

ANALYSIS OF OBSTETRIC ADMISSION PATTERNS AND MANAGEMENT IN THE CRITICAL CARE UNIT, KENYATTA NATIONAL HOSPITAL.

DISSERTATION SUBMITTED IN PART FULFILMENT OF
THE REQUIREMENTS FOR AWARD OF THE DEGREE OF
MASTER OF MEDICINE IN ANAESTHESIA OF THE
UNIVERSITY OF NAIROBI

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DECLARATION

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I hereby declare that this dissertation is my original work and that it has not been submitted to any university or institution for examination or any other purposes.

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LIST OF ABBREVIATIONS.

CCU -	Critical Care Unit
PACU -	Post Anesthesia Care Unit
KNH -	Kenyatta National Hospital
MDG -	Millennium Development Goals
APACHE -	Acute Physiology & Chronic Health Evaluation
MPM -	Mortality Probability Models
HELLP -	Hemolysis Elevated Liver enzymes, Low Platelets
ARDS -	Acute Respiratory Distress Syndrome
CO -	Cardiac Output
NYHA -	New York Heart Association
PPCM -	Peri-partum Cardiomyopathy
ECG -	Electrocardiogram
UON -	University of Nairobi
SPSS -	Statistical Package for the Social Sciences
MSICU-	Medical Surgical Intensive Critical Care Unit

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Operational Definitions

Obstetric care refers to the time from conception to six weeks after delivery.

Variables to be determined are age , parity, gestation of pregnancy, treatment, ventilation, duration of admission, co- morbidities, outcome.

Low Glasgow Coma Scale will be a score of eight and below.

Gastrointestinal tract complications included patients who required total parenteral nutrition, liver failure, burst abdomen and abdominal sepsis.

Genitourinary tract complications included pelvic abscess, uterine perforation, severe urinary tract infection, acute kidney failure and uterine atony.

Cardiovascular complications included cardiac arrest, dysrhythmias, deep venous thrombosis and need for inotropic support.

Central nervous system complications included hypoxic brain injury, uncontrolled convulsions and intra-cerebral hemorrhage.

Respiratory system complications included Acute Respiratory Distress Syndrome, pulmonary oedema, ventilator dependency, ventilator acquired pneumonia, chemical pneumonitis and trachea-esophageal fistula.

Musculoskeletal system complications included rhabdomyolysis, contractures, bed-sores and osteomyelitis.

Critical Care Unit included the main CCU, Emergency ward and Acute room, because they are wards where critically ill patients were admitted for intensive care which included, and was not limited to, intubation and mechanical ventilation, continuous monitoring of vital signs and organs support.

DEDICATION

To my parents Isaac and Lucy Mungai, you taught me to believe in myself and to put effort in whatever I do.

To my lovely wife, Dr. Joan Wanja Mutahi and adorable son, Nathan Kirumwa. My source of joy and strength.

ACKNOWLEDGEMENTS

My appreciation to my supervisor Dr. T. M. Chokwe for giving me guidance throughout the study period and in compiling this book.

I would also like to thank the Kenyatta National Hospital Ethics and Research Committee for allowing me to carry out this study.

ABSTRACT:

Background.

Pregnancy, delivery and peuperium can be complicated by severe maternal morbidity necessitating CCU admission. Management of the critically ill obstetric patient is very complex due to the physiological changes that occur during pregnancy and presence of the foetus, hence requires co-operation of both the obstetrician and intensivist/anesthetist. The care of critically ill pregnant women requires knowledge not only of the primary disease process and its treatment in the non-pregnant women, but also a thorough understanding of the changes that the maternal peri-partum physiology requires of such care. Critically ill obstetric patients can be managed successfully in the CCU with obstetrician's input.

Objective.

This study is aimed at evaluating the primary causes of CCU admission for expectant mothers, presence of other co-morbid illnesses, system or organ failure, their management and outcomes. The study will also evaluate demographic details such as age, parity, stage of pregnancy and level of education.

Methodology.

The study was a prospective, observational study, of all the expectant mothers and those in peri-partum period admitted in KNH CCU. Eligible patients, next of kin or their guardians filled a consent form before being recruited in the study. Sampling was via convenient sampling technique. Parametric and non-parametric information was collected using a data collection tool with details obtained both from the patient's medical records and questions asked to next of kin or guardian.

Results

Total of 50 patients were sampled, and the mean age was 27.6 years, with a range of 17 – 42 years. The duration of stay was less than one week, for majority (66%) of the patients. The main causes of CCU admissions were respiratory distress, low GCS, hypotension and post-cardiac arrest. The leading diagnosis however, were Preeclampsia toxemia, Anemia and Sepsis. The organ system involvement was mostly respiratory(80%), CVS(46%), CNS(56%) and GUT(34%). Majority (68%) of the patients, were referrals from other hospitals.

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INTRODUCTION

Pregnancy is associated with numerous alterations of the maternal physiology and organ systems. Most of these changes are initiated by hormones secreted by the corpus luteum and placenta. There is also enlargement of the uterus as the pregnancy proceeds, to accommodate the enlarging foetus. These changes are significant when the mother falls ill as the physician has to understand how to modify treatment specifically.

In pregnancy, the functional residual capacity is reduced and oxygen consumption is increased. Therefore when the respiratory system is affected by illness, supplementary oxygen and mechanical assist ventilation may be employed to mitigate the decline in respiratory function.

The creatinine clearance rate and glomerular filtration rate is increased in pregnancy. Therefore the drugs administered that are renally metabolized and excreted must be adjusted in order to maintain the drug therapeutic levels in serum. This will help in obtaining the desired therapeutic effects of the drugs.

The increased blood volume in pregnant mothers affects the volume of distribution of drugs, and the dose of drugs has also to be adjusted. Failure to which the drug concentration in plasma is reduced. The placenta also plays a role in excretion of some of the drugs, this has to be put in consideration.

