PREVALENCE AND FACTORS ASSOCIATED WITH POST-OPERATIVE NAUSEA AND VOMITING IN PATIENTS AFTER NEUROSURGERY AT MUHIMBILI ORTHOPAEDIC INSTITUTE

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By

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A Dissertation Submitted in Partial Fulfillment of Requirements for the Degree of Masters of Medicine in Anaesthesiology at

Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by the Muhimbili University of Health and Allied sciences a Dissertation entitled "**Prevalence and factors associated with post-operative nausea and vomiting in patients after neurosurgery at Muhimbili Orthopaedic Institute"** in fulfillment of one of requirements for the degree of Masters of Medicine in Anesthesiology of the Muhimbili University of Health and Allied Sciences.

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DECLARATION AND COPYRIGHT

I, **Ocholla Amon Carlmera,** declare that this dissertation is my own original work and that it has not been presented to any other university for a similar or any other degree award.

Signature ……...…… Date …….……

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To Dr. Respicious Boniface: You are more than just a supervisor, you are a teacher, mentor, and beacon of inspiration with your unconditional passion, and commitment to your students.
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With utmost admiration and respect,

Dr. Ocholla Amon Carlmera.

DEDICATIONS

I dedicate this research dissertation with boundless love and gratitude to the most important people in my life. To my beloved wife, Beryl Amondi Opeyo, this dissertation stands as a testament to your never-ending love, support, and encouragement throughout this academic journey. Your presence in my life has been a constant source of strength, inspiration, and motivation.

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Lastly, I dedicate this research dissertation to my late father, Hezekiah Ocholla,Your values that you instilled in me have been inspirational. Your support and belief in my abilities are always cherished.

With all my love and gratitude,

Ocholla Amon Carlmera.

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ABBREVIATIONS

$5\text{-}HT_3$	5-hydroxytryptamine
BMC	Bugando Medical Center
BMI	Body mass index
MNH	Muhimbili National Hospital
MOI	Muhimbili Orthopaedic Institute
MUHAS	Muhimbili University of Health and Allied Sciences
NK1	Neurokinin1
PACU	Post Anesthesia Care Unit
PONV	Postoperative nausea and vomiting
SPSS	Statistical Package for Social Sciences

DEFINITION OF TERMS

Neurosurgery- surgical intervention involving craniotomy to operate on the brain and spine surgery (15, 17, 28).

Postoperative Nausea and Vomiting- Nausea and vomiting within 24 to 48 hours following an operation (3).

ABSTRACT

Background: There is a frequent occurrence of postoperative nausea and vomiting (PONV) as a complication that is mostly seen after surgery, which is related to a range of factors including those that are patient-related, anaesthesia and surgical in nature. The prevalence of PONV in neurosurgical procedures ranges from 30% in low-risk groups to 80% in high-risk groups globally. despite anaesthetic techniques advances and improvement in PONV recognition, prevention, treatment and management strategies. Such cases may cause complications that can delay healing.

Objective: The aim of this study was to assess the prevalence and factors associated with PONV in patients after neurosurgery at Muhimbili Orthopaedic Institute (MOI).

Methodology: This cross-sectional study at MOI ICU involved 72 participants. Data were collected using a checklist, covering consent, patient factors (age, sex, history of PONV, motion sickness, smoking status), anaesthetic factors (type of anesthesia, drugs used, inhalation agents, fasting time), surgical factors (type of operation, anatomical location, duration), and PONV events within the first 48 hours. Data were entered, cleaned, coded, and analyzed using SPSS Version 27. Descriptive statistics summarized continuous variables with median and interquartile range (IQR) and categorical variables with frequency tables. Associations were analyzed using chi-square tests with p-values ≤ 0.05 considered significant. Logistic regression (bivariate and multivariate) was used to assess relationships and effects.

Result: The study included 72 patients with a median age of 44 years (IQR: 35–60). The prevalence of PONV was 52.8%. Significant independent predictors of PONV included: a history of motion sickness (OR = 2.96, 95% CI: 1.14–8.11, p = 0.029), a history of PONV (OR = 2.77, 95% CI: 1.08–7.37, p = 0.037), and smoking (OR = 3.09, 95% CI: 1.17–8.63, p = 0.006). Female patients experienced PONV more frequently than males (OR = 0.32, 95% CI: 0.12–0.84, p = 0.022). Fentanyl showed a nearly significant association with PONV (OR = 0.27, 95% CI: 0.06–0.99, p = 0.065).

Conclusion and recommendation: Prevalence of PONV in neurosurgical patients at MOI is high at 52.8% associated with patient factors of history of motion sickness, sex, history of PONV, and smoking. MOI should formulate effective assessment, prevention, management, and treatment strategies focusing on patient factors to reduce PONV prevalence and related adverse outcomes.

CHAPTER ONE

1.0 INTRODUCTION

1.1. Background of the Study

Postoperative nausea and vomiting (PONV) is one of the most incessant and anguishing complications for patients who have surgery under general anesthesia. Notwithstanding the advances in the development of anaesthetic devices, drugs, surgical techniques, and the overarching strategies for managing PONV, it still remains common. Worldwide, the incidence of PONV ranges from as low as 30% in low-risk populations to as high as 80% among high-risk populations (1-3). Occurrence of PONV after surgery can lead to discomfort and stress in the patient and may also result in dehydration, electrolyte imbalance, esophageal vessels rupture, wound dehiscence, aspiration of gastric contents, and death (4). Additionally, PONV is associated with prolonged hospitalization, high medical costs and resources utilization.

The associated factors for PONV are multifactorial, including patient-related, anaesthetic and surgical factors. Female gender, as a patient related factor, is consistently the strongest well-established factor for PONV, as well as non-smoking status, history of motion sickness or PONV, and age of the patient (1, 5). Anaesthetic factors for PONV include the use of dose dependent volatile anaesthetic drugs and opioid administration in the intraoperative and postoperative periods (5, 6-7). Also, some surgical procedures like strabismus correction, ENT (Ear Nose Throat), gynaecologic, shoulder and laparoscopic surgeries are associated with higher incidence of PONV.

A study conducted in Ethiopia reported that incidence of PONV was 36.2% (10) in general surgical patients while a study conducted in Kenya found that the prevalence of PONV was 39.8% in ear nose and throat surgery (11). Also, Ssebuufu found that the prevalence of PONV at Mulago hospital in Uganda was 40.7% (12) in general surgery patients. In the setting of Tanzania, Isaka found that the prevalence of PONV at MNH was 17.3% for patients undergoing elective surgery (8) while Chalya and colleagues reported that the prevalence of PONV at BMC was 41% (9). The protocols and guidelines like the Fourth Consensus Guidelines for the

Management of Postoperative Nausea and Vomiting of 2020, have also not been adequately accepted and adopted worldwide. Thus, despite availability of newer drugs such as the second-generation 5-hydroxytryptamine 3 (5-HT_3) receptor antagonists, neurokinin 1 (NK1) receptor antagonists, and dopamine antagonists; administering of general multimodal PONV prophylaxis; and PONV management practices as part of enhanced recovery pathways; the prevalence of PONV still remains high. This research studied prevalence of PONV and factors associated to it, in neurosurgical patients at MOI to improve prevention, treatment, and management of PONV.

1.2. Problem Statement

The problem of PONV persists globally, affecting various patient outcomes and costs of healthcare (4-5, 13). Its worldwide prevalence remains high despite advances in management techniques, ranging from 30% to 80%. Studies conducted at different hospitals like MNH in Tanzania have shown that PONV rates are significant thereby calling for better comprehension and handling (8, 9). Nevertheless, studies conducted at MNH showed inadequate knowledge as well as attitudes towards PONV among doctors thus implying a gap on health care service delivery (14). The two studies in BMC and MNH did not involve patients who underwent neurosurgery, therefore, the status in terms of prevalence and associated factors for PONV is not known among neurosurgical patients even after the availability of newer drugs and guidelines of 2020. PONV among neurosurgical patients can result in increased intracranial pressure, intracranial bleeding, aspiration, delayed recovery and other complications. At Muhimbili Orthopaedic Institute, there is lack of sufficient data on prevalence of PONV after neurosurgery thus necessitating investigations. This study aimed at evaluating the current prevalence and factors related to PONV among neurosurgical patients at MOI to improve prevention treatment and management modalities.

