IMMEDIATE POST OPERATIVE COMPLICATIONS AND ASSOCIATED FACTORS AS SEEN AT MUHIMBILI NATIONAL HOSPITAL OPERATION THEATERS, DAR ES SALAAM TANZANIA, 2007

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By

David Moses Polepole, MD

A Dissertation Submitted in Fulfillment of the Requirements for the Degree of Master of Medicine (Anaesthesiology) of the Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences

2008

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled ***Immediate Post Operative Complications And Associated Factors As Seen At Muhimbili National Hospital Operation Theaters In Dar Es Salaam, Tanzania,*** in fulfillment of the requirements for the degree of Master of Medicine (Anaesthesiology) of Muhimbili University of Health and Allied Sciences.

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Date: 20th November 2008

DECLARATION AND COPYRIGHT

I, **David Moses Polepole,** declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature: _____ Date: 20th November. 2008

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ABSTRACT

Background: The subject of postoperative complication and prevention has continued to generate interest in the last decade. Unfortunately, very few data are available locally to assess the extent of problems and measures designed to address them.

Objective: This study was designed to identify immediate post-operative complications and associated factors in patients admitted at operation theatre recovery rooms of Muhimbili National Hospital, Dar es Salaam, Tanzania.

Methods: A prospective study was conducted over a six-month period from July 2007 to January 2008 on patients who underwent various types of surgical operations under regional or general anaesthesia admitted to these recovery rooms. Complications were documented according to predefined criteria and were critically evaluated.

Results: Out of total of 265 patients recruited, 87.5% had some form of complication. Pain was the commonest complication occurring in 40.8% patients. 37.0% patients had complications referable to the respiratory system, 30.6% patients each had abnormal cardiovascular parameters and shivering, 26.0% patients had hypothermia, 9.8% patients had nausea and/or vomiting, 6.0% patients presented with restlessness, 5.3% patients presented with abnormalities referable to central nervous system and 1.6%patients presented with other problems. Many patients had more than one complication.

Conclusions: This study has shown that despite of recent advances in anaesthetic techniques and the introduction of newer anaesthetic drugs, the incidence of post anaesthetic complications is high in our environment. Therefore a large study is needed to know exact incidence of complications in these patients.

TABLE OF CONTENTS

Item page

TITLE

CERTIFICATION.....ii

DECLARATION AND COPYRIGHT iii

ACKNOWLEDGEMENT iv

ABSTRACT.....v

LIST OF TABLES.....viii

LIST OF FIGURES.....ix

ABBREVIATIONS:.....x

1.0 INTRODUCTION AND LITERATURE REVIEW 1

1.1 Background 1

1.2 Clinical patients monitoring.....1

1.3 Monitoring equipments.....2

1.4 Discharge criteria.....3

1.5 Incident of post operative complications 4

1.6 Factors associated with post operative complications 5

2.0 STATEMENT OF THE PROBLEM 10

3.0 RATIONALE.....10

4.0 OBJECTIVES 11

4.1 Broad objectives.....11

4.2 Specific objectives.....11

5.0 METHODOLOGY 12

5.1 Study design.....12

5.2 Study settings.....12

5.3 Study population.....12

5.4 Sample size estimation.....12

5.5 Duration of the study.....13

5.6 Sampling procedure and recruitment.....13
5.7 Eligibility criteria.....13
5.8 Exclusion criteria.....14
5.9 Study tools.....14
5.10 American society of anaesthesiologist (ASA) status.....15
5.11 Data collection.....16
5.11.1 Cardiovascular complications.....16
5.11.2 Respiratory complications.....17
5.11.3 Central nervous system complications.....17
5.11.4 Other complications.....17
5.12 Data entery, cleaning and analysis.....17
5.13 Ethical considerations.....18
6.0 RESULTS.....19
7.0 DISCUSSION.....30
8.0 CONCLUSION.....33
9.0 RECOMMENDATIONS.....34
10.0 LIMITATIONS OF THE STUDY.....34
11.0 REFERENCES.....35
12.0 APPENDICES.....43
12.1 Questionnaire.....43
12.2 Glasgow Coma Scale Chart.....47
12.3 Informed Consent Form (English Version).....48
12.4 Informed Consent form (Swahili Version).....50

LIST OF TABLES

Table 1: Characteristics of study population..... 23

Table 2: Patients with specific complications.....26

Table 3: Primary presenting problems.....27

Table 4: Association of age,sex with postoperative complications.....30

Table 5: Associated factors and postoperative complications.....31

LIST OF FIGURES (BAR CHARTS)

Fig1.Distribution of study participants according to their ages.....24

Fig 2.Distibution of study participants according to number of complications 25

ABBREVIATIONS:

ASA	American Society of Anaesthesiologist.
PACU	Post Anaesthesia Care Unit.
ECG	Electrocardiography.
USA	United States of America.
PONV	Post Operative nausea and vomiting.
PCA	Patient Controlled Analgesia.
NSAIDs	Non- steroidal anti-inflammatory drugs.
MNH	Muhimbili National Hospital.
MOI	Muhimbili Orthopedic Institute.
MUHAS	Muhimbili University of Health and Allied Sciences.
GCS	Glasgow Coma Scale.
ACHS	Australian Council on Healthcare Standards.
ICU	Intensive Care Unit.
BP	Systolic Blood Pressure.
DBP	Diastolic Blood Pressure
SaO_2	Arterial Oxygen Saturation.
SPSS	Statistical Package for Social Science.
IASP	International Association for Society of Pain.