Presence of the foetus necessitates the physician to avoid drugs which are contraindicated in pregnancy, however in critical illnesses, the life of the mother is given a priority. These and many other factors makes management of critically ill pregnant mothers a challenge. Thus requiring a multi-disciplinary team approach so as to get various inputs.

LITERATURE REVIEW:

Maternal mortality is high in developing countries in spite of advancement in obstetrical critical care. Maternal mortality in developed countries is 7 – 8 per 100,000 live births as compared to more than 700 maternal deaths in most of the African countries. [1] A major disadvantage in developing countries is the severe shortage of Critical Care facilities in comparison to the critically ill population. Majority of the population also lives in rural areas where there are several factors which lead to late admission in CCU and thus poor outcomes. [1] In 2000, the leaders of all United Nations Member States agreed that policies conducive to development and to the elimination of extreme poverty would be put in place in global scale. A set of targets has been established and many countries have done a substantial progress towards those outcomes, which became known as the Millennium Development Goals (MDGs) [1]. Social determinants and the health system performance play a major role in the occurrence of maternal deaths. One of the MDGs, the reduction of maternal mortality, is a robust indicator of development.

The need for critical care support and admission to CCU's in obstetrics patients is relatively infrequent, as they are usually a young and healthy group of patients. Despite the advances in the standard of care in the CCU's in the recent years, the expectant patient with medical complications represents a challenge to critical care physicians and often requires a multidisciplinary team involvement. Different approaches to the classification of severe maternal morbidity have been used, including clinically defined morbidities, organ system dysfunction and management-based criteria such as the need for intensive care. [2] Hemorrhage and hypertensive disorders constitute most of the obstetric CCU admissions. In spite of the low incidence of admission to critical care units among this population, the overall maternal mortality in the CCU's varies widely from 3.4% to 21%. [2] The care of critically ill parturient women requires knowledge not only of the primary disease process and its treatment in the non-pregnant women, but also a thorough understanding of the changes that the maternal peri-partum physiology requires of such care [3].

Obstetric patients requiring intensive care can have a complicated clinical course as compared to non-pregnant patients during various surgical and medical emergencies. Factors such as hypoxemia, hypotension, severe infection, severe anemia, and so on, can influence the obstetric outcome as both the parturient and fetus become extremely vulnerable to these clinical insults. The diseases, both specific and non-specific to pregnancy, affect equally in terms of increasing the morbidity and mortality in obstetric patients. [4]

Respiratory diseases like acute exacerbation of asthma, pneumonitis, pulmonary edema, acute respiratory distress syndrome (ARDS), and acute lung injury can have serious implications both on the mother and the fetus, and special considerations during these episodes include maintaining blood- oxygen saturation greater than 90%.

Cardiovascular disorders, such as rheumatic heart disease, mitral stenosis, and other valvular lesions can cause cardiac failure, which necessitates intensive care admission. Cardiac surgery during pregnancy is extremely challenging and should best be avoided, unless a life-saving procedure is required. Renal diseases like pyelonephritis can accentuate sepsis, which again propels the patient to the Critical Care Unit.

Coagulation disorders, hepatic derangements, including the HELLP syndrome, warrant urgent intensive care intervention in many instances as these disease entities can sometimes prove fatal. Neurological disorders can mimic the picture of eclampsia and the appropriate therapy involves a complete investigation profile. Gestational diabetes, thyroid disorders, and other endocrinal diseases can also be responsible for medical emergencies in obstetric patients requiring urgent critical care.[5]

Surgical emergencies, although occurring with equal frequency in both the obstetric and non-obstetric population, require urgent attention, especially in critically ill obstetric patients. Then again, the decision to perform surgery has to be taken after evaluating the pros and cons of the surgical procedure, as critically ill patients may not be able to sustain the anesthetic and surgical insults, and also, fetal compromise is most likely to occur during these circumstances.

One of the main reasons for the underreporting of maternal deaths in the developing nations is the poor classification of the mortality pattern and lack of uniformity in the application of various clinical prognostic scores such as Acute Physiology and Chronic Health Evaluation (APACHE) II and III, Simplified Acute Physiology Score (SAPS), and Mortality Probability Models (MPM). Predictors of maternal mortality are varied in different scoring systems, which leads to the development of wide conflicts during the analysis of statistical results. MPM seems to be the best scoring pattern, as it takes into account the need for mechanical ventilation, cardiopulmonary resuscitation, as well as acute and chronic co-morbid diseases.[3] However, various research studies have established almost similar mortality statistics with respect to these scores. The main drawback of all the scoring systems is that they do not take into consideration the wide physiological alterations during pregnancy.

(HELLP) syndrome, for example does not find a suitable place in any of these scores during evaluation of the physiological health status of the parturient, yet is rapidly fatal.

The admission pattern of critically ill obstetric patients in the CCU is almost similar to the triage principle, as per the guidelines of the Joint Commission, and is based on the critical nature of the underlying disease process. The criteria may differ from country to country and in different setups, but admission should be within the purview of these guidelines [Table 1]. The co-morbid disorders should be a priority consideration during the decision-making for CCU admission.

Table 1.

Organ system	Clinical Indications
General/ Obstetric	Sepsis, severe pre-eclampsia, Eclampsia, HELLP syndrome, Amniotic fluid embolism.
Cardiac	Valvular heart disease, Rheumatic heart disease, CCF, severe hypertension, IHD, MI, peri-partum cardiomyopathy, Dysrhythmias
Pulmonary	Severe asthma, Severe pneumonia, ARDS, respiratory failure, Pulmonary oedema, Pulmonary embolism
Endocrine	Diabetic ketoacidosis, thyrotoxicosis, pancreatitis.
Renal	Acute pyelonephritis, Renal failure
Gastrointestinal	Hepatic failure, HELLP syndrome
Hematological	Coagulation disorders, Anaemia
Surgical/ anesthetic complications	Anaesthetic complications during surgery for LSCS, surgical Complications on the table

HELLP= Hemolysis, Elevated Liver Enzymes, Low platelets. IHD= Ischemic Heart Disease, CCF= Congestive Cardiac Failure, LSCS= Lower segment Caesarian Section, ARDS= Acute Respiratory Distress Syndrome, MI= Myocardial Infarction

Jose Orsini e.t.al, Clinical Profile of Obstetric Patients Admitted to the Medical-Surgical Intensive Care Unit (MSICU) of an Inner-City Hospital in New York. 2012.