1.3. Conceptual Framework

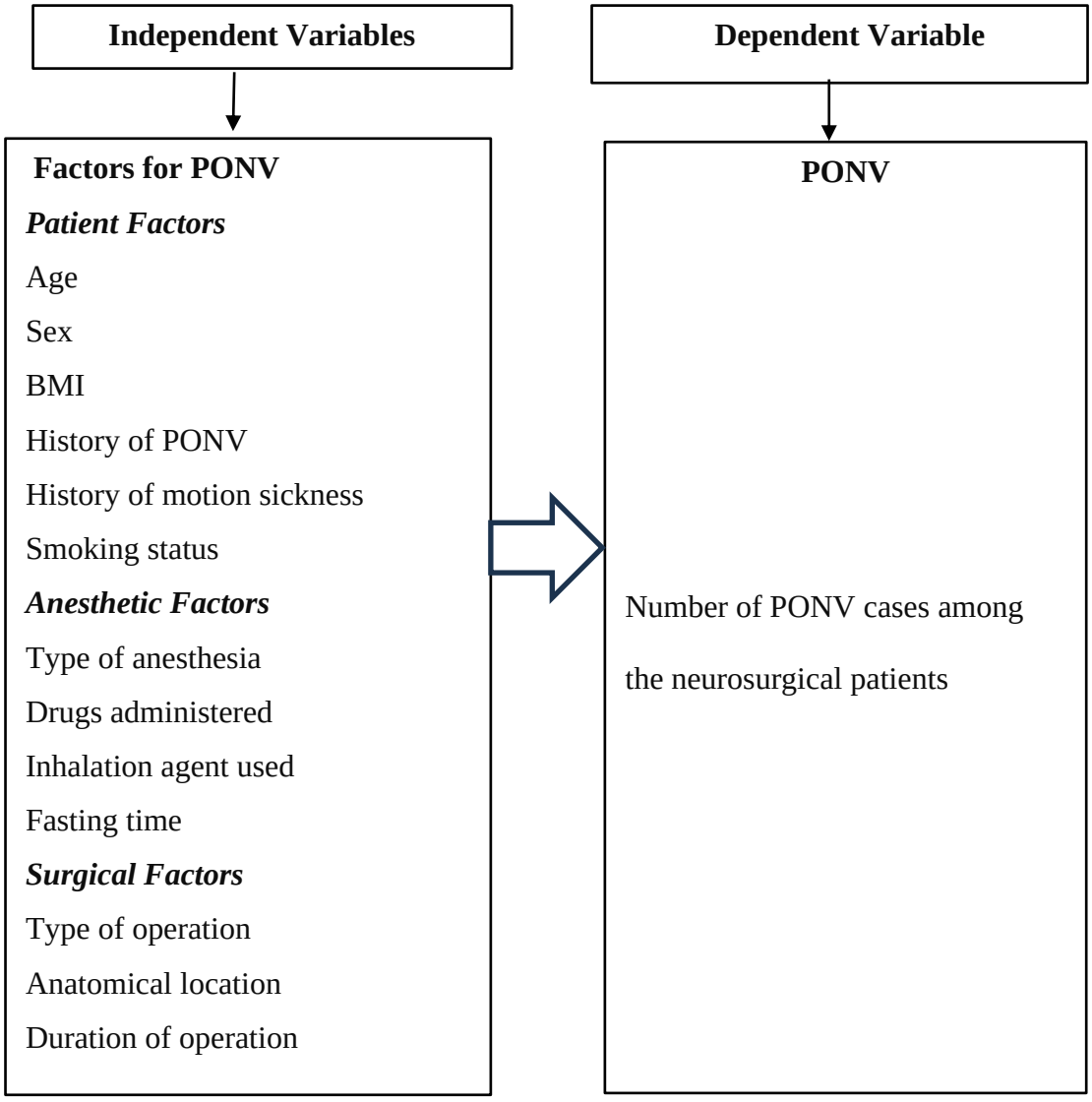


Figure 1: Diagrammatic conceptual framework for the study

1.4. Rationale

There is limited data for PONV among neurosurgical patients at MOI. For the healthcare providers to be able to improve on their postoperative nausea and vomiting evaluation, prevention, therapy and control with an aim of reducing its deleterious effects, they must have an understanding on how it is prevalent and what factors are related to PONV among neurosurgical patients. Recast this statement. This study sought to assess the prevalence of PONV and factors associated with it, in patients following neurosurgery at MOI. The findings will be useful for medical personnel such as anaesthesia providers, surgeons, nurses and other policy makers like health care administrators among others. Based on these findings, there shall be some steps taken in enhancing the evaluation, prevention, treatment and management of PONV particularly at MOI.

1.5. Research Questions

1.6.1. What is the prevalence of post operative nausea and vomiting in patients after brain surgery at Muhimbili Orthopaedic Institute?
1.6.2. What are the patient, anaesthetic, and surgical factors associated with post operative nausea and vomiting in patients after brain surgery at Muhimbili Orthopaedic Institute?

1.6. Objectives

1.6.1. Broad Objective

To determine the prevalence of post operative nausea and vomiting and associated factors in patients after brain surgery at Muhimbili Orthopaedic Institute.

1.6.2. Specific Objectives

1.6.2.1. To determine the prevalence of post operative nausea and vomiting in patients after brain surgery at ICU of Muhimbili Orthopaedic Institute from May to July, 2024.
1.6.2.2. To identify patient, anaesthetic, and surgical factors associated with postoperative nausea and vomiting in brain surgery patients at ICU of Muhimbili Orthopaedic Institute from May to July, 2024.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1. Overview

Postoperative nausea and vomiting has been a serious complication with multisystemic effects and detrimental outcome to patients. The argument has been supported by several studies. PONV is one of the most distressing complications associated with surgery, neurosurgical procedures inclusive (15). PONV leads to various complications including fluid and electrolyte imbalance, airway compromise, venous hypertension, wound dehiscence, and surgical site hematoma. The high intra-abdominal and intrathoracic pressure (>100 mmHg) generated during ejection phase of vomiting is directly transmitted to the intracranial pressure (16). In addition, the risk of aspiration is high in neurosurgical patients due to depressed neurological status or weakened airway reflexes (17). Thus, factors associated with PONV in patients should be identified and efforts made to reduce the cases. However, despite improvement in PONV assessment, prevention, treatment, and management, its prevalence remains high as shown by studies (1-3).

2.2. Prevalence of PONV

The prevalence of PONV is varied in different setups and patients; however, the global average tends to be similar. The assertion is supported with global, regional, and local studies. It has been reported that the general global prevalence of postoperative nausea and vomiting (PONV) in surgical patients is 25-30% (1, 18-21). However, this figure can be much higher among high-risk patients such as those undergoing certain types of surgeries which can be up to 70-80% (6, 21-22). There have been various studies conducted on prevalence of PONV in Africa. In Ethiopia Hoyle et al. studied prevalence and factors associated with PONV among general surgery patient and found that it was 36.2% (10). Owure on his study in Kenya on incidence and contributing factors after ear nose and throat surgery identified a rate of 39.8% (11). At Mulago Hospital in Uganda, Ssebuufu studied PONV among general surgery patients and found a prevalence of 40.7 % of all patients investigated (12). A study carried out by Chalya et al. on PONV in general in a tertiary hospital Tanzania revealed a prevalence rate of 41 percent (9).

These studies suggest that PONV is a serious problem within the region with prevalence rates similar to global averages. Therefore, Chalya and colleagues' research emphasized the existence of high rates of postoperative nausea and vomiting among surgical patients in Tanzania, implying that this issue needs to be addressed significantly by health care providers in the country especially during their training programs or interventions to improve patient outcomes.