1.0 INTRODUCTION AND LITURATURE REVIEW

1.1Background

The recovery room in the operation theatre is a specialized area in which intensive monitoring and care is provided to all patients immediately after surgery. These areas vary considerably in the level of staffing and monitoring available from the "ideal" fully staffed, fully equipped modern recovery facility to the somewhat less than perfect dimly lit corridor just outside theatre [1]

The recovery area should provide a good lighting together with a suitably trained recovery nurse to recover each unconscious patient on a one-to-one basis. [2]

The causes of recovery room mishaps result from unidentified changes in a patient's airway, breathing or circulation and these can be rectified if identified at an early stage. [3]

Inspite of vast amount of anaesthetic literature dealing with recovery room care there is gap of information regarding the overall incidence and nature of recovery room complications in developing world setting. [4]

Several surveys have reviewed complications in western population, but in contrast, no study is available in the Tanzania context. In New Zealand, Peskett et al observed that 10% of patients who received General anesthesia were likely to have problems in the early post-operative period. [5]

In 1993 the Association of Anaesthetists of Great Britain and Ireland published recommendations for the provision of equipment necessary for a modern recovery area. [1]

Association of Anaesthetists of Great Britain and Ireland Guidelines 1993	
Position of recovery	Situated as close as possible to the operating theatre to minimise the risks of transporting unstable patients.
Size and temperature	An average of 1.5 recovery bays per operating theatre (9.3m^2 per bay), room temperature 21-22 °C, relative humidity 38 - 45% and fifteen changes of air per minute. Gas scavenging system and six 13 ampere electricity outlets per bay and well lit with lighting approximating to the daylight spectrum.
Equipment in each bay	Oxygen outlets face masks and breathing systems, pulse oximetry, availability of blood pressure monitoring and ECG. Suction units with Yankaur ends, a fully equipped anaesthetic machine with ventilator, drugs and intravenous fluids. A paediatric equipment trolley containing facemasks, airways, endotracheal tubes and connectors in a range of paediatric sizes.

1.2. Clinical patient monitoring

Clinical monitoring is divided into assessment of airway, breathing and circulation. Maintenance of patent airway is the most important aspect of immediate post-operative care. Anaesthetist should ensure that the airway is patent till the patient is awake and able to maintain their own airway. [6]

1.3. Monitoring Equipment

The most useful monitors in the operation theatre recovery rooms are the pulse oximeter and the sphygmomanometer that measures oxygen saturation and blood pressure respectively. [7]

Postoperatively patients may present with hypotension due to the sedative effects of drugs and the likelihood of blood loss or intraoperative fluid redistribution. [8]

Since its widespread introduction in the 1980's the pulse oximeter has become one of the mainstays of post anaesthetic monitoring. Where available these machines will give a fairly reliable indicator of systemic oxygenation, together with some indication of cardiovascular status. [9]

The presence of a good quality pulsatile signal usually denotes adequate peripheral circulation, although vasodilatation and hypotension can still be present, so the blood pressure should still be monitored. [10]

Urine output should be assessed using an indwelling urinary catheter and ECG monitoring is necessary where there is risk of arrhythmias. [1]

Temperature should also be checked following long operations (particularly in the elderly) where hypothermia is a risk. Lack of attention to temperature maintenance in the theatre can lead to major problems during recovery. [11]

Patients tend to lose heat rapidly under anaesthesia due to obtunding of homeothermic mechanisms and prolonged surgical exposure. Hypothermia can have a major impact on postoperative recovery. [12]

As temperature decreases drug metabolism and excretion also decreases thereby prolonging recovery. Shivering causes increased oxygen utilization thus increase the tendency to hypoxaemia, and is best treated with body surface warming. [13]

1.4. Discharge Criteria

The patient should continue to be observed until fit for discharge to the wards. Discharge criteria includes the return of preoperative conscious level and protective reflexes, maintenance of a clear airway, satisfactory breathing and oxygenation (oxygen saturation

> 93% on air), stable pulse and blood pressure, acceptable temperature and adequate analgesia. [14]

1.5. Incidents of post-operative complications

In a prospective study done in 1992 on complications in operation theatre recovery room of a teaching hospital in USA by Hines et al the complications were reported to be 23.7%. [15]

In another study which was done in Malaysia to know the incidence and nature of recovery room complications revealed that, out of a total 1,995 patients, 50 (2.5%) had some form of anaesthetic complications. The commonly reported complications were pain (23 patients) and nausea and vomiting (21 patients).There were 32 patients with central nervous system problems (including 23 patients with pain), 21 with gastrointestinal, 10 with cardiovascular, 2 with respiratory and 3 with other problems. [16]

A prospective survey conducted in Singapore, over one-month period in all surgical patients admitted to the recovery room of university-affiliated teaching hospital, a total of 443 patients were admitted and 133 (30%) of these, some complication was noted. 19.4% patients had complications referable to central nervous system, 15.3% had abnormal cardiovascular parameters, 5.4% presented with nausea and /or vomiting and 2.3% with abnormalities referable to respiratory system. [17]

In the study done in Australia, 419 incidents that occurred in the recovery room were extracted from the Anaesthetic Incident Monitoring Study database, representing 5% of the total database of 8372 reports. Incidents were reported mainly in daylight hours, with over 50% occurring in ASA1-2 patients. The most common presenting problem related to respiratory/airway issues 43%, cardiovascular problems 24% and drug errors 11%. [18]

The retrospective study of all recovery room admissions done at Aga Khan Hospital in Pakistan over a period of 18 months, it was observed that 9.96% had one or more forms

of post operative complications. [19]

The study done in Hong Kong, Queen Mary Hospital, to assess the incidence and characteristics of early postoperative complications in the recovery room in extubated patients after elective procedures using propofol and remifentanil based total intravenous anaesthesia, the overall incidence of shivering was 30.3%, post operative nausea and vomiting 16.6% and postoperative hypertension 35.2%. [20]

In another study done in Nigeria to identify the anaesthesia-related post operative complications at recovery area, revealed that, out of 172 patients 38 (22.1%) had complications ranging from transient episodes of shivering to severe respiratory tract infection. The commonest complications observed was respiratory tract infection, which occurred in 19.6% patients, followed by pyrexia 17.9%, nausea/vomiting 13.4% and sore throat 9.8%. Ocular complication and urinary retension was the least, each occurring in one patient 0.58%. [21]

In India, Pramila et al documented the overall frequency of post operative complications of 59.4%. Pain being the commonest complication occurring in 23.7%. Tachycardia and hypertension had incidence of 16.8%. Age >60years was a risk factor for increased incidence of post operative complications. [22] In Pakistan, Manninen et al conducted a study on 486 neurosurgical patients and found that 54.5% of these patients had at least one complication the commonest being post operative nausea and vomiting. [23]

Therefore the incidence of immediate postoperative complications in the operation theatre recovery rooms ranges from 1.3-59.4% [15, 16, 17, 18, 19, 20,21,22,23].