Goals in management of critically ill obstetric patients involve intensive monitoring and physiologic support for patients with life-threatening but potentially reversible conditions.

Institutional capabilities, the frequency and acuity of serious obstetric complications largely determine the need for critical care [6]. Spiraling medical costs have prompted an evaluation of critical care use. The concept of intermediate care or “step-down” units was proposed for patients who did not require CCU monitoring, but who needed more care than could be provided on a general ward. It was also suggested as a strategy that promotes greater flexibility in patient triage, increases accessibility to limited critical care, and provides a cost-effective alternative to CCU admission [7].

One of the advantages of high-level obstetric units is the concurrent availability of expert obstetric care and critical care management. Institutions that rely on those obstetric units for the majority of their complicated patients, mostly tertiary care centers, will transfer to the CCU only patients with multiple organ failure and those who require mechanical ventilatory support as well as invasive hemodynamic monitoring. Smaller hospitals may not be able to fulfill the requirements for an intermediate care unit, or they may not encounter enough critically ill women; in these situations, transfer to a Medical or Surgical CCU’s may be preferable for the optimal care of such patients [8].

In a study by Jose Orsini e.t.al, obstetric admissions to CCU represented 4.1 per 1,000 deliveries and 2.37% of all CCU admissions in that institution (Inner City Hospital of New York), which was comparable with figures reported in the literature. [19] The mean length of stay in ICU of 3.5 days, which was similar to data reported in recent studies, suggested that most of these patients did not have major complications during their CCU admission. In this report, the rate of pregnancy-induced hypertensive disorders that required CCU admission was lower than in other studies and, contrasting with previously reported data; obstetric hemorrhage was the most common diagnosis requiring admission to CCU.

The needs for mechanical ventilatory support among the patients in this study was comparable to other reports, where the necessity for mechanical ventilation ranged between 41-60% [9], but it was significantly higher than in other studies. Most of the patients were either transferred to CCU immediately after surgical procedures with an endotracheal tube, or intubated in the emergency department and admitted to the CCU.

Literature on obstetric PACU admissions is lacking, while high-risk obstetric patients in non-primary obstetric hospitals are usually handled by the CCU. In those institutions the PACU

may represent a suitable alternative to the intermediate obstetric unit, since the characteristics of the high-risk postoperative obstetric patients usually allow early recovery if optimal monitoring and medical treatment are readily applied. However, in hospitals where PACU is not available to deliver such care, an intermediate obstetric unit would be of a great value in accommodating such patients [10].

In non-primary obstetric hospitals, taking advantage of the PACU as an intermediate obstetric unit should decrease the needs for CCU monitoring among some obstetric patients, reserving CCU beds for the most critically ill. The full scope of CCU resources should be immediately available to the obstetric patients when the need arises.

Currently there are no universal guidelines stating the management of critically ill obstetric patients, although at times different guidelines and protocols have been published by the various international societies of obstetricians, anesthesiologists, intensivists, and other critical care physicians. The application of the American College of Critical Care Management guidelines seems to be the most appropriate and is being followed to a major extent in most of the developing nations.[13] However, strict compliance and adherence to these protocols and guidelines is not feasible in a majority of developing nations, due to numerous factors, including economic constraints, sociocultural beliefs, levels of education, attitude toward the criticality of clinical conditions, poor means of transportation and communication.

In summary, the reasons for critical care needs among obstetric patients have not changed over the past years. While the need for intensive care is commonly unforeseeable and unavoidable, obstetric hemorrhage and pregnancy-induced hypertensive disorders are often followed by severe maternal morbidity. Any obstetric unit knows that it will have to deal with predictable complications, even though they may occur at unpredictable times. Preparation for such emergencies, and organization of resources, may reduce the threat to maternal health and obviate the need for expensive and complex critical care.[14]

A multidisciplinary team involvement is essential in the management of pregnancy-induced hypertensive disorders and obstetric hemorrhage, as they are the most common causes of maternal morbidity and mortality as well as the main reasons for CCU admission[15]. Understanding the physiological changes of pregnancy and the course of the diseases that commonly complicate pregnancy is essential to provide optimal quality of care.

JUSTIFICATION:

Majority of our expectant mothers are of a young age group and should therefore be able to carry pregnancy and deliver safely. There is need to know the common causes of CCU admission in KNH and determine the outcome of these admissions. The interventions done to these patients will also be evaluated and the presence of co-morbidities.

This study will evaluate the physiological support given to patients with life threatening but reversible illnesses. Local and institutional factors involved in the management of these critically ill patients, will be determined, to try and explain the CCU admission rates in KNH.

No similar study has been undertaken before in KNH and this will form a basis for improvements if any, in obstetric and CCU care. The findings of this study will increase knowledge as to the common causes of CCU obstetric admission in KNH, how these can be prevented and determination of various methods of management of critically ill patients to improve outcomes.

The findings of this study may be used to improve outcomes of CCU obstetric admissions and also prevent some of the causes of admission by timely intervention. Improved maternal outcomes will have a great socio-economic impact because the newborn babies will have maternal care and reduced cost of medical bills due to prolonged hospital stay.

The findings of this study will be used to compare with previous similar non- obstetric studies to show whether there is improvement in the outcomes of general CCU admissions. One such evaluation by Dr. Jamala, [20] which revealed that majority of patients admitted in CCU were of the age group twenty to twenty four years, with mean duration of stay of four days. Out of the patients studied, 59% were discharged to the wards and 41% died in CCU.