2.3. Associated Factors for PONV

The etiology of PONV is multifactorial which can be categorized into those related to the patient, surgical procedure, anaesthesia, and others. This argument is supported by multiple studies that have identified several factors that increase the likelihood of PONV (18-21, 23). These factors can generally be classified into patient factors such as age, gender, history of PONV, history of motion sickness, and smoking status; anesthetic factors such as type of anesthesia, administered drug, and inhalation agent; and surgical factors such as type of operation, anatomical location, and duration of operation (5, 15, 24-25). Understanding the associated causes for PONV enables health professionals to assess and thus prevent, treat, or manage PONV. For example, a patient developing PONV can be determined based on four factors of female gender, no smoking, postoperative opioids, and previous PONV or motion sickness in patients' history (1, 26).

2.4. Effects of PONV

PONV has detrimental effects in different body systems and patient outcome in general. The assertion has been confirmed by multiple studies. Nausea and vomiting frequently occur as distressing complications following anaesthesia and surgical procedures, including those of neurosurgical nature (15). Several studies have associated PONV with delayed PACU (post-anesthetic care unit) discharge, unplanned hospital admissions, increase in hospital costs and utilization of resources, as well as patient dissatisfaction and discomfort (15, 25, 28-30). In particular, Jangra et al. and Uribe et al. reported that PONV leads to various complications including fluid and electrolyte imbalance, airway compromise, venous hypertension, wound dehiscence, surgical site hematoma, and neurosurgical deterioration (15, 25). Fabling and colleagues also reported that the high intra-abdominal and intrathoracic pressure (> 100 mmHg)

generated during the ejection phase of vomiting is directly transmitted to the intracranial cavity, resulting in increased intracranial pressure, intracranial hemorrhage, and/or cerebral herniation (17). Furthermore, in neurosurgical patients in particular, the possibility of aspiration is high due to depressed neurosurgical status or weakened airway reflexes (15, 17). Due to the several adverse effects of PONV, there is a need for health professionals to understand PONV and its changing and varied interventions for effective assessment, prevention, treatment, and management. However, Ndibwire conducted a study conducted at MNH in Tanzania regarding knowledge, attitude, as well as practices by healthcare providers in the management of PONV. The study observed that 61.6% of healthcare providers studied showed limited knowledge while 64.2% of the healthcare providers had negative attitude towards PONV thus compromising their clinical practice regarding PONV (14). Thus, lack of evidence on prevalence of PONV and associated factors at MOI among neurosurgical patients; the impact of PONV on patients and practitioners; and poor knowledge and attitude of practitioners towards PONV; create a gap, therefore, a need for research to improve assessment, prevention, treatment, and management of PONV.

CHAPTER THREE

3.0 METHODOLOGY

3.1. The Design of the Study

This was a descriptive cross-sectional study, conducted at Muhimbili Orthopedics Institute.

3.2. Study Area and Setting

The study was conducted at MOI which is situated in Dar es Salaam, Tanzania. The institute provides mainly neurosurgery, orthopaedic, emergency, and critical care services in Tanzania, and East and Central Africa. It is also a learning and training institute. At least 25 patients are being operated per month for neurosurgery and are admitted to the MOI- ICU post-operation. There is a total of 19 intensive care unit (ICU) beds. The MOI-ICU has 6 registrars, 2 residents, 1 specialist, 5 critical care nurses, 3 nursing officers, and 38 assistant nursing officers. The neurosurgery patients who participated in the study were picked from the MOI intensive care unit (ICU) where neurosurgical patients are admitted postoperatively.

3.3. Study Population

This study included patients who were admitted at MOI-ICU and have undergone neurosurgical procedures. Consent from patients and relatives was obtained to collect data from patients.

3.3.1 Inclusion Criteria

1. Patients aged 18 years and above who have undergone brain surgery procedures at Muhimbili Orthopedic Institute.
2. Patients who have been monitored for at least 48 hours post-operatively to assess the presence of post-operative nausea and vomiting (PONV).
3. Patients whose consent were obtained to participate in the study.
4. Patients admitted in the MOI-ICU both elective and emergency

3.3.2 Exclusion Criteria

1. Patients who had stayed more than 48 hours in the MOI-ICU after brain surgery.
2. Patients with pre-existing conditions that could confound the results, such as chronic nausea or ongoing therapy.

3.4. Study Duration

The research was carried out for three months from May to July, 2024.

3.5. Sample Size

To calculate the statistically appropriate sample size of participants for the intended study, the researcher used the Taro Yamane's formula (31), whereby; **n** is the sample size to be determined for the study; **N** is the population of the study which is approximately 88; and **e** is the margin of error in the calculation which in this case will be 0.05 to ensure that the findings of the study are representative of the population and therefore reliable by 95 percent. Thus, the sample size for the study was determined to be 72 as presented in equation 1.

$$n = \frac{N}{1 + Ne^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$n = \frac{88}{1+88 \times 0.05^2} = 72$$

Therefore, the sample size of 72 participants was studied in this research. This sample size was suitable for this research because it was statistically representative of the population. The use of confidence level of 95% to statistically determine sample size of the participants implies that the results obtained from the sample studied accurately captured 95 percent of population parameters.

3.6. Sampling Procedure

Purposive sampling based on pre-determined inclusive and exclusive criteria was used to select participants for the study; who were postoperative neurosurgery patients admitted in MOI-ICU.

3.7. Description of variables in the Study

Independent Variables: In the study, the independent variables included patient factors such as age, gender, BMI, history of PONV, history of motion sickness, and smoking status, with some data gathered from patient records and their close relatives. Anaesthetic factors like the type of anaesthesia, the specific drugs administered, the inhalation agent used, and the fasting time were also considered. Additionally, surgical factors such as the type of operation, the anatomical location involved, and the duration of the operation were analyzed.

Dependent variables: The dependent variable in this study was the incidence of PONV (Post-Operative Nausea and Vomiting) among neurosurgical patients, which was measured as the number of PONV cases observed.

3.8. Data Collection Method

The study used a checklist to collect data through observation, review of patient records, and interview of patients who could talk. The checklist was adopted from Apfel score, a standard PONV screening tool for neurosurgery, and modified (15, 17, 28). For patient factors; age was recorded in years; sex recorded using binary variable either male or female; and BMI (kg/m^2) calculated using patient's weight in kilograms and height in meters measured at bedside. Anaesthetic factors like fasting time, and surgical factors like duration of operation were measured in hours.

The checklist was divided into five sections: consent and patient information, patient factors, anesthetic factors, surgical factors, and PONV events. The process started with getting consent from patients or their close relatives. The PI then gathered data on patient factors like age, gender, BMI, history of PONV, history of motion sickness, and smoking status. Next, the PI recorded details about the type of anesthesia, the drugs used, inhalation agents, and how long the patient had fasted before surgery.

The researcher then collected information on the type of surgery, where it was performed on the body, and how long it lasted. Finally, the researcher tracked and noted any instances of nausea and vomiting within the first 48 hours after neurosurgery. The data was collected through direct observation, patient records, and interviews with patients or their close relatives, ensuring all important information was captured.

3.10. Data Analysis procedure

The study used both descriptive and inferential statistics to analyze the collected data through SPSS Version 27. Descriptive statistics were employed to organize and summarize the data. Continuous variables, specifically the age and of patients, was analyzed using the median and interquartile range (IQR). Categorical variable including sex, BMI, history of motion sickness, history of PONV, smoking status, duration of operation, use of inhalation agents, type of drugs used, fasting times, types of brain surgery, and anatomical locations of surgery were summarized using frequency tables.

Associations between variables were initially analyzed using the chi-square test, with a p-value of less than or equal to 0.05 considered statistically significant. To further explore the relationships between factors and PONV, logistic regression was conducted. In this analysis, variables with a p-value of 0.2 or below in the bivariate model were included in the multivariate model. In the final logistic regression model, both the p-value (≤ 0.05) and confidence intervals (CIs) were used to determine the statistical significance and strength of the associations.

3.12. Ethical Considerations

The researcher obtained permission to conduct the study from the MUHAS Institutional Review Board. The permission was also be obtained from MOI which is the study area. The study ensured confidentiality, and privacy of participants. Data management adhered to ethical principles and dissemination of the findings is to be done after approval by relevant authorities.

