation of the sympathetic nervous system and adrenal medulla with catecholamine production and activation of the hypothalamic-pituitary-adrenal axis with cortisol production.

Effects of anxiety can lead to physical changes in heart rate, and blood pressure which in turn lead to poor analgesia control, poor patient satisfaction, and even cancelation of life-saving surgery. It is often masked as hypertension which has not been noticed previously and managed immediately with anti-hypertensive medication [1].

Anxiety can be measured in many ways, previously by direct measurement of serum cortisol levels and urine catecholamine, and indirectly by blood pressure and heart rate. However, new methods have been validated to assess anxiety levels in patients awaiting surgery specifically. These include the Hamilton anxiety scale, the VAS, STAI, and GAD-7.

The Hamilton anxiety scale is a 14-item questionnaire that is well-defined by questions about symptoms experienced. The result measures mental agitation and psychological distress as well as physical complaints related to anxiety. Each Item in question scores 0 - 4 (not present - severe), with resulting scoring of mild anxiety < 17 scores, mild to moderate 18 - 24, and moderate to severe 25 - 30. The scale's reliability and validity have yielded acceptable results but were found to be sufficient although its internal validity was found to be insufficient [2].

VAS, the visual analog anxiety scale, is used in the assessment of anxiety and pain by referring to an analog scale where a line of 10 centimeters in length with extremes being "not at all" to the left side and "very much" to the far right. Results measured by millimeters of the point are chosen by patients. Although useful this scale tends to skew scores in patients' responses and it's generally not sensitive to the causative agent of the anxiety [3].

STAI, the state-trait anxiety inventory, is a checklist of 40 self-reported systems on a 4-point Likert scale with 0—not anxious extreme to 4—anxious extreme. Studies have evident results of validity and reliability to assess anxiety levels accurately [4]. This scale, nevertheless, contains too many questions rendering it cumbersome to utilize within a prescribed period.

GAD-7, the general anxiety disorder scale-7, is a tool used as a 7-question self-administered screening instrument with assigned scores of 0, 1, 2, and 3 to the response categories, respectively, of "not at all", "several days", "more than half the days", and "nearly every day". And an additional question of 0 - 4: mi-

nimal anxiety 5 - 9: mild anxiety 10 - 14: moderate anxiety 15 - 21: severe anxiety, the GAD-7 total score for the seven items ranges from 0 to 21. This tool is used to assess general anxiety and is not specific to the surgical process, much like the above tools. The reliability of the GAD-7 was found to yield good results compared to other measures. In this study, the GAD-7 tool yielded a sensitivity of 73.3% and a specificity of 67.3% [5].

The APAIS, The Amsterdam pre-operative anxiety and information scale, consists of six structured questions that focus on the major fear of Anesthesia and Surgery, it has been translated into more than 5 languages. It was specifically devised to regard anxiety to surgery and Anesthesia and was utilized multiple times on elective patients. It was developed in 1996 by the Dutch group of Moerman.

The items in the APAIS are rated on a five-point Likert scale with end poles "not at all" and "extremely" which represent the two scales of anxiety. A checklist grades anxiety from 0 not anxious to 5 extremely anxious. Patients' scores add up to sub-scales (Sum A, Sum S, and Sum C) each category levels anxiety in mild, moderate, and severe levels respectively [6] [7] [8].

The reliability of the tool has been assessed multiple times using Cronbach's alpha which measures the internal consistency of an instrument. A result value of 0.70 is acceptable to conclude good internal consistency the study concludes that even though the need for information falls short possibly due to the number of questions but overall, the evidence suggests that APAIS is a reliable instrument to assess pre-operative anxiety [7].

Patients who experience severe anxiety towards a certain trigger can present with a plethora of symptoms and signs. These include irritability, isolation, nervousness, insecurity, headache, sweating, vomiting, diarrhea, tingling, chills, hot-flush, tachypnea, tachycardia, and hypertension [1]. An anxious patient is on a constant trigger of the stress response, leading to these debilitating effects. Interventions to reduce preoperative anxiety include pharmacological therapy, provision of information, distraction, and so on [9].

According to the study by Broadbent E, Kahokehr A, *et al.*, patients with anxiety can be managed, and once assessed for level of anxiety, each patient has managed accordingly. Multiple methods of managing debilitating pre-operative anxiety are present including medical interventions such as administering midazolam, giving proper pre-operative information, music therapy, etc. [9] [10].