Research Question:

1. What is the mean age of expectant mothers admitted in KNH CCU, their level of education, gestational age and primary diagnosis.
2. What are their causes of admission to Critical Care Unit.
3. What is the mode of admission to KNH CCU.
4. What treatment modalities are employed to manage the patients admitted in KNH CCU and what are their outcomes.

BROAD OBJECTIVE:

To evaluate the patterns of obstetric patients admission to the Kenyatta National Hospital Critical Care Unit, their management and outcome, over a one year period.

SPECIFIC OBJECTIVES:

1. To outline the clinical characteristics of obstetric admissions to the CCU.
2. To find out the causes of CCU admission.
3. To determine the acute interventions done during admission and the duration of stay in CCU.
4. To identify organ system involvement in the obstetric patients admitted to the CCU.

HYPOTHESIS:

Alternate Hypothesis:

Most of the causes of CCU admission in KNH for expectant mothers are preventable by timely intervention to reduce end organ damage.

Null Hypothesis:

Most of the causes of CCU admission in KNH for expectant mothers are not preventable by timely intervention and hence end organ damage.

RESEARCH METHODOLOGY.

Study Design

A prospective -observational study.

Study Site

The study was conducted at the Kenyatta National Hospital main Critical Care Unit and Satellite CCU's (Emergency ward and Acute - room) where patients are admitted for critical care management. The satellite CCU's are used due to the limited bed capacity of the main CCU, and they are located in Casualty of KNH situated in Nairobi, Kenya. However, the main CCU is located on first floor of KNH, adjacent to main theatre and Burns unit.

Study population

All patients admitted in KNH main CCU, Acute- room casualty and Emergency ward during pregnancy or peri-partum period.

Sampling procedure

Convenience sampling procedure was used. This technique involved non-random selection of patients in the CCU using the criteria below. Patients were consecutively enrolled into the study, until the desired sample size was achieved.

Inclusion criteria;

- Expectant mothers admitted in main CCU, Acute- room and E- ward.
- Consent obtained from next of kin or guardian.
- Peri-partum period of six weeks.

Exclusion criteria;

- Decline to participate in study.

Sample size

The sample size was determined by the formula: [2]

$$n = \frac{t^2 \times p(1-p)}{m^2}$$

Description:

n = required sample size

t = confidence level at 95% (standard value of 1.96)

p = estimated prevalence of CCU obstetric admission (2.37%) [19]

m = margin of error at 5% (standard value of 0.05)

Prevalence of CCU admission from other studies [19], was 2.37% which I rounded-off to 3%, which gives the value of 0.03. Hence $p = 0.03$

Thus, $n = \frac{1.96 \times 1.96 \times 0.03(1 - 0.03)}{0.05 \times 0.05}$

$$0.05 \times 0.05$$

$$n = 45 + 10\%(45)$$

$$n = 50$$

Data collection procedure

Obstetric patients admitted in CCU were identified using the CCU admission register. All eligible clients were listed down and the investigator approached them on their beds. The eligible criteria was administered and informed consent sought among those meeting the inclusion criteria. The patients who could talk (conscious), gave their consent to participate in the study or declined. While relatives/ guardians of those who could not talk (unconscious), gave consent on behalf of the patients. The consenting patients were then interviewed using a structured questionnaire (Appendix 3), to collect data on all the variables related to the objectives. Additional information was obtained from the data recorded in the patient's file and observations made. The principal investigator was responsible for data collection assisted by a trained research assistant.

Data management and analysis

At the end of data collection, questionnaires were coded and entered into Microsoft Access database. Data cleaning was performed at the end of data entry and data exported to SPSS version 20, Chicago, IL for analysis.

Percentages and means/ medians were used to present categorical and continuous data respectively. Socio-demographic characteristics were analysed to show the description of the population. Clinical characteristics, causes of admission, acute interventions done and organ involvement were analysed and presented as percentages with frequency distributions.

Statistical tests were performed using Chi square test for association of categorical variables and Student's T test for comparing means. All tests of significance were interpreted at P-value of < 0.05 (95% confidence level). The findings have been presented using tables and charts.

Ethical considerations

1. No names of patients or practitioners were used in this study.
2. The study had no harmful effects on subjects, not entailing any invasive procedures, drug administration or omission nor present any hazard whatsoever. No extra costs was incurred by study subjects.
3. Study subjects could decline inclusion in the study and/or could leave the study at any point without victimization or compromise to their clinical management.
4. Permission to conduct the study was sought from the Kenyatta National Hospital/University of Nairobi – Ethics & Research Committee prior to commencement.
5. Study findings will be availed to the University of Nairobi, Kenyatta National Hospital administration and the Kenya Society of Anesthesiologists to facilitate appropriate policy formulation aimed at improving patient care.

FINDINGS:

The study involved 50 patients, who were admitted in KNH main CCU, E- ward or Acute room.

Table 2: Socio-demographic factors

Variable	Frequency (%)
Age	
Mean (SD)	27.6 (6.7)
Min-Max	17-42
Education Level	
Primary	12 (24.0)
Secondary	20 (40.0)
Tertiary	18 (36.0)
Marital Status	
Married	41 (82.0)
Single	9 (18.0)
Parity	
Primy	21 (42.0)
Multi	29 (58.0)
Gestation age	
1st trimester	1 (2.0)
2nd trimester	4 (8.0)
3rd trimester	14 (28.0)
Post delivery	31 (62.0)

The mean age was 27.6 years, with a standard deviation of 6.7 years and a range of 17 – 42 years. Majority had attained a level of education beyond primary school. Majority (82%) were married, while most of the patients (58%) were multi-parous. Majority of the mothers admitted in CCU were in the post delivery period (62%).