3.13. Limitations of the study

This research experienced a few limitations considering its design and methodology. It was a cross-sectional study thus it could not measure incidence of PONV among neurosurgical patients and cause-effect relationships to determine whether the associated factors are the risk factors. It could not study cause and effect because of the limited time. The study was also prone to being bias because it was a one-time measure of exposure and possible outcome not repeated and controlled.

3.14. Dissemination of the Findings

The submission of the dissertation will be to MUHAS as a requirement of the fulfillment for the degree award of Masters of Medicine in anaesthesiology. Assistance for publication in scientific journals will be sought out from supervisors and a copy will be sent to the Muhimbili Orthopaedic Institute. The research dissemination will also include presentation in scientific conferences.

CHAPTER FOUR

4.0 RESULTS

4.1 Characteristics of the study participants

Table 1: Distribution of participants' age

Variable	Median (Q1, Q3)
Age	44 (35, 60)

Table 2: Characteristics of the study participants

Variable	**Frequency (percentage)**
Sex	
Female	40 (55.6%)
Male	32 (44.4%)
BMI	
>= 25	66 (91.7%)
18-24.9	6 (8.33%)
Nausea and vomiting history	
No	35 (48.6%)
Yes	37 (51.4%)
Motion sickness history	
No	41 (56.9%)
Yes	31 (43.1%)
Smoking	
No	43 (59.7%)
Yes	29 (40.3%)
[1]Median (Q1, Q3); n (%)	

As shown in Table 1, the study sample consisted of 72 patients with a median age of 44 years (IQR 35-60 years). There were 40 females (55.6%) and 32 males (44.4%). Most patients, 66 (91.7%), had a BMI of 25 or higher, while 6 (8.33%) had a BMI between 18 and 24.9. A history of nausea and vomiting was reported by 37 patients (51.4%), while 35 (48.6%) had no such history. Regarding motion sickness, 31 patients (43.1%) had a history, compared to 41 (56.9%) who did not. Smoking was reported by 29 patients (40.3%), while 43 (59.7%) were non-smokers.

4.2 The prevalence of PONV

In the study sample, 38 patients (52.8%) experienced post-operative nausea and vomiting (PONV), while 34 patients (47.2%) did not.

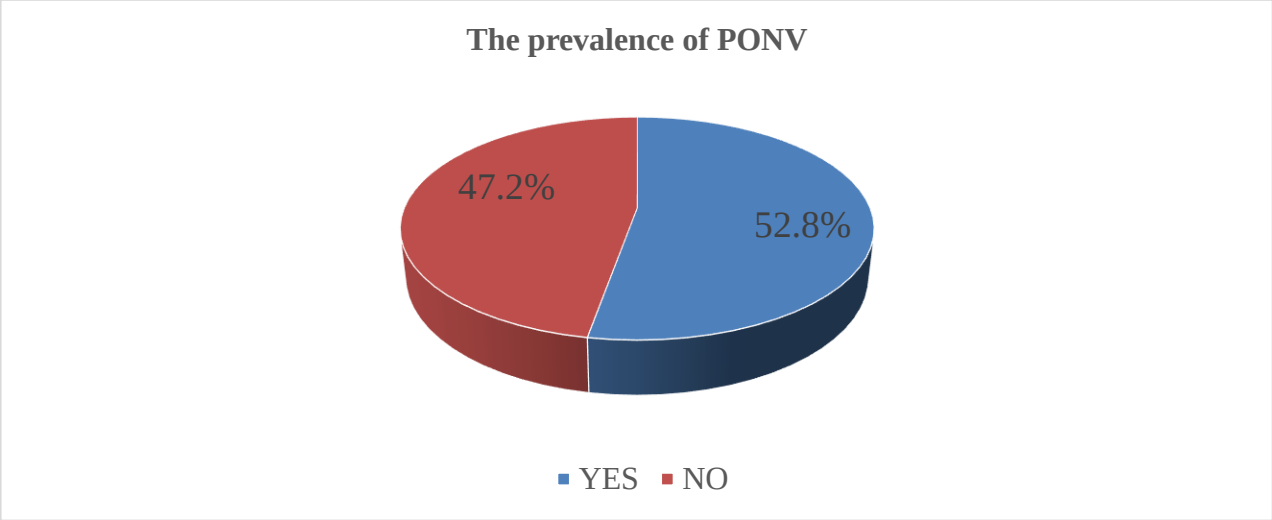


Figure 2: The prevalence of PONV

4.3 Anesthetic factors distribution

Table 3:The distribution of Anesthetic factors among the study participants

Anesthetic factors	Frequency (N=72)	Percentage
Was inhalational agent used		
No	1	1.39%
Yes	71	98.6%
Fasting time		
<= 8 Hrs.	17	23.6%
> 8 Hrs.	55	76.4%
History of post-operative nausea and vomiting		
No	35	48.6%
Yes	37	51.4%
Anesthetic drugs administered		
Propofol		
No	6	8.33%
Yes	66	91.7%
Midazolam		
No	63	87.5%
Yes	9	12.5%
Isoflurane		
No	29	40.3%
Yes	43	59.7%
Sevoflurane		
No	28	38.9%
Yes	44	61.1%
Fentanyl		
No	13	18.1%
Yes	59	81.9%
NSAIDs		
No	54	75.0%
Yes	18	25.0%
Atracurium		
No	1	1.39%
Yes	71	98.6%
Suxamethonium		
No	3	4.17%
Yes	69	95.8%
Paracetamol		
No	48	66.7%
Yes	24	33.3%
Morphine		
No	64	88.9%

Yes	8	11.1%
Pethidine		
No	72	100%
Yes	0	0%
Lignocaine		
No	72	100%
Yes	0	0%
Bupivacaine		
No	72	100%
Yes	0	0%
Ropivacaine		
No	72	100%
Yes	0	0%

Among the study participants as presented in Table 2, inhalational agents were used in 71 patients (98.6%). Propofol was administered to 66 patients (91.7%), and midazolam to 9 patients (12.5%). A history of post-operative nausea and vomiting was reported by 37 patients (51.4%). Isoflurane was used in 43 patients (59.7%) and sevoflurane in 44 patients (61.1%). Fentanyl was administered to 59 patients (81.9%), and NSAIDs to 18 patients (25.0%). Atracurium was used in 71 patients (98.6%), and suxamethonium in 69 patients (95.8%). Paracetamol was given to 24 patients (33.3%), and morphine to 8 patients (11.1%). Pethidine, lignocaine, bupivacaine, and ropivacaine were not administered to any patients. Regarding fasting time, 55 patients (76.4%) fasted for more than 8 hours, while 17 patients (23.6%) fasted for 8 hours or less.

Table 4: The distribution of surgical factors among the study participants

Surgical factors	Frequency	Percentages
Duration of operation		
< 1 Hrs.	6	8.33%
1-4 Hrs.	27	37.5%
> 4 Hrs.	39	54.2%
Type of brain surgery		
Craniotomy	57	79.2%
Non-craniotomy	15	20.8%
Anatomic location of surgery		
Cortex		
No	36	50.0%
Yes	36	50.0%
Brainstem		
No	71	98.6%
Yes	1	1.39%
Cranial nerves		
No	71	98.6%
Yes	1	1.39%
Ventricles		
No	63	87.5%
Yes	9	12.5%
Meninges		
No	48	66.7%
Yes	24	33.3%
Vessels		
No	66	91.7%
Yes	6	8.33%
Posterior fossa		
No	69	95.8%
Yes	3	4.17%

In the study sample as presented in Table 3, the duration of operation varied as follows: 6 patients 8.33%) had operations lasting less than 1 hour, 27 patients 37.5%) had operations lasting between 1 and 4 hours, and 39 patients 54.2%) had operations lasting more than 4 hours. The majority of surgeries were craniotomies, performed in 57 patients 79.2%), while 15 patients 20.8%) underwent non-craniotomy procedures. Anatomically, surgeries were distributed as

follows: the cortex was involved in 36 patients 50.0%), the brainstem in 1 patient 1.39%), cranial nerves in 1 patient 1.39%), ventricles in 9 patients 12.5%), meninges in 24 patients 33.3%), vessels in 6 patients 8.33%), and the posterior fossa in 3 patients 4.17%).