1.6. Factors associated with post-operative complications

The following have been noted to be factors associated with post-operative complications; site and nature of surgical operation, duration of anaesthesia, ASA (American Society of Anesthesiologists) physical status, anaesthetic technique and

whether the procedure was elective or emergency. [15]

Seago et al noted that most complications occurred predominantly in general surgical and orthopaedic patients. Orthopaedic and abdominal operations have shown to have a higher complication rate and duration of stay in recovery room than other procedures. [24]

Complications occurred in patients with or without a coexisting disease, and in some case this led to serious sequelae, including cardiac arrest. These findings were observed in prospective survey by Hines et al that involved 38 000 patients, it was observed that over three-quarters of adverse events occurred in patients who were of ASA status 1-2. [15] In contrast to a study done by the French group that reviewed cardiac arrest associated with anaesthesia and noted that the overall frequency was 1.1 per 10 000 procedures, with ASA status 3-5 and age > 84 years identify as risk factor. [25]

The most serious and life-threatening postoperative complications in recovery was found to relate to the airway. [26] Vaughan addressed this issue and quoted the complication rate following removal of artificial airways as 15% in one uncompleted study and 20% in a study following extubation. [27,28] Other studies specifically investigating airway problems in the recovery room reported much lower incidences of 2.9%, 1.9% and 1.3%. [29, 30, 31]

Commonest respiratory problem is the upper airway obstruction and Hines et al reported 6.9% of patients required airway support. [15]

Dr Abdy in his audit of airway problems in the recovery room reported incidence of airway problem to be 2.8% (in 1000 patients) and suggested that the incidence is too low to warrant a full time anaesthetic presence. [32] However the other study by Asai et al showed much higher incidence of 9.5% (in 1005 patients) occurring in the recovery room. [33]

Incidence of hypoxia in patient's breathing room air immediately after general anaesthesia is a common phenomenon. But a study done at Singapore General Hospital

showed lower incidence of hypoxia both during transport to the recovery room as well as in the recovery room. [34]

Incidence of post-operative nausea and vomiting (PONV) which may even follow regional anaesthesia, appears to be 9.8 %. [15]

A study done in Guyana by Harvey AB et al in the recovery room of public Hospital of 760 patients showed that only 22 patients (2.9%) experience PONV, all after general anaesthesia and 21 of these patients had risk factors for PONV in their history. PONV in the recovery room was associated with the female gender, gynaecological surgery, extra abdominal surgery and lack of anti-emetic medication. [35]

A retrospective survey of postoperative nausea and vomiting (PONV) in the recovery room over a five year period was conducted, followed by a prospective study of 200 adult patients to estimate the incidence and predisposing factors to nausea and vomiting during the first 24 hours after anaesthesia and surgery in Nigerians. In the retrospective study only records of 61 patients (0.79%) out of the 7714 post anaesthetic recovery room charts reviewed revealed documentation of vomiting. These were 20 males (32.8%) and 41 females (67.2%). In the prospective study showed the incidence of post operative nausea and vomiting within 24 hours of surgery was 41.6% and 19.6% respectively. Intravenous anaesthetics in general except opioid, induced less nausea and vomiting than inhalational anaesthetics, propofol being especially promising. [36]

Causes of PONV are numerous but use of opioids, surgery on upper abdomen and middle ear, laparoscopic procedures, distension and suctioning of stomach, early ambulation in the post-operative period are but a few common ones. [15]

The study done in United Kingdom at Gloucestershire Royal Hospital, over 10,000 consecutive patients (Eltringham et al. 1978) showed the commonest cardiovascular complication was hypotension (systolic BP< 100 mm Hg) occurred in about 5%, followed closely by hypertension (systolic BP>170 mm Hg) occurred in 4%, bradycardia

occurred in 176 patients (nearly 2%), tachycardia were seen only in 37(0.37%) patients and 41(0.41%) patients were retained because of heamorrhage. [37]

Cardiovascular instability in the form of hypertension and tachycardia are due to pain, hypoxia, hypercarbia, bladder distention and peripheral vasoconstriction. Hypotension in the recovery room with a blood pressure of 25% below pre-operative baseline is usually due to hypovolaemia, diuresis, third space loss or residual effects of anaesthetic drugs but may rarely be due to septicemia. [38]

Post-anaesthetic shivering is common and is usually caused by decreased body heat content. [39]

During recovery from anaesthesia increased muscular activity increases oxygen consumption as much as fivefold. Hypoxaemia, lactic acidosis, and hypercarbia may then complicate recovery from anaesthesia at a time when the patient is at risk of hypoxaemia from other causes. Even without these complications patients find shivering uncomfortable, and preventing the syndrome is clearly desirable. [40]

Anticholinergic drugs increase postoperative shivering by a peripheral mechanism which may be due to peripheral vasodilatation and consequent loss of heat from the skin. [41]

In women, postoperative shivering is more common during the luteal phase of the menstrual cycle than during the follicular phase, an effect that may be due to the vasodilatory effects of progesterone. [42]

In a study done by Buggy and Hughes in Turkey, emphasized the importance of afferent information on temperature from areas other than the core in the aetiology of postoperative shivering. The aetiology is clearly multifactorial, the factors including the patient's age and sex and aspects of the anaesthetic technique such as premedication, the identity of the induction agent, and the ventilatory technique used. They suggested that preventing the syndrome may not be difficult but current management emphasizes on treatment. [43]

Measurement of the core temperature is important as hypothermia must be treated concurrently with shivering to prevent further cooling. Drugs remain the most popular mode of treatment. [44]

Incidence of moderate to severe pain implying inadequate analgesia following surgery from the 50s to the 90s has been reported to be between 20% and 75%. Other than patient comfort, relief of pain is a necessity to reduce the sequelae due to the effects of stress response. Spinal and epidural opiates with or without local anaesthetics, opiates by intermittent parenteral route or by continuous intravenous infusion, patient controlled analgesia (PCA), oral, rectal or parenteral NSAIDs and nerve blocks, have been used individually or sometimes in combinations, for successful management of acute post-operative pain. [45]

Pain is a complex phenomenon involving physical, physiologic, psychologic and emotional components. [46]

The International Association for the Study of Pain (IASP) defines pain as "unpleasant sensory and emotional experience associated with actual or potential tissue damage. Pain is anticipated following a surgical procedure. [47]

Unrelieved pain after surgery is often unhealthy; fortunately it is preventable or controlled in majority of cases. After major abdominal surgery post operative analgesics significantly reduce post operative ileus and pulmonary complications such as atelectasis.[48]

It has been noted also that the risk of thrombo-embolic complications following lower body procedures is minimized. Pain control may have benefit of improving clinical outcome by reducing the incidence of post operative complication. [49,50]

Postoperative pain may results, into neurogenic shock. This comes about due to loss of

vasomotor tone control, expansion of venous capacitance bed with peripheral pooling of blood, leading to inadequate ventricular filling. This manifests as an abrupt fall in blood pressure. (51)

As perception of pain is different in different individuals, there are factors which influence need for analgesia such as age, sex, and other individual characteristics such as being intolerant of any discomfort to self-control of pain. Male patients who were operated and given post operative analgesia had a high pain rating score during the post operative period in comparison to the female patients. (52)

In a study done by Zavala et al noted that the magnitude and site of surgery has significant difference on the perceived pain. Patients who underwent orthopedic surgery reported severe pain compared to those who underwent other procedures in general surgery and gynecology. (53)

2.0. STATEMENT OF THE PROBLEM

The immediate postoperative period in the recovery room is known for high risk of anesthetic complication occurrences. (16) Complications in the recovery room could lead into considerable patient morbidity and mortality.