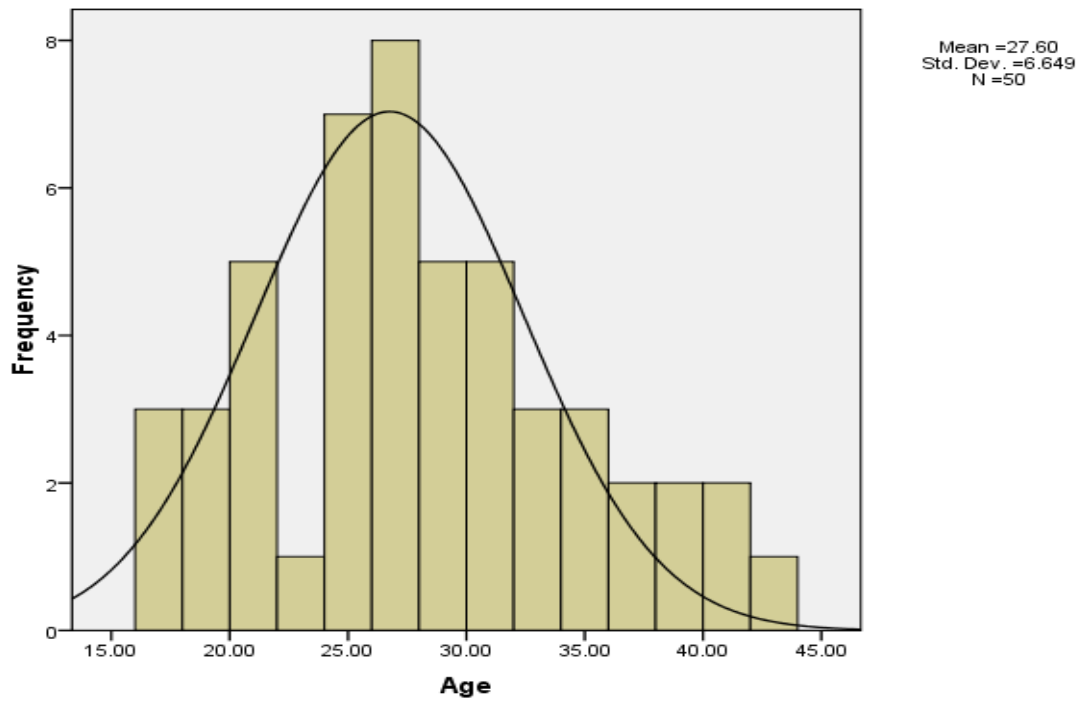


Figure 1: Age distribution

The age distribution curve was normal.

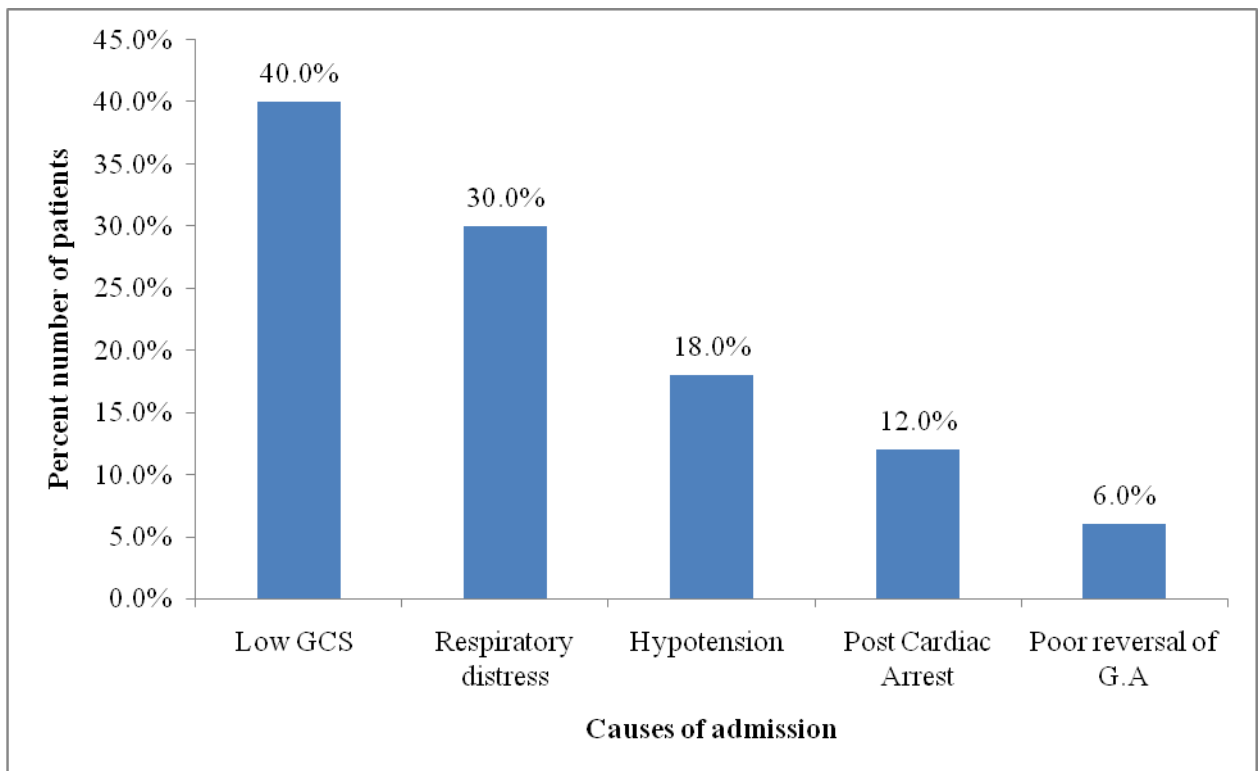


Figure 2: Causes of CCU admissions

The leading cause of CCU admission was low GCS (40%), followed by respiratory distress (30%) and hypotension (18%).