4.4 Factors associated with PONV

4.4.1 Patient factors associated with PONV

Table 5: Patient factors associated with PONV

		PONV		
Demographic factors	**N**	**Yes**, N = 38[1]	**No**, N = 34[1]	**p-value**[2]
Age	72	44 (35, 60)	44 (34, 58)	0.8
Sex	72			
Female		26 (68.4%)	14 (41.2%)	0.020
Male		12 (31.6%)	20 (58.8%)	
BMI	72			
>= 25		37 (97.4%)	29 (85.3%)	0.094
18-24.9		1 (2.6%)	5 (14.7%)	
Nausea and vomiting history	72			
No		14 (36.8%)	21 (61.8%)	0.035
Yes		24 (63.2%)	13 (38.2%)	
Motion sickness history	72			
No		17 (44.7%)	24 (70.6%)	0.027
Yes		21 (55.3%)	10 (29.4%)	
Smoking	72			
No		18 (47.4%)	25 (73.5%)	0.024
Yes		20 (52.6%)	9 (26.5%)	

[1]Median (IQR); n (%)

[2]Wilcoxon rank sum test; Pearson's Chi-squared test; Fisher's exact test

As shown in Table 4, age did not significantly differ between patients with PONV (median 44 years) and those without (median 44 years; p value= 0.8). However, females were more likely to experience PONV, with 68.4% of those with PONV being female compared to 41.2% of those without (p value = 0.020). A history of nausea and vomiting was also significantly associated with PONV; 63.2% of patients with PONV had such a history versus 38.2% without (p value= 0.035). Motion sickness history and smoking were significantly associated with PONV as well,

with 55.3% of patients with PONV having a history of motion sickness (p value= 0.027) and 52.6% of smokers experiencing PONV compared to 26.5% of non-smokers (p value= 0.024). Also, BMI did not show a significant difference between the groups (p = 0.094).

4.4.2 Anaesthetic factors associated with PONV

Table 6: Anesthetic factors associated with PONV

Anaesthetic Factors	**N**	**Yes**, N = 38[1]	**No**, N = 34[1]	**p-value**[2]
Was inhalation agent used	72			
No		0 (0.0%)	1 (2.9%)	0.5
Yes		38 (100.0%)	33 (97.1%)	
Anaesthetic drugs administered (Propofol)	72			
No		3 (7.9%)	3 (8.8%)	>0.9
Yes		35 (92.1%)	31 (91.2%)	
Anaesthetic drugs administered (Midazolam)	72			
No		34 (89.5%)	29 (85.3%)	0.7
Yes		4 (10.5%)	5 (14.7%)	
History of PONV and vomiting	72			
No		14 (36.8%)	21 (61.8%)	0.035
Yes		24 (63.2%)	13 (38.2%)	
Anaesthetic drugs administered (Isoflurane)	72			
No		15 (39.5%)	14 (41.2%)	0.9
Yes		23 (60.5%)	20 (58.8%)	
Anaesthetic drugs administered (Sevoflurane)	72			
No		15 (39.5%)	13 (38.2%)	>0.9
Yes		23 (60.5%)	21 (61.8%)	
Anaesthetic drugs administered (Fentanyl)	72			
No		10 (26.3%)	3 (8.8%)	0.054
Yes		28 (73.7%)	31 (91.2%)	
Anaesthetic drugs administered (NSAIDs)	72			
No		28 (73.7%)	26 (76.5%)	0.8
Yes		10 (26.3%)	8 (23.5%)	
Anaesthetic drugs administered (Atracurium)	72			
No		1 (2.6%)	0 (0.0%)	>0.9
Yes		37 (97.4%)	34 (100.0%)	
Anaesthetic drugs administered (Suxamenthonium)	72			
No		3 (7.9%)	0 (0.0%)	0.2

Yes		35 (92.1%)	34 (100.0%)	
Anaesthetic drugs administered (Paracetamol)	72			
No		27 (71.1%)	21 (61.8%)	0.4
Yes		11 (28.9%)	13 (38.2%)	
Anaesthetic drugs administered (Morphine)	72			
No		32 (84.2%)	32 (94.1%)	0.3
Yes		6 (15.8%)	2 (5.9%)	
Fasting time	72			
<= 8 hrs		12 (31.6%)	5 (14.7%)	0.092
> 8hrs		26 (68.4%)	29 (85.3%)	

[1]n (%)
[2]Fisher's exact test; Pearson's Chi-squared test

As indicated in Table 6, the use of inhalation agents was not significantly different between patients with PONV (0%) and those without (2.9%; p = 0.5). Propofol and Midazolam also showed no significant association with PONV, with 92.1% and 10.5% of patients with PONV, respectively, compared to 91.2% and 14.7% without PONV (p > 0.9 and p = 0.7). However, a significant association was observed for a history of PONV, with 63.2% of patients with PONV having such history compared to 38.2% without (p = 0.035). The use of Isoflurane and Sevoflurane did not show significant differences between the groups (p = 0.9 for both). Fentanyl administration approached significance, with 73.7% of patients with PONV and 91.2% without having received it (p = 0.054). The use of NSAIDs, Atracurium, and Suxamethonium did not show significant differences, while Paracetamol and Morphine also had no significant association with PONV (p = 0.4 and p = 0.3). Fasting time was not significantly associated with PONV, with 68.4% of patients with PONV fasting for more than 8 hours compared to 85.3% without PONV (p = 0.092).

4.4.2 Surgical factors associated with PONV

Table 7: Surgical factors associated with PONV

Variable	N	Yes, N = 38[1]	No, N = 34[1]	p-value[2]
Duration of operation	72			
< 1 Hrs.		4 (10.5%)	2 (5.9%)	0.9
1-4 Hrs.		14 (36.8%)	13 (38.2%)	
> 4 Hrs.		20 (52.6%)	19 (55.9%)	
Type of brain surgery	72			
Craniotomy		29 (76.3%)	28 (82.4%)	0.5
non-craniotomy		9 (23.7%)	6 (17.6%)	
Anatomical location (Cortex)	72			
No		21 (55.3%)	15 (44.1%)	0.3
Yes		17 (44.7%)	19 (55.9%)	
Anatomical location (Brainstem)	72			
No		37 (97.4%)	34 (100.0%)	>0.9
Yes		1 (2.6%)	0 (0.0%)	
Anatomical location (Cranial nerves)	72			
No		37 (97.4%)	34 (100.0%)	>0.9
Yes		1 (2.6%)	0 (0.0%)	
Anatomical location (Ventricles)	72			
No		31 (81.6%)	32 (94.1%)	0.2
Yes		7 (18.4%)	2 (5.9%)	
Anatomical location (Meninges)	72			
No		26 (68.4%)	22 (64.7%)	0.7
Yes		12 (31.6%)	12 (35.3%)	
Anatomical location (Vessels)	72			
No		36 (94.7%)	30 (88.2%)	0.4
Yes		2 (5.3%)	4 (11.8%)	
Anatomical location (Posterior fossa)	72			
No		36 (94.7%)	33 (97.1%)	>0.9
Yes		2 (5.3%)	1 (2.9%)	

[1]n (%)
[2]Fisher's exact test; Pearson's Chi-squared test

As presented in Table 6, the duration of the operation did not significantly differ between patients with PONV and those without, with similar distributions across duration categories: less than 1 hour (10.5% with PONV vs. 5.9% without; p-value = 0.9), 1-4 hours (36.8% with PONV vs. 38.2% without), and more than 4 hours (52.6% with PONV vs. 55.9% without). The type of brain surgery also showed no significant difference; craniotomies were performed in 76.3% of patients with PONV and 82.4% without PONV, while non-craniotomies were performed in 23.7% with PONV and 17.6% without (p-value = 0.5). Regarding anatomical locations, there were no significant differences between groups. Surgeries involving the cortex were seen in 44.7% of patients with PONV and 55.9% without (p-value = 0.3). Involvement of the brainstem and cranial nerves was minimal, with 2.6% of patients with PONV and none without experiencing these (p-value > 0.9). The involvement of ventricles was noted in 18.4% of patients with PONV compared to 5.9% without (p-value = 0.2). Meninges were involved in 31.6% of patients with PONV and 35.3% without (p-value = 0.7). The involvement of vessels was seen in 5.3% of patients with PONV and 11.8% without (p-value = 0.4), while the posterior fossa was involved in 5.3% of patients with PONV and 2.9% without (p-value > 0.9).