Post-operatively, Anxiety has been known to lead to poor surgically related consequences such as depression, prolonged hospital stay, poor pain management and dissatisfaction from the surgical patient leading to significant morbidity and poor quality of life [11] [12] [13].

Essentially this study was aimed at revealing the presence of pre-operative anxiety in MNH surgical patients, with the APAIS the incidence was revealed and the demographics were selected to note the factors that relate to the anxiety.

2. Methodology

2.1. Study Design

This was a prospective cross-sectional analytical study.

2.2. Study Setting

MNH is the tertiary teaching hospital; Muhimbili National Hospital General Surgery department has three units namely Firm one, two and Pediatric Surgery and Urology units, with elective surgeries occurring every weekday among the surgical units attending 300 patients/month, located in Dar es Salaam, Ilala district, Upanga ward. As a referral hospital it receives patient from all over the country with the capacity of offering super-specialized services.

2.3. Study Population and Sample

All patients are awaiting elective surgery from both general and urology surgical wards.

All patients placed on elective surgery list that fit inclusion criteria.

2.4. Study Sample Size

The sample size was calculated from Fisher's formula:

$$n = Z^2 P(1-P)/E^2$$

where:

n = sample size;

Z = point of normal distribution corresponding to the significance level of 1.96;

P = prevalence of pre-operative anxiety, P = 47% from previous study (14);

95% confidence interval will be used;

E = maximum likely error 5%.

Therefore $n = (1.96)^2 \times 0.47(1-0.47)/(0.05)^2 = 384$.

Correction for sample, due to the number of procedures being less than 10,000/month

$$nf = n/\left(1+\left(\frac{n}{N}\right)\right)$$

Approximately fewer than 300 elective surgeries are performed per month in the surgical departments not meeting the criteria of 10,000 patients/month, correction for sample size;

Where, N = 300.

$$n = 384$$

Corrected sample size was 168 *patients.*

2.5. Sampling Technique

Convenient random sampling employed for patients fitting inclusion criteria, about 70 patients were recruited each month for good representation.

2.6. Inclusion and Exclusion Criteria

2.6.1. Inclusion Criteria

1) Patient must be >18 years of age.

2) Able to verbalize and consent to participate in the study.

3) Listed for elective surgery and taken to the operating theater.

2.6.2. Exclusion Criteria

1) Patients with previous diagnosis or medicated for major anxiety and psychological disorders. No patients were excluded with respect to this criterion.

2) Patients on anti-anxiety as well as anti-psychotic medication. No patients were excluded with respect to this criterion.

3) Hypertensive on or not on medication. For every 2 patients recruited 1 was excluded for being hypertensive.

4) Patients who scored > 18 on the GAD-7. No patients recruited were excluded with respect to this criterion.

2.7. Method of Data Collection

Tools A structured questionnaire was utilized to collect demographic information (age, sex, socio-economic status, level of education, previous history of surgery and religion) as the specific independent variables in all patients awaiting elective surgery fitting inclusion criteria.

The GAD-7 translated version already in use at Muhimbili National Hospital, was used at the pre-visit Anesthesia clinic to assess patients for anxiety disorders having not been diagnosed.

Translated APAIS was utilized to assess pre-operative anxiety levels. Information was gathered the night before elective surgery as the anesthetic team reviews patients and consent is taken.

With the help of a trained research assistant, mean blood pressures and heart rates were taken in the wards. This was considered as patients' baseline blood pressure and heart rates. These were then compared to pre-induction measured blood pressure and Heart rate taken 1 minute before administration of anesthesia.

2.8. Variables

2.8.1. Independent Variables

Age—this variable is categorized in age ranges 18 - 35, 36 - 55 and Above 55.

Sex—categorical with Female and male as the variable.

Socio-economic status included—patient current occupation and admission status (*i.e.* public, private and cash paying private).

Level of education—this variable included primary and less, secondary and college and above.

Previous history of surgery—as having history (yes) and not having a history (no).

Religion—categorical with two values of Islam and Christian.

2.8.2. Dependent Variables

Primary outcome—pre-operative anxiety.

Secondary outcome—Hemodynamic changes, postponement and cancellation, relation of Hemodynamic changes to anxiety.

2.9. Handling and Data Analysis

Information acquired using tools was entered into SPSS version 25, and ethical standards were adhered to.

Categorical data and numerical data were input into SPSS version 25. Analysis was done based on study objectives, and each objective was analyzed as described in the table below. Continuous variables were summarized as mean with standard deviations, and categorical variables were summarized as proportions/percentages. Comparing continuous variables and categorical variables to look for predictors was done by univariate analysis, with significant p-value of less than 0.05 and 95% CI.