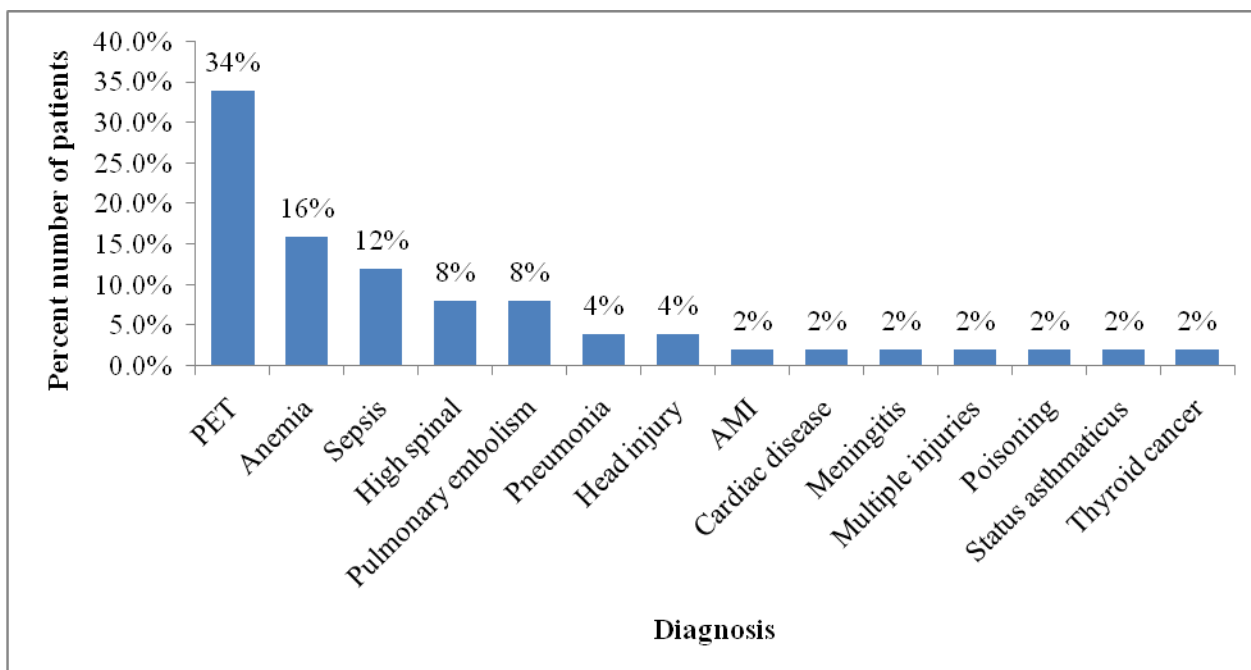


Figure 3: Diagnosis

The main diagnosis of CCU admission were PET (which included Eclampsia) 34%, Anemia (16%), and Sepsis (12%). This was similar to other studies done previously. [19]

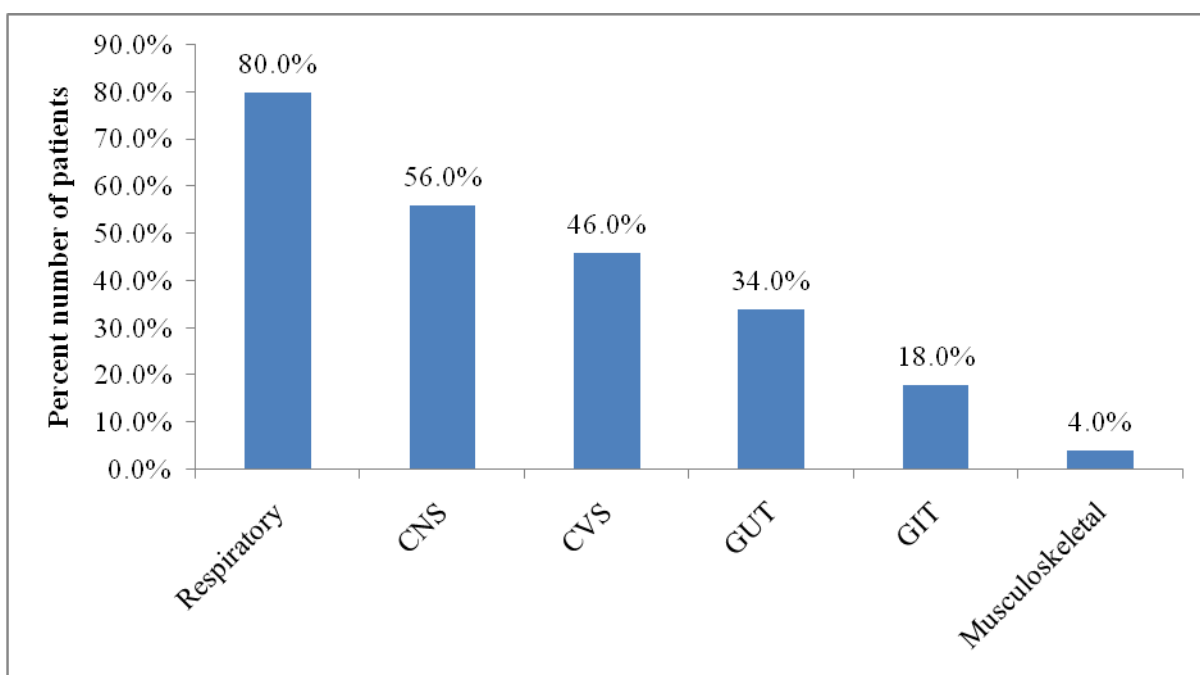


Figure 4: Systemic or organ involvement

The leading organ/ systemic involvement was respiratory (80%), CNS (56%), CVS (46%) and GUT (34%).

CVS involvement, (63%) $p= 0.036$ and CNS involvement, (73%) $p=0.02$ was associated with higher mortality than those without CVS or CNS involvement.