4.5 Logistic regression for factors associated with PONV

4.5.1 Patient factors associated with PONV

Table 8: Bivariate and multivariate logistic regression for factors associated with PONV

		Bivariate			Multivariate		
Characteristic	**N**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Sex	72						
Female		1			1		
Male		0.32	0.12, 0.84	0.022	0.25	0.07, 0.78	0.021
BMI Category	72						
18-24.9		1			1		
>= 25		6.38	0.96, 12.6	0.10	3.75	0.46, 79.2	0.3
History of PONV	72						
No		1			1		
Yes		2.77	1.08, 7.37	0.037	1.42	0.45, 4.40	0.5
History of motion sickness	72						
No		1			1		
Yes		2.96	1.14, 8.11	0.029	4.07	1.23, 15.1	0.026
Smoking status	72						
No		1			1		
Yes		3.09	1.17, 8.63	0.026	6.28	1.84, 25.5	0.006

[1]OR = Odds Ratio, CI = Confidence Interval

Table 7 shows that in the bivariate analysis, males were found to have a significantly lower likelihood of experiencing PONV compared to females, with an odds ratio (OR) of 0.32 (95% CI: 0.12, 0.84; p-value = 0.022). This association remained significant in the multivariate model, where the OR was 0.25 (95% CI: 0.07, 0.78; p-value = 0.021). For BMI, individuals with a BMI of 25 or higher showed a potential increased likelihood of PONV in the bivariate analysis, with an OR of 6.38 (95% CI: 0.96, 126; p-value = 0.10). However, this association was not significant in the multivariate analysis, where the OR was 3.75 (95% CI: 0.46, 79.2; p-value = 0.3). A history of PONV was associated with an increased likelihood of PONV in the bivariate analysis (OR = 2.77; 95% CI: 1.08, 7.37; p-value = 0.037). In the multivariate model, this association did not remain significant, with an OR of 1.42 (95% CI: 0.45, 4.40; p-value = 0.5).

Individuals with a history of motion sickness had a significantly higher likelihood of PONV, with an OR of 2.96 (95% CI: 1.14, 8.11; p-value = 0.029) in the bivariate analysis. This association was even stronger in the multivariate analysis, with an OR of 4.07 (95% CI: 1.23, 15.1; p-value = 0.026). Smokers also had a higher likelihood of PONV, with a bivariate OR of 3.09 (95% CI: 1.17, 8.63; p-value = 0.026). This association was more pronounced in the multivariate analysis, where the OR was 6.28 (95% CI: 1.84, 25.5; p-value = 0.006).

CHAPTER FIVE

5.0 DISCUSSION

The current study aimed at investigating the prevalence and factors associated with post-operative nausea and vomiting in patients after neurosurgery at Muhimbili Orthopaedic Institute**.** The global prevalence of PONV is reported to range from 25-30% among surgical patients, with rates climbing to 70-80% in high-risk groups, such as those undergoing complex or prolonged surgeries (1, 18-21). Findings of the current study, showing PONV prevalence of 52.8% among neurosurgical patients, suggest a higher-than-average prevalence, underscoring the substantial burden of PONV in this population. The higher prevalence observed in this study is consistent with previous research highlighting the increased risk of PONV in neurosurgical patients due to the nature of the procedures and the potential for elevated intra-abdominal and intracranial pressures (15, 17). Neurosurgical patients are particularly vulnerable to PONV due to factors such as the high intra-abdominal and intracranial pressure during vomiting and the increased risk of aspiration due to compromised airway reflexes. This elevated risk is reflected in the present study's findings and aligns with the reported prevalence rates in other regional studies, including 36.2% in Ethiopia (10), 39.8% in Kenya (11), and 41% in Tanzania (9).

The present study's examination of patient factors associated with PONV reveals several critical findings. The increased prevalence of PONV in females and those with a history of PONV or motion sickness is consistent with existing literature (1, 26). These findings reinforce the importance of considering patient factors in assessing PONV risk. The higher prevalence of PONV among female patients and those with a history of motion sickness or previous episodes of nausea and vomiting highlights the need for targeted prevention strategies for these high-risk groups.

However, the findings of this study also present some discrepancies compared to previous studies, particularly regarding the impact of BMI, anaesthetic drugs, and fasting times. For instance, the present study did not find significant associations between BMI categories or fasting times and PONV, which contrasts with some studies that highlight these factors as influential (18-21). This variation could be due to differences in study samples, methodologies, or the specific surgical and anaesthetic protocols employed. The lack of a significant association

with fentanyl administration in this study, compared to its reported effects in other research, may also suggest that its role in PONV is complex and influenced by other variables not fully captured in this study's analysis.

Surgical factors, such as the duration of operation and type of brain surgery, did not show strong associations with PONV in the present study. This finding is in line with some literature suggesting that the impact of these factors can vary widely depending on the specific context of the surgery and the individual patient characteristics (5, 24-25). The anatomical location of surgery showed mixed results, with certain locations, like the cortex or ventricles, potentially affecting PONV condition differently. This variability highlights a need for further research to clarify the relationship between surgical factors and PONV. Multivariate analysis revealed that a history of PONV and motion sickness were significant predictors of PONV, although their effect appeared to diminish when adjusted for other factors. This suggests that these factors interact with others not fully captured in our study, indicating a need for more comprehensive research to understand the complex interplay of variables influencing PONV. The trend toward significance for Fentanyl and fasting time in our multivariate analysis further emphasizes the need for ongoing investigation into these potential risk factors.

The findings of this study highlight the importance of identifying and managing high-risk patients based on their history of PONV, motion sickness, and gender. Formulating effective prevention and treatment strategies to these individuals could significantly improve patient outcomes. Also, addressing gaps in healthcare providers' knowledge and attitudes towards PONV, as identified in other studies (14), is crucial for enhancing clinical practice and improving overall patient care.

In general, while this study confirms the high prevalence of PONV among neurosurgical patients and identifies key associated factors, it also highlights the need for continued research to refine understanding and management of this complex condition. By addressing identified gaps and formulating interventions to high-risk patients, healthcare providers can improve the prevention, treatment, and management of PONV, ultimately enhancing patient outcomes and quality of care.

CHAPTER SIX

6.0 CONCLUSION, AND RECCOMENDATIONS

6.1 Conclusion

Based on this study, the prevalence of PONV among neurosurgical patients at Muhimbili Orthopedic Institute was 52.8 percent. This high level of PONV prevalence is associated with patient factors of history of motion sickness; history of PONV; smoking status; and female sex. However, it was found that patient factors of age and BMI; anesthetic factors of fasting times, use of inhalational agents, and types of drugs administered; and surgical factors of duration of operation, type of brain surgeries, and anatomical locations of brain surgery are not significantly associated with PONV at MOI.

6.2 Recommendations

Healthcare providers, particularly at MOI, should conduct proper assessment of patient factors to establish their history of motion sickness, history of post-operative nausea and vomiting, smoking status, and their gender so as to administer effective prevention, management, and treatment strategies to reduce the prevalence of PONV among neurosurgery patients at MOI.

Further research should be conducted on types of drugs administered particularly Fentanyl, as well as, anatomical locations of brain surgery particularly cortex, ventricles, vessels for refined and conclusive findings on whether they are significantly associated or not associated with PONV.

REFERENCES

1. Pierre S, Whelan R. Nausea and vomiting after surgery. Continuing *Education in Anaesthesia Critical Care & Pain*. 2013; 131):28–32.

2. Elvir-Lazo OL, White PF, Yumul R, Cruz Eng H. Management strategies for the treatment and prevention of postoperative/postdischarge nausea and vomiting: an updated review. F1000Res. 2020 Aug 13;9: F1000 Faculty Rev-983. doi: 10.12688/f1000research.21832.1. PMID: 32913634; PMCID: PMC7429924.

3. Greenlee H, Darwin L. Postoperative nausea and vomiting. Anaesthesia & Intensive Care Medicine. 2021 Oct 1;2210):625-9.