Methods of Data Analysis

According to specific objective

1) To estimate the incidence of pre-operative anxiety among elective surgical patients at MNH.

a) Proportion of patients with anxiety was computed in percentage.

2) To determine which clinical demography is associated with pre-operative anxiety among elective adult surgical patients in MNH.

b) Variables were compared between patients with and without anxiety and p-value of less than 0.05 was considered significant.

3) To describe the hemodynamic changes (blood pressure and heart rate) in patients awaiting elective surgery at MNH.

c) Mean changes in hemodynamics were compared with a paired T-test to calculate the difference.

2.10. Ethical Consideration

Ethical clearance was requested from MUHAS IRB and Permission from MNH research and training departments was obtained. Consent was obtained in Swahili from patients for participation. Confidentiality was observed, patients' names were not used instead identification numbers were used and all in accordance with Declaration of Helsinki.

As the researcher, assessed patients who were diagnosed with significant anxiety levels were not intervened but were referred to the anesthesia team for evaluation and management.

3. Results

3.1. Sociodemographic Characteristics of Study Participants

A total of 169 patients qualified for the study, most recruits refused participation or did not fit inclusion criteria (for every 3 patients recruited 1 was hyperten-

sive). Of the 169 patients recruited in this study with mean age of 50.33 ± 15.96 years, age range of 20 to 93 years. Seventy-six (45.0%) were aged between 36 and 35 years. Of all the participants in the study; 95 (56.2%) were male and 74 (43.8%) were female, 118 (69.8%) married and 133 (78.7%) had less than or equal to ordinary secondary education. Regarding admission category and economic status; 83 (49.1%) were public patients and 143 (84.6%) claimed of being employed in either private or government sector and received salaries.

About 119 (70.4%) patients were planned for elective surgeries under general surgery department while 50 (29.6%) were under urology department with 107 (63.3%) had history of previous surgery at least once. Refer to Table 1.

3.2. Proportion of Pre-Operative Anxiety

The pre-operative anxiety was assessed using APAIS with 6 questions in Likert

Table 1. Represents the frequencies of patients selected in the study according to the fermi graphical characteristics.

Variable		Frequency (%)
Age groups (years)	18 - 35	31 (18.3)
	36 - 55	76 (45.0)
	Above 55	62 (36.7)
Sex	Male	95 (56.2)
	Female	74 (43.8)
Marital status	Married	118 (69.8)
	Single	30 (17.8)
	Widow(er)	7 (4.1)
	Divorced	14 (8.3)
Religion	Muslim	88 (52.1)
	Christian	81 (47.9)
Education level	Primary/secondary	133 (78.7)
	College and above	36 (21.3)
Occupation	Employed-salary paid	143 (84.6)
	Unemployed-no means of salary	26 (15.4)
Admission category	Public	83 (49.1)
	Cash paying private	74 (43.8)
	Private	12 (7.1)
Surgical Unit	General surgery	119 (70.4)
	Urology	50 (29.6)
Prev. h/o surgery	Yes	107 (63.3)
	No	62 (36.7)

scale. The overall proportion of pre-operative anxiety (>11 APAIS score) for both anesthesia and surgery related was 11.8% (20/169). Surgery related anxiety in particular was moderate (score 5 - 7 out of 10) in 36 patients (21.3%) while only 8 patients had high levels of anxiety (8 - 10 out of 10). Similarly, 25 (14.8%) had moderate level of anesthesia related anxiety while majority 140 (82.8%) had no or little anxiety related to anaesthesia.

Interestingly, information related anxiety was the most prevalent. The mean score for surgery related anxiety was 3.81 ± 1.82 (out of 10) and 3.2 ± 1.58 (out of 10) for anaesthesia related while it was higher for information related anxiety with mean of 6.1 ± 1.93 (out of 10). Patients were more anxious for information about surgery rather than surgery and anaesthesia (p-value < 0.001). Moreover, they were more anxious about the surgery when compared to anaesthesia (p-value < 0.001). Refer to Figure 1.

3.3. Predictors of Anxiety among Patients before Surgery

Age, sex, religion, occupation, admission category, education level, previous history of surgery and surgical unit were the assessed predictors. Admission category was the only factor associated with preoperative anxiety. Being a public patient had 7.4 times risk of preoperative anxiety as compared to executive category (AOR 7.4 CI, 1.38 - 39.99, p-value (0.019)) while being an IPP category patient had 5.6 times risk of preoperative anxiety as compared to executive category (AOR 5.6 CI, 1.16 - 27.13, p-value (0.032)). Refer to Table 2.