Table 3: Management, CCU stay and outcome

Variable	Frequency (%)
Treatment administered	
Mechanical ventilation	40 (80.0)
Dialysis	5 (10.0)
Surgery	10 (20.0)
I.V antibiotics	50 (100.0)
Anti-emetics	49 (98.0)
Inotropes	12 (24.0)
Anticonvulsants	24 (48.0)
Analgesics	47 (94.0)
Others	36 (72.0)
Duration of stay in CCU	
0-7 days	33 (66.0)
8-14 days	11 (22.0)
15-21 days	2 (4.0)
More than 28 days	4 (8.0)
Outcome of the disease process	
Discharged to ward	28 (56.0)
Death	19 (38.0)
Still in the ward	3 (6.0)

Mechanical ventilation was required in 80% of the patients. All the patients were on antibiotics, 10% required dialysis, 24% were on inotropic support and 48% on anti-convulsants.

Majority of the patients (66%), stayed less than one week.

Majority of the patients who were admitted in CCU, were discharged to the wards (56%). However the mortality rate was high at 38%, compared to other studies which reported between 3% to 6%.

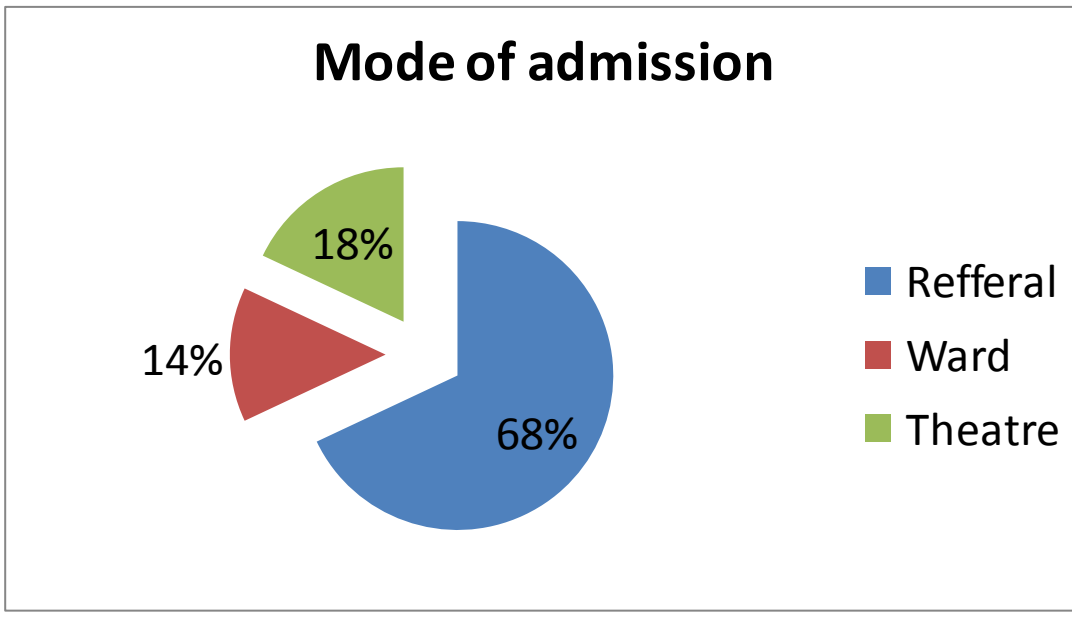


Figure 5: Mode of admission

The mode of admission of the patients in KNH CCU, was mostly referrals from other hospitals (68%).

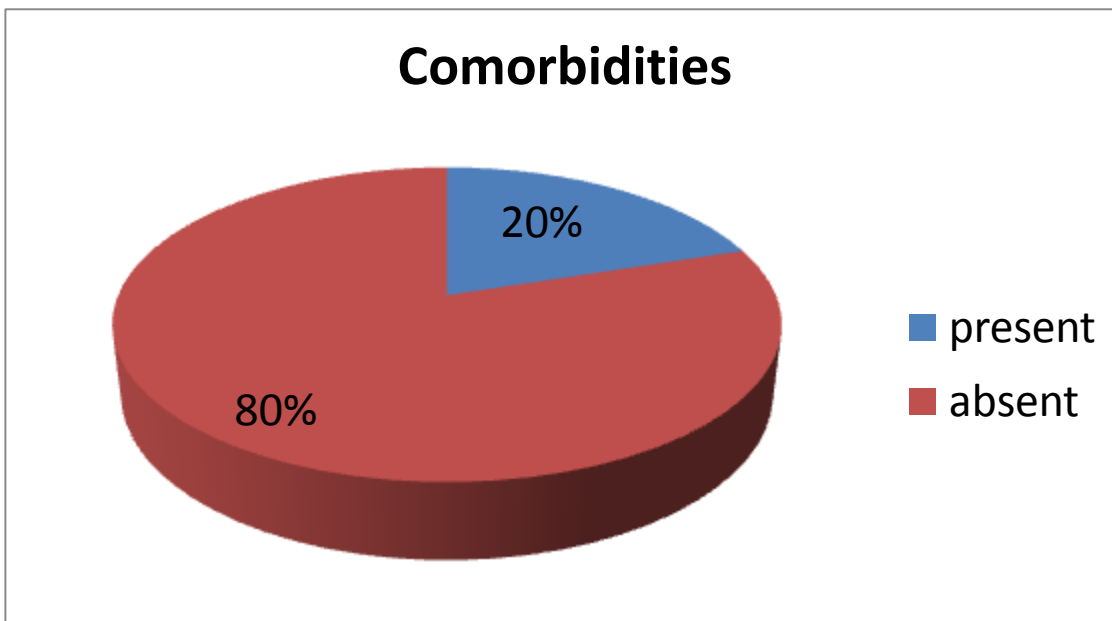


Figure 6: Comorbidities

Most of the mothers admitted in CCU, had no Comorbidities (80%). This was similar to other studies which showed the rate of Comorbidities to be 11%.