Studies from other centers have reported the incidence of immediate postoperative complications to be between 1.3-59.4%. (15, 16, 17, 18, 19, 20, 21, 22, 23) But no local data are available to ascertain the magnitude of this problem in our setup.

It is therefore important to identify the types of problems encountered in this area and their modes of presentation and from these to suggest for improvements.

3.0. STUDY RATIONALE

Many research studies have been done to identify postoperative complications at recovery room in other countries, but there are no published data with regard to the magnitude of post operative complication at the recovery rooms of MNH.

Studies in developed countries have shown low incidence of post operative complication

which applies only to the developed countries. The incidence rate could be different in the developing countries where resources are limited.

Many recovery room events are significant predictors of recovery area utilization; increasing duration of stay by up to 26% [21] and for patients suffering a significant physiological disturbances warrant transfer to Intensive Care Unit (ICU) and this increase the burden of cost to hospital and a nation at large.

Improvement of operation theatre recovery room services would lead into improved quality care and therefore less mortality and morbidity through timely and prompt attendance to occurring complications.

Therefore this study was done to look at the immediate post operative complications and their associated factors at the recovery rooms of MNH.

4.0. STUDY OBJECTIVES

4.1. Broad objective

To identify immediate postoperative complications and associated factors in patients admitted at the MNH recovery rooms.

4.2. Specific Objectives

1. To determine proportion of immediate postoperative complications among patients admitted at recovery room.
2. To determine the association between ASA status and postoperative complications.
3. To determine the association between nature of procedure and postoperative complications.
4. To determine the association between anesthetic technique and postoperative complications.
5. To determine the association between surgical type and postoperative complications.
6. To determine association between duration of anaesthesia and postoperative complications.

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5.0. METHODOLOGY

5.1. Study design

Descriptive Cross-sectional study.

5.2. Study settings

The study was conducted in recovery rooms of main and obstetric theaters of Muhimbili National Hospital. This is the National referral Hospital in the country and the University Teaching Hospital of the Muhimbili University of Health and Allied Sciences (MUHAS) with bed capacity of about 1500 beds. It is situated in Dar es Salaam, Largest city in Tanzania with an estimated population of over 3million. [54]

5.3. Study population

All adults patients aged 18years and above admitted at recovery room after surgical procedures as elective or emergencies by using either general anaesthesia or regional technique were enrolled into the study.

5.4. Sample size estimation

The following formula for sample size estimation was used to calculate the minimum sample size [55]

$$\text{Sample size (N)} = Z^2 P \frac{(1-P)}{d^2}$$

Where:

Z=percentage of normal distribution corresponding to level of significance.

If significance is 5% Z=1.96

P= proportional of patients with post operative complications. For this study was taken to be 22 .1% [21]

d= marginal error which was taken to be 5%

Then,

$$N = \frac{(1.96)^2 * 0.22\,(1-0.22)}{(0.05)^2} = \frac{(1.96)^2 * 0.22 * 0.78}{(0.05)^2}$$

$$N = 264$$

5.5. Duration of the study

The study was conducted from July 2007 to January 2008.

5.6. Sampling procedure and recruitment

Adult patients who consented for the study admitted at recovery room after undergoing surgical procedure were enrolled into the study until the mid of January 2008 for data analysis. Participants were explained the aim of the study and all the procedures involved. They were then requested to give an informed written consent prior to surgical procedure. Conveniently, patients from obstetrics and main theatre were studied. At obstetrics theatre at least 10 patients were recruited per week and at main theatre at least 5 patients were recruited per week. This making average of 60 patients per month. All patients were selected randomly, elective patients were selected randomly from the operation list and emergency patients were selected as admitted at operation theatre for procedure.

5.7. Eligibility criteria

Patients were included into the study if;

- Admitted at recovery room after given general or regional anaesthesia.
- Age 18years and above.
- Consent for participation was obtained.

5.8. Exclusion criteria

Patient were excluded from the study if;

- Age below 18 years.
- They were directly admitted to ICU after surgical procedure.
- Consent to participate not obtained.

5.9. Study tools

A structured questionnaire designed for the purpose of the study was used. Information collected includes:

- Demographic information (Age. Sex, address)
- Clinical findings: general physical assessment and ASA status classification.
- Nature of Surgical procedure (emergency v/s elective).
- Surgical speciality: general surgery, gynaecology, obsteritics, urology, plastic surgery.
- Non-invasive measurements of SBP, DBP, Oxygen saturation (SaO_2), pulse and heart rate.
- Anaesthetic technique, duration of anaesthesia was recorded as obtained from anaesthetic chart. The time of admission and discharge from recovery was recorded.

5.10. American society of Anaesthesiologist (ASA) status definition

The American Society of Anesthesiologist classification system was used to stratify patients preoperatively by risk.

ASA	Patient's Health	Status of Under-lying Disease	Limitations on Activities	Risk of Death
I	excellent; no systemic disease; excludes persons at extremes of age	None	none	None
II	disease of one body system	well-controlled	none	None
III	disease of more than one body system or one major system	controlled	present but not incapacitated	no immediate danger
IV	poor with at least 1 severe disease	poorly controlled or end stage	incapacitated	Possible
V	very poor, moribund		incapacitated	Imminent

Where: ASA I excludes the very young and very old. [56,57]

5.11. Data collection

A graduate nursing officer was trained by the author on assessment of postoperative complications and ASA status classification of patients before the commencement of the study. The trained research assistant participated in recruitments of patients and in process of data collection. The author did the assessment to almost all enrolled patients except for few whom he was assisted by the trained research assistant.