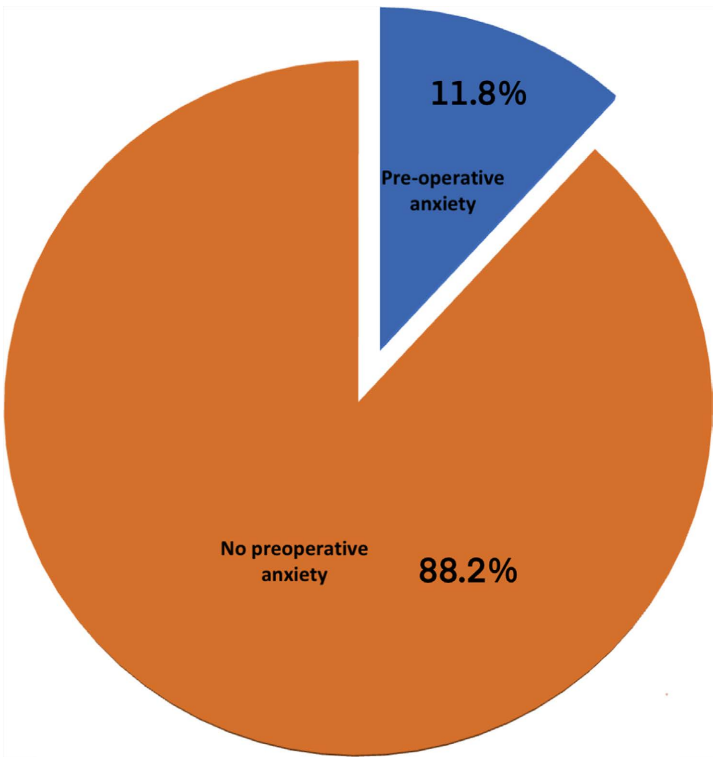

Figure 1. Depicts the proportions of patients with significant preoperative anxiety to those with moderate to not having anxiety.

Table 2. Depicts the association of the demographical features as the predictors of preoperative anxiety.

Predictors		Preoperative anxiety N (%)		CR	p-value	AOR	p-value
		Yes, *n* = 20	No, *n* = 149				
Age	Above 55	5 (25.0)	57 (38.2)	Ref	-	Ref	-
	18 - 35	3 (15.0)	28 (18.8)	0.819	0.794	1.301	0.775
	36 - 55	12 (60.0)	64 (43.0)	0.468	0.177	0.344	0.091
Sex	Female	10 (50.0)	64 (40.0)	Ref	-	Ref	-
	Male	10 (50.0)	85 (57.0)	1.32	0.552	1.0	0.989
Marital status	Single/widow/divorce	9 (45.0)	42 (28.2)	Ref	-	Ref	
	Married	11 (55.0)	107 (71.8)	2.08	0.13	2.88	0.071
Education	Above O/L sec.	5 (25.0)	31 (20.8)	Ref	-	Ref	
	Below or O/L sec	15 (75.0)	118 (79.2)	1.27	0.668	0.749	0.689
Occupation	Not employed	5 (25.0)	21 (14.1)	Ref	-	Ref	
	Employed	15 (75.0)	128 (85.9)	2.03	0.212	1.81	0.349
Ad. Category	Private insured	4 (20.0)	8 (5.4)	Ref	-	Ref	
	Public	8 (40.0)	75 (50.3)	4.68	**0.031**	7.44	**0.019**
	Private cash paying	8 (40.0)	66 (44.3)	4.13	**0.048**	5.60	**0.032**
Religion	Christian	8 (40.0)	73 (49.0)	Ref	-	Ref	-
	Muslim	12 (60.0)	76 (51.0)	0.69	0.451	0.706	0.510
Surgical Unit	Urology	7 (35.0)	43 (28.9)	Ref	-	Ref	
	G/surgery	13 (65.0)	106 (71.1)	0.753	0.573	2.06	0.258
History of surgery	No	6 (30.0)	56 (37.6)	Ref	-	Ref	-
	Yes	14 (70.0)	93 (62.4)	0.712	0.510	0.89	0.835

NOTE: Cr—Crude odds ratio, AOR—Adjusted odds ratio, G—General, Ad.—Admission, Hx—History.