4. Shaikh SI, Nagarekha D, Hegade G, Marutheesh M. Postoperative nausea and vomiting: A simple yet complex problem. *Anesth Essays Res*. 2016;103):388-396.

5. Yosief PK, Beraki GG, Mayer S, Mengistu MB, Tesfamariam EH. Incidence and risk factors of postoperative nausea and vomiting after ENT surgery. Int J Anesthetic Anesthesiol. 2022; 9:132.

6. Apfel CC, Kranke P, Katz MH, et al. Volatile anaesthetics may be the main cause of early but not delayed postoperative vomiting: a randomized controlled trial of factorial design. *Br J Anaesth*. 2002;885):659-668

7. Onyando AA. *The effect of preoperative volume loading on the incidence of postoperative nausea and vomiting at Kenyatta National Hospital*. 2014.

8. Isaka HJI. Incidence of postoperative nausea and vomiting and associated risk factors among patients undergoing elective surgery at Muhimbili National Hospital, Dar Es Salaam, Tanzania. *MUHAS Research bulletin*. 2014; 171):157-158

9. Chalya PL, Mhewa OZ, Mabula JB. Postoperative nausea and vomiting at a tertiary care hospital in north-western Tanzania. Tanzania Journal of Health Research. 2015; 173).

10. Hoyle, Reddi, Melkie. Prevalence and factors associated with postoperative nausea and vomiting, northwest Ethiopia. 2012.

11. Sizemore DC, Singh A, Dua A, Singh K, Grose BW. Postoperative Nausea. 2022 Nov 9. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan–. PMID: 29763205.

12. Ssebuufu R, Kakande I, Okello M. Post-operative nausea and vomiting at Mulago Hospital. *East and Central African Journal of Surgery*. 2009; 14:50-57.

13. Screelakshmi V, Malleswari R, Nagaraju T. Postoperative nausea and vomiting prophylaxix: A comparative study of graniesetron alone and graniesetron plus dexamethasone after ENT surgeries. *Journal of Evidence Based Medicine and Healthcare*. 2015; 2:44.

14. Elvir-Lazo OL, White PF, Yumul R, Cruz Eng H. Management strategies for the treatment and prevention of postoperative/post discharge nausea and vomiting: an updated review. F1000Res. 2020 Aug 13;9: F1000 Faculty Rev-983. doi: 10.12688/f1000research.21832.1. PMID: 32913634; PMCID: PMC7429924.

15. Jangra K, Kumari K, Panda NB, Samagh N, Luthra A. Postoperative nausea and vomiting in neurosurgical patients: Current concepts and management. *Neurol India*. 2018;664):1117-1123.

16. Andrews PL. Physiology of nausea and vomiting. *Br J Anaesth*. 1992;697 Suppl 1):2S-19S. Doi: 10.1093/bja/69.supplement_1.2s

17. Fabling JM, Gan TJ, Guy J, Borel CO, el-Moalem HE, Warner DS. Postoperative nausea and vomiting. A retrospective analysis in patients undergoing elective craniotomy. *J Neurosurg Anesthesiol*. 1997;94):308-312.

18. Kovac AL. Prevention and treatment of postoperative nausea and vomiting. *Drugs*. 2000; 59:213-243.

19. Kazemi-Kjellberg F, Henzi I, Tramèr MR. Treatment of established postoperative nausea and vomiting: a quantitative systematic review. *BMC Anesthesiol*. 2001;11):2. doi:10.1186/1471-2253-1-2

20.Van den Bosch JE, Kalkman C, Vergouwe Y, Van Klei, et al. Assessing the applicability of the scoring system for predicting postoperative nausea and vomiting. *Anaesthesia*. 2005; 60: 323-331.

21. Gan TJ, Diemunsch P, Habib AS, et al. Consensus guidelines for the management of postoperative nausea and vomiting. *Anesth Analg*. 2014;1181):85-113.

22. Smith HS, Smith EJ, Smith BR. Postoperative nausea and vomiting. *Annals of Palliative Medicine*. 2012; 1: 94-102.

23. Maleck WH, Piper SN. Predictive models for postoperative nausea and vomiting. *British Journal of Anesthesia*. 2002; 88: 339-342

25. Uribe AA, Stoicea N, Echeverria-Villalobos M, et al. Postoperative nausea and vomiting after craniotomy: An evidence-based review of general considerations, risk factors, and management. *J Neurosurg Anesthesiol*. 2021;333):212-220.

26. Weilbach C, Rahe-meyer N, Raymondos K, Weissig A, Scheinichen D, Piepenbrock S. Postoperative nausea and vomiting PONV): Usefulness of the Apfel-score for identification of high-risk patients for PONV. *Acta Anaesthesiol Belg*. 2006;574):361-363.

27. Apfel CC, Läärä E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. *Anesthesiology*. 1999;913):693-700.

28. Eberhart LH, Morin AM, Kranke P, Missaghi NB, Durieux ME, Himmelseher S. Prevention and control of postoperative nausea and vomiting in post-craniotomy patients. *Best Pract Res Clin Anaesthesiol*. 2007;214):575-593.

29. Latz B, Mordhorst C, Kerz T, et al. Postoperative nausea and vomiting in patients after craniotomy: incidence and risk factors. J Neurosurg. 2011; 114:491–496.

30. Lonjaret L, Guyonnet M, Berard E, et al. Postoperative complications after craniotomy for brain tumor surgery. *Anaesth Crit Care Pain Med*. 2017; 36:213–218.

31. Yamane T. *Statistics: An introductory analysis*. London: John Weathers Hill, Inc., 1973.

32. Werner J, Fernandez S, Awad H. The role of smoking in the development of postoperative nausea and vomiting. Anesthesiology. 2008; 109: 156-157.

33. Kim E, Ahn H, Park S, et al. Risk factors of postoperative nausea and vomiting: Development of Korean risk model. *Korean Journal of Anesthesiology*. 2005; 484): 380-386.

34. Mishra A, Srivastava U, Kumar D, et al. Nausea and vomiting after ENT surgeries: A comparison between ondansetron, metoclopramide and small dose of propofol. *Indian J Otolaryngol Head Neck Surg*. 2010; 62: 29-31.

35. Onyando A. The effect of preoperative volume loading on the incidence of postoperative nausea and vomiting at Kenyatta National Hospital.

36. Kovac A. Postoperative and postdischarge nausea and vomiting after ambulatory surgery: An update. *Current Anesthesiology Reports*. 2014; 4: 316-325.

37. Meng L, Quinlan J. Assessing risk factors for postoperative nausea and vomiting: A retrospective study in patients undergoing retromastoid craniectomy with microvascular decompression of cranial nerves. *J Neurosurg Anesthesiol*. 2006; 18: 235-239.

38. Tan c, Ries CR, Mayson K, Gharapetian A, Griesdale DE. Indication for surgery and risk of postoperative nausea and vomiting after craniotomy: A case-control study. *J Neurosurg Anesthesiol*. 2012; 24:325-330.

39. Manninen PH, Raman SK, Boyle K, Gharapetian A, Griesdale DE. Early postoperative complications following neurosurgical procedures. *Can J Anesth*. 1999; 46: 7-14.

APPENDICES

Appendix A: Consent Form

Muhimbili Orthopaedic Institute,

A checklist has been prepared to collect data on **Prevalence and Factors Associated with Post-Operative Nausea and Vomiting in Patients after Neurosurgery at Muhimbili Orthopaedic Institute.** My name is Dr. Ocholla Amon Carlmera. I am pursuing Masters of Medicine in Anesthesiology at Muhimbili University of Health and Allied Sciences MUHAS). I have received permission from the MUHAS Institution Review Board and the Research, Training and Consultancy Unit at MOI to conduct research entitled, **Prevalence and Factors Associated with Post-Operative Nausea and Vomiting in Patients after Neurosurgery at Muhimbili Orthopaedic Institute.** The broad objective of the research is to assess the prevalence of post operative nausea and vomiting and associated factors in patients after brain surgery at Muhimbili Orthopaedic Institute. The findings of this study will contribute to reducing postoperative nausea and vomiting events, complications, length of hospital stay, cost of hospitalization, as well as, increasing patient satisfaction and outcome. You have been randomly selected from the target population to participate in this research. I am therefore requesting you to voluntarily ask you some questions as I feel the checklist. There are no known risks associated with this research. You do not need to write your name or any identifying detail and your responses will be kept anonymous and strictly confidential. The collected data will be properly stored, managed and disposed, and only the researcher, research assistants, and research supervisors will have access to data. The debriefing of research will be done at the end of the study. I am kindly requesting you to answer every question. Would you be willing to participate, please put "X" mark below:

Yes **……...**

No **……**

Having been well explained to and informed of participants' rights, objectives and benefits of this research; I voluntarily consent to participate in the research.