At the recovery room patients were monitored for vitals signs,

- Peripheral oxygen saturation was measured and monitored using a Datex-Ohmeda, Inc, TrustSat pulse oximeter.
- Pulse rate was measured and monitored using Datex-Ohmeda, Inc, TrustSat pulse oximeter.
- Systolic blood pressure, diastolic blood pressure were measured using a Geratherm GP- 6621 digital blood pressure machine.
- Respiratory rate was counted manually per min.
- Axillary temperature was measured using mercury thermometer.

All patients were under continuous monitoring for Oxygen saturation and pulse by a pulse oximeter. Blood pressure, respiratory rate and axillary temperature were measured at five minutes interval.

Patients were observed for occurrence of any post operative complications according to the following predefined criteria:-

5.11.1. Cardiovascular complications were defined as

- Hypotension, any decrease of >20% from pre-operative systolic reading for >15min or >50% for one reading;
- hypertension, any increase of >20% from pre-operative systolic reading for 15min or >50% in one reading;
- bradycardia, <50beats/min >15min;
- tachycardia, >120 beat/min for >15min,
- Cardiac arrest or no cardiac output requiring resuscitation. [58]

5.11.2. Respiratory complications were defined as

- Arterial desaturation, oxygen saturation <90% at any time;
- airway obstruction, upper airway problem requiring intervention, e.g. stridor, obstruction, laryngospasm; hypoventilation, respiratory rate <8/min bronchospasm, wheezing on expiration, blood or gastric aspiration [58]

5.11.3. Central nervous system complications were defined as

- Prolonged sedation, Delayed recovery-when patient fails to regain consciousness 60-90min following general anaesthesia, if unconsciousness was unduly prolonged a coma level assessment chart was used. [59]

5.11.4. Other complications

- **Hypothermia**, axillary temperature <36.0°C (ACHS definition) [60]
- **Pain**:-Excessive pain, moaning or writhing in pain at any time or initial pain dominated by pain control or requiring more analgesia than ordered. [61,62]
- Post operative nausea and vomiting, allergy; restlessness, shivering, and others was assessed.

5.12. Data entry, cleaning and analysis

Information obtained was collected using questionnaires. All questionnaires were checked daily for completeness and consistencies. Data entry and cleaning was done using EPI info software version 6. Data was analyzed using the Statistical Package for Social Science (SPSS) version 12. Analyses included comparison of different categories by the use of Chi-square test especially when comparing different proportions. P-values of less than or equal to 0.05 was considered statistically significant.

5.13. Ethical considerations

The study received ethical clearance from the Research and Publication committee of MUHAS and the Ethics department of MNH. Patients were included after informed verbal and written consent. All patients who were found to have post operative complications were managed accordingly to the usual MNH recovery room management protocol. Patients therefore had the benefit of having best medical care, however, there was no financial gain obtained by participating in this study.

6.0. RESULTS

During the 6 month period there were a total of 5366 patients admitted at recovery rooms of main and obsteritics theatres of MNH. Out of these 270 patients were eligible for the study. 4 patients were excluded after was directly admitted to ICU, 1 patient had high blood pressure that led to postponement of the operation. The remaining 265 patients were enrolled into the study.

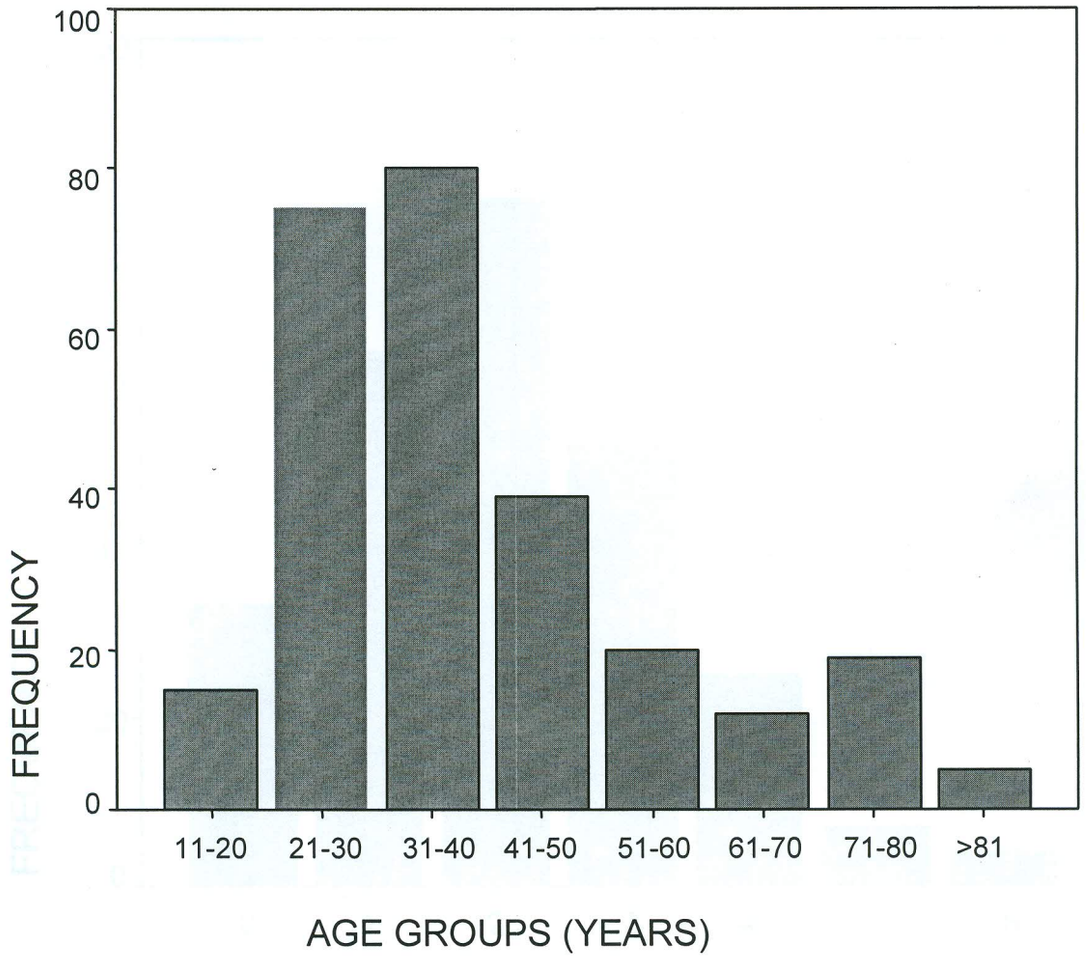
Among the studied patients 150 (56.6%) were females and 115 (43.4%) were males. There age range was from 18 to 87 years, with mean age of 39.62± 16.58 years. Majority of them 80 (30.2%) fell into the age group 31-40 years.