3.4. Hemodynamic Changes in Pre-Operative Patients

Hemodynamic changes were determined using BP, HR, and MAP during pre-operative preparations and pre-induction of anaesthesia. The mean preoperative MAP was 94.1 ± 9.3 mmHg and raised to 96.6 ± 14.5 mmHg just before anesthetic induction however, there were no significant changes (p-value = 0.05). There was a significant change in systolic BP during preoperative preparation and pre-anaesthetic induction (p-value < 0.001) with mean systolic BP being 125.5 ± 12.9 mmHg preoperatively and 132.7 ± 20.0 mmHg at pre-induction time. Nonetheless, no significant changes were detected in diastolic pressure.

On the other hand, significant changes were detected in pulse rates (p-value < 0.001) with mean pulse rate preoperatively being 80.9 ± 10.9 bpm and 88.7 ± 16.5 bpm at pre-induction time. Refer to Table 3.

In each parameter there were raised percentages when compared at preoperative preparation and during pre-induction time; 38 (22.5%) had raised MAP

Table 3. Depicts the changes noted with the patients with respect to hemodynamics.

Variable	Preoperative	Pre-Induction	p-value
Systolic BP (mmHg)	125.5 ± 12.9	132.7 ± 20.00	<0.001
Diastolic BP (mmHg)	78.53 ± 10.0	78.6 ± 12.9	0.953
MAP (mmHg)	94.1 ± 9.3	96.6 ± 14.5	0.05
Pulse rate (bpm)	80.9 ± 10.9	88.7 ± 16.5	<0.001

above 100 mmHg pre-operatively which increased to 54 (32.0%) at pre-induction time. Similarly, 10 (5.9%) had raised pulse rate above 100 bpm while the number increased to 31 (18.3%) at pre-induction. More details are given in Table 3.

4. Discussion

Surgery is a traumatic experience which subject patients to both surgical and psychological stress. One psychological stress is pre-operative anxiety which has been related to surgery, anaesthesia and need for more information about the surgical procedure and anaesthesia. Some degree of anxiety is natural reaction to stressful condition and is expected, however if excessive it may lead to pathophysiological responses which may results in perioperative complications. This study aimed at assessing the prevalence and predictors of pre-operative anxiety together with hemodynamic changes occurring among elective surgical patients.

The overall prevalence of pre-operative anxiety in this study was 11.8%. This prevalence is relatively lower than what has been reported in majority of studies where the prevalence ranges between 40.6% and 80% in both developed and developing countries [12]-[17]. The observed prevalence in this study could be explained by the nature of study participants, in which nearly two-thirds had previous history of surgery different from other studies. This is based on the fact that prior history of surgery has been associated with lower levels of preoperative anxiety [15] [18] [19]. Moreover, in most African countries 'religion is one of the common approaches employed in lowering anxiety where based on person's belief patients pray or seek spiritual help [14] [18] [19]. In the index study, all participants belonged to one religious group either Christian or Muslim which could also be one way to ensure assurance and hope hence lowering anxiety levels.

Information related anxiety was more prevalent as compared to surgery and anaesthesia-related anxiety and this was statistically significant. More than two-third (80.5%) of participants had moderate to severe information related anxiety while surgery and anaethesia related anxiety ranged between 16% and 25%. Similar findings have been reported by Mulungeta *et al.* which showed patients with adequate information about surgical procedure and anaethesia had lower state-anxiety score [18]. This was in line with other studies [20] [21] [22]. Jlala and his colleagues demonstrated that patients who were provided with short video about planned surgery and anaesthesia had significant low pre-operative anxiety as

compared to control group [23]. The index study had relatively higher information need anxiety which reflect inadequate provision of information for both surgery and anaesthesia before the planned operation. It is therefore of paramount importance for the patients to be provided with right and adequate information about the planned procedure and the type of anaesthesia.

This study also assessed the predictors of pre-operative anxiety, admission category was the only predictor associated with pre-operative anxiety. Admission category was classified as private (insured class), private (cash paying patients) and public (non-insured). Being a public and private cash paying patient had 7.4 and 5.6 folds of having pre-operative anxiety as compared to private insured patients. To the best of my knowledge, there was no published study that assessed the link between admission category and pre-operative anxiety. However, a study done among women undergoing gynecological surgeries found that patients without health insurance had higher levels of anxiety as compared to insured patients [12]. Moreover, different studies have demonstrated the association between economic status and pre-operative anxiety which could be reflected as admission category in our study. Higher economic status has been associated with low prevalence of anxiety [12] [19] [24]. A good explanation for such findings in our study could be based on special care, adequate information on both anaesthesia and surgery as well as close follow-up perioperatively given to executive patients compared to insured and public patients where such services are sometimes limited. Providing essential information on surgery and anaesthesia regardless of admission category could help minimize this gap.