Sign Date

…… ……

Researcher's Personal Contact: +255 742 111 578/+254720066908

Appendix B: Fomu ya Idhini

Taasisi ya Mifupa Muhimbili,

Orodha ya ukaguzi imetayarishwa ili kukusanya data kuhusu **Maambukizi na Mambo Yanayohusishwa na Kichefuchefu Baada ya Upasuaji na Kutapika kwa Wagonjwa baada ya Upasuaji wa Ubongo katika Taasisi ya Mifupa Muhimbili.** Jina langu ni Dk. Ocholla Amon Carlmera. Ninasomea Shahada ya Uzamili ya Udaktari wa Dawa ya Unuku katika Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili MUHAS). Nimepata kibali kutoka kwa Bodi ya Mapitio ya Taasisi ya MUHAS na Kitengo cha Utafiti, Mafunzo na Ushauri cha MOI kufanya utafiti unaoitwa, **Maambukizi na Mambo yanayohusishwa na Kichefuchefu na Kutapika Baada ya Upasuaji kwa Wagonjwa baada ya Upasuaji wa Ubongo katika Taasisi ya Mifupa Muhimbili.** Madhumuni mapana ya utafiti huo ni kutathmini kiwango cha kuenea kwa kichefuchefu na kutapika baada ya upasuaji na mambo yanayohusiana na hayo kwa wagonjwa baada ya upasuaji wa ubongo katika Taasisi ya Mifupa ya Muhimbili. Matokeo ya utafiti huu yatachangia kupunguza matukio ya kichefuchefu na kutapika baada ya upasuaji, matatizo, muda wa kukaa hospitalini, gharama ya kulazwa hospitalini, na pia, kuongeza kuridhika kwa mgonjwa na matokeo. Umechaguliwa bila mpangilio kutoka kwa walengwa kushiriki katika utafiti huu. Kwa hivyo ninakuomba kukuuliza kwa hiari baadhi ya maswali kadri ninavyohisi orodha ya ukaguzi. Hakuna hatari zinazojulikana zinazohusiana na utafiti huu. Huhitaji kuandika jina lako au maelezo yoyote ya utambulisho na majibu yako yatahifadhiwa bila kujulikana na kuwa siri kabisa. Data iliyokusanywa itahifadhiwa, kudhibitiwa na kutupwa ipasavyo, na ni mtafiti, wasaidizi wa utafiti, na wasimamizi wa utafiti pekee ndio watapata data. Muhtasari wa utafiti utafanywa mwishoni mwa utafiti. Naomba unijibu kila swali. Je, ungependa kushiriki, tafadhali weka alama ya “X” hapa chini: -

Ndiyo **……**

Hapana **……**

Baada ya kuelezwa na kufahamishwa vyema kuhusu haki, malengo na manufaa ya washiriki wa utafiti huu; Ninakubali kwa hiari kushiriki katika utafiti.

Tarehe ya Saini

……

Mawasiliano Binafsi ya Mtafiti: +255 742 111 578/+254720066908

Appendix C: Postoperative Nausea and Vomiting PONV)

Data Collection Checklist

Patient ID: ……

Instructions:

- Fill out this checklist by observing the patient or reviewing their medical records.
- Place a checkmark ✓) in the box that applies.

Patient Factors

1. Age: _____ years
2. Sex:
   - ☐ Male
   - ☐ Female
3. Body Mass Index BMI): _____ kg/m²
4. History of PONV:
   - ☐ Yes
   - ☐ No
5. History of motion sickness:
   - ☐ Yes
   - ☐ No
6. Smoking status:
   - ☐ Current smoker
   - ☐ Former smoker
   - ☐ Never smoker

Anesthetic Factors

1. Type of anesthesia:
   - ☐ General
   - ☐ Regional
   - ☐ Local
2. Anesthetic drugs administered: Please list all drugs:
   - a) Propofol b) Midazolam c) Isoflurane d) Sevoflurane e) Fentanyl f) NSAIDs g) Atracurium h) Suxamenthonium i) Paracetamol j) Morphine k) Pethidine l) Lignocaine m) Bupivacaine n) Ropivacaine……
3. Inhalation agent used:
   - ☐ Yes
   - ☐ No
4. Fasting time:
   - ☐ < 2 hours
   - ☐ 2-8 hours
   - ☐ 8 hours

Surgical Factors

1. Type of Operation: Please specify: _
   - ☐ Craniotomy
   - ☐ Non-Craniotomy_____
2. Anatomical Location of Surgery: Please specify: _
   - Cortex, Brain stem, Cranial nerves, Ventricles, Meninges, Vessels, Posterior fossa_____
3. Duration of Operation:
   - ☐ < 1 hour
   - ☐ 1-4 hours
   - ☐ >4 hours

PONV Events

- **1. Did any postoperative nausea and vomiting episodes occur in the first 48 hours after surgery?**
  • Yes
  • No
3. **If Yes, please state the number of nausea and vomiting episodes in the first 48 hours after surgery: _____**

Appendix D: Ethical Clearances

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

Ref. No DA.282/298/01.C/ 2304 Date: 05/06/2024

MUHAS-REC-06-2024-2304
Ocholla Amon Carlmera,
College of Medicine,
MUHAS.

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: PREVALENCE AND FACTORS ASSOCIATED WITH POST-OPERATIVE NAUSEA AND VOMITING IN PATIENTS AFTER NEUROSURGERY AT MUHIMBILI ORTHOPAEDIC INSTITUTE.

Reference is made to the above heading,

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 05/06/2024
EXPIRATION DATE OF APPROVAL: 05/06/2025

STUDY DESCRIPTION:
Purpose:
The purpose of this study is to assess the prevalence and factors associated with post-operative nausea and vomiting in patients after neurosurgery at Muhimbili Orthopaedic Institute.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided:
https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2014532.pdf and in the MUHAS archives.

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The PI is required to:

1 Submit bi-annual progress reports and final report upon completion of the study.

2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.

3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.

4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.

5. Data security is ultimately the responsibility of the investigator.

6. Apply for and obtain data transfer agreement (DTA) from NIMR if data will be transferred to a foreign country.

7 Apply for and obtain material transfer agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country,

8. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)

9 The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.

10. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https //drp muhas.ac.tz/

Dr Nahya S Masoud

For Chairperson, MUHAS Research and Ethics Committee

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Appendix E: Ethical Clearances

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote:
Ref. No. HD/MUH/K.30/2020 04th June 2024

The Executive Director,
Muhimbili Orthopaedics Institute
P.O. Box 65474,
DAR ES SALAAM

Re: INTRODUCTION LETTER OCHOLLA AMON CARLMERA

We would like to inform you that the bearer of this letter is **Ocholla Amon Carlmera** with Reg. No. **HD/MUH/K.30/2020** is a student at Muhimbili University of Health and Allied Sciences (MUHAS) "pursuing **MMed. Anaethesiology.**

As part of his studies, he will be doing an elective research titled: **"Prevalence and Factors Associated with Post-Operative Nausea and Vomiting in Patients After Neurosurgery at Muhimbili Orthopaedic Institute.** he is being supervised by Dr Selehe Mrutu from MUHAS and Respicious Boniface from MOI.

The research has been approved by the Chairman of University Senate.

Kindly provide him the necessary assistance to facilitate the conduct of his research.

We thank you for your cooperation.

Ms. Victoria Mwanilwa
For: DIRECTOR, POSTGRADUATE STUDIES

c.c Ocholla Amon Carlmera

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