Among the 265 patients 57.7% were in ASA Status grading I, the rest was in ASA Status grading II/III (36.2% and 5.3%) respectively and ASA IV grading was the least 0.8%. 58.1% of the study population was elective cases and 41.9% was emergency cases. In 50.9% patients regional anaesthesia was given and 49.1% received general anaesthesia. Most patients were from the general surgery department (39.2%), followed by obsteritics (32.5%), gynaecology (16.2%) and plastic surgery was the least (1.5%). Characteristics of study population are summarized in table 1.

Table 1 Characteristics of the study population. (n=265)

CATEGORY	TOTAL (%)
Age of patients (years)	
Range	18-87
Mean (±SD)	39.62± 16.58
Sex	
Male	115 (43.4%)
Female	150 (56.6%)
ASA Status	
I	153 (57.7%)
II	96 (36.2%)
III	14 (5.3%)
IV	2 (0.8%)
Nature of surgery	
Elective	154 (58.1%)
Emergency	111 (41.9%)
Anaesthetic Technique	
General anaesthesia	130 (49.1%)
Regional anaesthesia	135 (50.9%)
Surgical Speciality	
General surgery	104 (39.2%)
Gynaecology	43 (16.2%)
Obsteritics	86 (32.5%)
Urology	28 (10.6%)
Plastic	4 (1.5%)

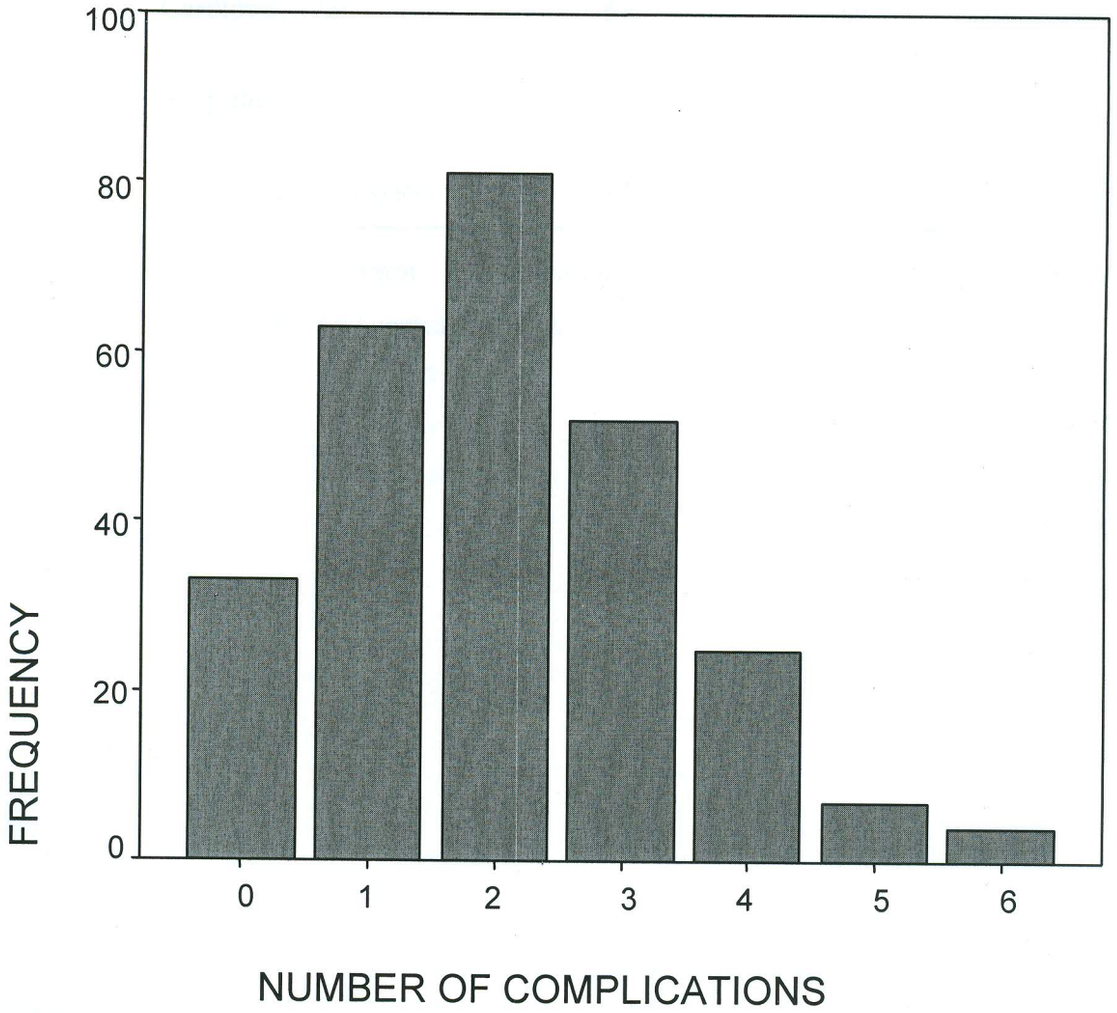
Fig 1. Age distribution of study participants.



Majority 30.2% were in age group 31-40yrs, followed by 21-30yrs 28.3% and 13.6% was aged above 61yrs.

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Fig.2.Frequecy distribution of number complications to patients.



Majority of patients 30.6% had 2 complications, only 1.5% had six complications.

Table 2. Patients with specific complication number (percentage) (n=265)

Complications	Numbers	Percentage
Cardiovascular	81	30.6
Respiratory	98	37.0
Central nervous system	14	5.3

37.0% patients had respiratory complications, 30.6% patients had cardiovascular complications and 5.3% had central nervous system complications.

Table 3: Primary presenting problems in the recovery room (n=265)

Post op complications		Frequency	Percent
Cardiovascular	Hypotension	22	8.3
	Hypertension	43	16.2
	Bradycardia	11	4.2
	Tachycardia	25	9.4
	Cardiac arrest	1	0.4
Respiratory	Airway obstruction	72	27.2
	Hypoventilation	22	8.3
	Hypoxaemia	23	8.7
	Bronchospasm	5	1.9
	Hyperventilation	4	1.5
Central nervous system	Prolonged sedation	10	3.8
	Delayed recovery	4	1.5
Others	Hypothermia	70	26.0
	Pain	108	40.8
	Post operative nausea and vomiting	26	9.8
	Restlessness	16	6.0
	Shivering	81	30.6
	Allergy	1	0.4
	Hyperthermia	4	1.5

The most frequent presenting post operative complications was pain in (40.8%) patients and cardiac arrest and allergy ranked the lowest, each occurring in one patient (0.4%).