Other predictors assessed were age, gender, marital status, education level, occupation, religion, surgical unit and prior history of surgery. All these factors were not significantly related to preoperative anxiety. With regards to age, similar findings have been reported in different studies where age had no significant association to pre-operative anxiety [25] [26]. However, Mekonnen *et al.* and Ryamukuru *et al.* reported on young patients being more anxious compared to older ones [27] [28].

Patients with prior history of surgery are likely to be less anxious as compared to the ones who are first-time experience [29]. In the index study, 70% of patients with pre-operative anxiety had prior history of surgery although there was no significant association which contrary to the above findings. With other factors, less has been published to make comparison with our findings. The major discrepancy observed could be associated with difference in study design, sample size, duration of study and surgical units which could interfere with reported predictors.

Different studies had variable findings regarding level of education with similar findings reported by a number of studies [30] [31]. Conflicting results were reported in other studies where high school and college graduates had significantly less pre-operative anxiety in comparison with those with primary education [32]. Nevertheless, other studies showed that as education status increase

the pre-operative anxiety level increases which was contributed by tendency of educated people to seek knowledge from media or readings about risks involved in surgeries which may rise the anxiety levels [33].

Pre-operative anxiety, like any form of anxiety is associated with physiological changes which affect hemodynamic parameters such as blood pressure (BP) and heart rate. The index study reported significant changes in systolic BP and heart rate at pre-operatively and pre-induction time for all study participants. Mean arterial pressure (MAP) and diastolic BP did not show significant changes. This was in line with the findings by Tanaka and his colleagues where there were significant changes from baseline Systolic BP and heart rate during admission and 5 minutes prior to induction [34]. There are limited comparable studies on pre-operative and pre-induction hemodynamic changes as the index study. Ahmetovic-Djug *et al.* reported on significant changes in MAP, however, this was pre and after induction, and none of the hemodynamic parameters were taken pre-operatively [35]. A possible explanation for observed hemodynamic changes could secondary to catecholamine release in response to stress as the patient is exposed to theatre environment.

The observed hemodynamic changes in this study were inconsiderate of pre-operative anxiety status. Therefore, there is a need to establish the relationship and extent of hemodynamic changes among patients with pre-operative anxiety.

5. Conclusions and Recommendations

5.1. Conclusions

Pre-operative anxiety is relatively low in our setting with higher proportion of information related-anxiety as compared to surgery and anaesthesia related anxiety. Admission category was significantly associated with pre-operative anxiety with public and insured patients showing higher risks for pre-operative anxiety as compared to executive (high class) patients. Age, sex, marital status, education level, occupation, religion, surgical unit and history of surgery were not significant predictors of pre-operative anxiety.

There were remarkable hemodynamic changes between pre-operative and pre-induction time with significant changes observed in Systolic blood pressure and heart rate.

5.2. Recommendations

1) Improvement of pre-operative care, making sure patients are provided with adequate information concerning anaesthesia and planned surgery as well as counseling especially during signing of consent forms.

2) Provision of basic and essential information as stated in recommendation 1 above regardless of patients' admission category.

3) Long duration and multi-centered study to cover large sample size and minimize bias errors. This will help establish clear evidence of other predictors of pre-operative anxiety.

4) Improvement of peri-operative care with close observation of pre-operative, pre-induction and post-operative hemodynamic changes to assess the need for intervention.

Authors' Contributions

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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List of Abbreviations

APAIS	Amsterdam Pre-Operative Anxiety Information Scale
CO	Cardiac Output
STAI	The Spielberger State-Trait Anxiety Inventory (STAI)
CVP	Central Venous Pressure
GAD7	Generalized Anxiety Disorder 7
HADS	Hospital Anxiety and Depression Scale
HR	Heart Rate
IRB	Institutional Review Board
MAP	Mean Arterial Pressure
MNH	Muhimbili National Hospital
MUHAS	Muhimbili National Hospital
NO	Nitric Oxide
STAI	State Trait Anxiety Inventory
SV	Stroke Volume
VAS	Visual Analogue Scale
SI	International System of Units
PTSD	Post Traumatic Stress Disorder