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	Hyperthermia	4	1.5

The most frequent presenting post operative complications was pain in (40.8%) patients and cardiac arrest and allergy ranked the lowest, each occurring in one patient (0.4%).

Out of total of 265 patients recruited, 232 (87.5%) had some form of complication with pain being the commonest in 108 patients (40.8%). The number of patients with one complication only was 23.8%, 30.6% had 2 complications and 19.6% had 3 complications whereas 13.5% had complications more than 3. (Fig. 2)

Table 2 shows patients with specific complications whereas respiratory complications constituted 37.0% of sample population. The commonest was airway obstruction (27.2%) due to falling back of the tongue, excessive saliva or vomit, followed by hypoxaemia (8.7%) patients; others were hypoventilation (8.3%), bronchospasm (1.9%) and hyperventilation (1.5%) patients. Significant respiratory complication occurred in one patient with complete obstruction became cyanosed, developed bradycardia and cardiac arrest. He was re-intubated by anaesthetists, resuscitated and rapidly recovered and then transferred to ICU. Two patients with low GCS were not extubated after surgery, they were transfered to recovery room with endotracheal tube insitu and then observed until they have recovered then extubated and transferred to ward.

Cardiovascular complications occurred in 30.6% of the population studied. Hypertension was found to be the commonest complication (16.2%), followed by tachycardia (9.4%), hypotension occurred in (8.3%) patients, bradycardia occurred in (4.2%) and 1 patient developed cardiac arrest. Neurological complications constituted (5.3%) of the population, most patients presented with prolonged sedation (3.8%) and 4 patients were unarousable at 30 minutes.

Table 3 shows primary presenting problems at recovery room. Post operative pain was the most frequently occurring complication (40.8%), the incidence being higher in patients who received regional anaesthesia than those given general anaesthesia. Post operative shivering occurred in 30.6% of the patients under study. Temperature changes occurred were hyperthermia was seen on 4 patients (1.5%) and hypothermia was found in 70 patients (26.0%) of study population.

Twenty six patients (9.8%) of the study population either vomited or were nauseated, and some were given antiemetics. Restlessness was seen in 16 patients (6.0%) and one patient had allergic reaction due to pethidine.

Table 4 shows the relationship between age and sex with postoperative complications. According to sex, there was no significant difference in occurring complications, although post operative complications showed a male predominance. (p=0.904) According to age, post operative complications was found to be highest among patients aged 51-60 yrs (95.0%), followed by those aged 31-40yrs (88.8%) and was the least in patients aged 41-50yrs (84.6%). This observation was statistically insignificant. (p=0.920)

Possible risk factors for patients who developed postoperative complications were assessed. The results are in Table 5.

Table 4 Association between age and sex on postoperative complications

Patients characteristics	Post operative complications		Total	p-value
	Yes	No		
Age groups				
11-20	13 (86.7%)	2 (13.3%)	15	
21-30	65 (86.7%)	10 (13.3%)	75	
31-40	71 (88.8%)	9 (11.3%)	80	
41-50	33 (84.6%)	6 (15.4%)	39	0.920
51-60	19 (95.0%)	1 (5.0%)	20	
>61	31 (86.1%)	5 (13.9%)	36	
Sex				
Male	101 (87.8%)	14 (12.2%)	115	0.904
Female	131 (87.3%)	19 (12.7%)	150	

Most complications occurred in age group between 51-60yaers (95.0%) and frequency of complications was almost the same between males and females. (87.8% Vs 87.3%) (p=0.904).

Table 5 Associated factors and post operative complications.

Associated factors	Post operative complications		Total	P-value
	Yes	No		
ASA status				
I	131 (85.6%)	22 (14.4%)	153	
II	86 (89.6%)	10 (10.4%)	96	
III	13 (92.9%)	1 (7.1%)	14	0.675
IV	2 (100%)	0 (0.0%)	2	
Nature of surgery				
Elective	133 (86.4%)	21 (13.6%)	154	
Emergency	99 (89.2%)	12 (10.8%)	111	0.492
Surgical types				
General surgery	91 (87.5%)	13 (12.5%)	104	
Gynaecology	40 (93.0%)	3 (7.0%)	43	
Obstetric	75 (87.2%)	11 (12.8%)	86	0.004
Urology	25 (89.3%)	3 (10.7%)	28	
Plastic	1 (25.0%)	3 (75.0%)	4	
Anaesthetic technique				
General anaesthesia	121 (93.1%)	9.69%)	130	
Regional anaesthesia	111 (82.2%)	24 (17.8%)	135	0.007
Duration of anaesthesia (Min)				
0-60	105 (83.3%)	21 (16.7%)	126	
61-120	99 (90.0%)	11 (10.0%)	110	
121-180	20 (95.2%)	1 (4.8%)	21	0.177
181-240	8 (100%)	0 (0.0%)	8	

In ASA I patients 85.6% developed complications whereby in ASA II and III, 89.6% and 92.9% developed complications respectively. Patients under ASA grade IV all developed complications. However the number of ASA III and IV were very few to arrive at a conclusion. The result was statistically insifignicant. (p=0.675).

Post operative complications were observed more in patients given general anaesthesia (98.5%) than those given regional anaesthesia (88.1%). This difference was statistically significant (p=0.007). Most postoperative complications occurred in emergency cases (89.2%) than in elective cases (86.4%) (p= 0.492). However most of complications were observed in patients with gynaecological problems (93.0%), followed by urology (89.3%), general surgery (87.5%) and was the least in plastic surgery procedures (25%). This difference was stastically significant (p=0.004).

Postoperative complications were observed more in patients were duration of anaesthesia was more than 3hrs (100%) and was the least in patients were duration of anaesthesia was less than 1hr (90.5%) patients. The difference was not statistically significant (p=0.177). The mean duration of anaesthesia was 62± 43.15 Minutes.

7.0. DISCUSSION

In this study, 265 patients were recruited and in 232 (87.5%) of these some form of complications was noted, with pain being the commonest complication occurring in 108 (40.8%) patients.

Despite recent advances in anaesthetic techniques and introduction of newer anaesthetic drugs, the incidence of postanaesthetic complications is high in our environment. The recovery period remains a time of great potential danger to patients. [17]

This study reflects on types of immediate post operative complications patients presented with at recovery rooms of tertiary care centre in Tanzania.

In this present study postoperative complications occurred in 87.5% patients with pain being the commonest complication in 40.8% patients. These results agree well with what was found in other studies. Two different studies done by Pramila et al [22] and Manninen et al [23] on neurosurgical patients reported the overall incidence of post operative complications to be 59.4% and 54.5% respectively. With pain being the commonest complication in both studies.

The increased incidence in this study may be attributed to more monitoring and more seriously ill patients being treated, the reporting techniques and the definition of what constitutes the postoperative complication.

Respiratory complications are of great concern to an anaesthetist. This study shows that thirty seven percent of the study population developed respiratory complications. Upper airway obstruction being the commonest in 27.2% patients this result are in line with study done by Vaughan et al who found that, the most serious and life threatening postoperative complication in recovery room was related to airway. Vaughan addressed this issue and quoted the complication rates of 15% following removal of artificial airway and 20% following extubation. [27,28] In another study by Hines et al [15] reported 6.9% of

patients requiring airway support, upper airway obstruction being the commonest cause. Similar results concurred in previous studies. [26,30,31,32]

Incidence of hypoxia in patients breathing room air immediately after general anaesthesia was 8.7% in this study compared to contemporary reports, a study done at Singapore general Hospital had lower incidence of hypoxia both during transport to recovery room as well as in recovery room, these patients were transported with oxygen to recovery room and the pulse oximeter was put up after the initiation of oxygen therapy which may have led to a low incidence. [34] Inadequate or sluggish respiration occurred in 8.3% patients, this was probably due to effects of residual anaesthetics, narcortic analgesics, muscle relaxant and upper abdominal incision, other pulmonary complications like bronchospasm occurred in 1.9% patients and hyperventilation occurred in 1.5% patients. The difference in incidence may probably due to definition of what constitutes an airway problem, patient's characteristics, anaesthetic peri-operative care, the duration of observation, anaesthetic technique and incidence of underreporting.

In this current study cardiovascular complications occurred in 30.6% patients, hypertension being the commonest problem in 16.2% patients. This finding differs from Pramila study who found the incidence of cardiovascular complication to be 16.8%, tachycardia being the commonest. [22] Also Rose et al found that out of 18,380 patients cardiovascular events occurred in 7.2% of all admissions to PACU. [38] and Manninen et al found the incidence of cardiovascular events to be 6.7%. [23] This difference is probably due to cut- off point of the definition of cardiovascular complications and the sample size that was used was much higher than in this particular study.

In this study frequency of neurological complications was 5.3% whereas it was 5.7% in Manninen's study. [23] Most patients woke up rapidly after surgery and most of them were conscious by the time they entered the recovery room. Only 4 patients took more than half an hour to regain consciousness, 2 of these were treated with naloxone, one with 5% dextrose.

In this present study post operative pain occurred in 40.8% patients, common in patients given regional anaesthesia than those given general anaesthesia probably due to less opiods use intraoperatively. At recovery room analgesics were given to 46 patients, pethidine and morphine were by far the commonest analgesics prescribed in equal number. These findings concur with findings in Pramila study who reported incidence of postoperative pain in 45.7% patients undergoing spine surgery. [22]

This study revealed that, 26 patients (9.8%) had PONV, commonly in female, patients given general anaesthesia and patients undergoing abdominal surgery. This finding is different from the study done by Harvey AB et al in Guyana involving 760 patients reported low incidence of 2.9% of PONV. [35] This different finding could be attributed to the fact that, In Harvey study prophylactic antiemetics was used in contrary to this study where prophylactic antiemetics were not used.

In this present study restlessness was seen in 16 patients (6.0%), 13 of whom had received general anesthesia, pain was the major cause 7 improved after given analgesics and one patient had full bladder improved after catheterization.

In this study shivering occurred in 81 patients (30.6%) commonly followed regional anaesthesia, most patients were covered by linen and blankets and improved rapidly this finding is consistent with Wong AY et al prospective survey of over 145 adults patients showed the overall incidence of shivering of 30.3%. [20]

This study showed that, 4 patients (1.5%) had elevated temperatures and were associated with infection.70 patients (26.0%) were found to have low temperatures. The 2 lowest were 34.6 ^{o}C and 34.8 ^{o}C both in elderly patients following prolonged abdominal surgery with infusion of cold fluids.

In this current study age and sex did not show any significant association on post operative complications, in contrary on what was found by Keith et al who found that age > 60years and male gender, were the risk factors for critical respiratory events.[26]

This study shows that surgical types and anaesthetic technique was the only risk factors for post operative complications which was statistically significant ($p<0.004$ and $p<0.007$) respectively. However there was no significant association between ASA status, nature of surgery or duration of anaesthesia with post operative complications. These findings differ with findings in Hines et al study who found that ASA status and duration of surgery were potential predictors of PACU complications. [15] In this present study, the results can be explained by the fact that the study population was small. With this few number of patient, it was not possible to prove any association of ASA status, nature of surgery and duration of anaesthesia on post operative complications.

8.0. CONCLUSION

- The present study demonstrates an overall frequency of complications of 87.5%. The commonest complication encountered was pain with its attendant tachycardia and hypertension.
- In this study surgical types and anaesthetic technique was the only risk factor for complications whereas age, gender, ASA status, nature of surgery or duration of anaesthesia was not.
- Respiratory complications caused the greatest concern, therefore careful observation and early detection of warning signs could correct abnormalities before serious and potentially fatal complications occur.
- There were more complications in patients with ASA status III/IV than those with ASA status I/II.

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9.0. RECOMMENDATIONS

- This is the first study to be done in Tanzania; it involved only a small sample size. I therefore recommend a study with larger sample size should be conducted to increase the power of this study.
- Recovery area staffs must be skilled in airway management, cardiovascular manipulation and drug delivery by ensuring comprehensive training specific to the area and encouraging ongoing education.
- Adequate monitoring facilities are required at recovery rooms of MNH to promote better patient safety and an uneventful recovery from anaesthesia and surgical procedures.

10.0 LIMITATION OF THE STUDY

- The sample size was small; therefore, the power of the study was also small to give concrete conclusion on the findings in this study.
- The study was unable to assess the effects of different anaesthetic drugs used in patients on post operative complications, which would have may be, given us more information.

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