DISCUSSION

A pregnant woman may present for critical care support in 2 main ways; either with a disease state that is unique to pregnancy or with critical illness that is not unique to pregnancy. Diseases specific to pregnancy include preeclampsia, eclampsia, HELLP syndrome (Hemolysis, elevated liver enzymes, and a low platelet count), and amniotic fluid embolism syndrome, all of which usually require immediate therapy that may be lifesaving. Some critical illnesses not unique to pregnancy, such as preexisting maternal hypertension, thromboembolic disease, cardiac disease and trauma, can be precipitated or aggravated by pregnancy. The normal physiologic, metabolic and hormonal changes of pregnancy may alter the presentation of disease processes and add a level of complexity to diagnosis and treatment.

The mean age of admission was 26.7 years, with a range of 17 – 42 years. This was comparable to other studies which reported mean ages of 31 years, with a range of 17 – 51 years, especially in developed countries [21]. Whereas in developing countries, the mean age was as low as 24 years. In developed countries, it was noted that there is a delay in age of conception due to several reasons such as education, employment, smaller family sizes, to mention but a few. However in developing countries, younger ages were admitted in CCU due to early conception, caused also by multiple reasons, such as early marriages, poverty hence lack of education opportunities and cultural practices [21]. Since these patients are of a young age group and are ‘bread – winners’ in their families, their admission to CCU and mortality causes a huge economic burden to the nation and families of those affected.

Majority of the patients were literate and their level of education was beyond primary school. This is an indication of their ability to follow instructions concerning treatment or follow-up of an illness. Most of the patients were admitted after delivery (62%), and was comparable to other studies which reported up-to 78% CCU admission post- delivery [22]. This indicated that the period after delivery was crucial for expectant mothers, and they require close monitoring and follow-up. This is because, it is during this time that the physiological changes that occurred during pregnancy in order to accommodate the foetus, are reverting back to pre- pregnancy state. Some of the changes are such as increase in blood volume, increase in cardiac output, decrease in functional reserve capacity, increase in oxygen consumption and demand.

The leading causes of CCU admission was low GCS, respiratory distress and hypotension. Whereas the main diagnosis in CCU admission were PET(including eclampsia),

Anemia(including due to hemorrhage) and Sepsis. This was similar to studies done elsewhere, in which Preeclampsia and Hemorrhage were the main diagnosis in developed countries. However, in developing countries, Sepsis is also a major diagnosis in addition to Hemorrhage and PET [22]. These diagnosis are associated with low GCS, respiratory distress and hypotension, either due to the patho-physiology of the disease process, or complications due to treatment of the disease e.g Magnesium sulphate used for treating PET can cause respiratory depression and hypotension. Sepsis is caused by several factors such as lack of appropriate antibiotics post- delivery, inadequate dosing of antibiotics, lack of drug sensitivity tests, re-use of disposable items, e.t.c

The main organs/ systems involved were the respiratory(80%), cardiovascular(56%), central nervous system(46%) and genito-urinary system(34%). This was accompanied by most of the patients being invasively ventilated (80%), dialysis done for 10% of the patients, 24% of the patients were on inotropic support while all the patients were on antibiotics. Since the FRC (functional residual capacity) is reduced, the expectant mothers are at risk of hypoxia, when there is increased oxygen demand. This necessitates the need for ventilatory support and/ or supplemental oxygen, however, in developed countries, where there is availability of non-invasive ventilation, only approximately 20% were invasively ventilated. However other studies reported mechanical ventilation rates of 40- 61%. Up-to 25% of the patients in developed countries are admitted in CCU for observation via invasive monitoring e.g central venous pressure, arterial blood pressure monitoring (invasive), e.t.c. [23] Cardiovascular involvement and CNS involvement, was associated with significantly higher mortalities of 63%(p= 0.036) and 73%(p=0.02) respectively.

Most of the patients (66%), stayed for less than one week, this included both those who were discharged to the ward and those who died. Of those who stayed for less than one week, 38% died during this period. This was comparable to other studies which reported mean duration of stay of 2 days, with a range of stay of 1 – 10 days [23]. Prolonged stay in CCU was associated with poor outcomes, either mortality or adverse loss of neurological functions, e.g. hypoxic brain injury. 56% of the patients admitted in CCU, were discharged, while 38% died. Other studies reported mortality rates ranging between 3% – 6%, mostly in developed countries, while in some of the African countries, mortality as high as 64% was reported [24]. The higher mortalities could be attributed to several factors such as lack of trained personnel, lack of adequate equipments and late presentation of patients.

Most of the patients admitted in CCU, were referrals from peripheral hospitals (68%). This could be associated with the high mortalities due to late presentation to KNH. Most of these peripheral hospitals had no facilities or personnel to manage critically ill patients, more so peri-partum mothers. 80% of the patients admitted in CCU, had no Comorbidities, which was similar to other studies, indicating that pregnant mothers were at risk of developing critical illnesses, even when they had no underlying diseases before pregnancy [24].

CONCLUSION:

- ✓ The patients admitted in CCU KNH are relatively young, with a mean age of 27.6 years and most admissions are during the post- delivery period. Of these admissions in KNH 10% of the CCU admissions will be obstetric. Of the obstetric mothers admitted in KNH, 1% will be admitted in CCU and obstetric admissions contribute 38% of all KNH admissions.
- ✓ The leading causes of CCU admission in KNH were low GCS, respiratory distress, hypotension and post- cardiac arrest. The main diagnosis were Preeclampsia toxemia, Anemia and Sepsis.
- ✓ The acute interventions done were mechanical ventilation in majority of the patients, intravenous antibiotics in all patients, dialysis, inotropic support, anti-convulsants were given, to mention but a few. The duration of stay was less than one week, for majority of the patients.
- ✓ The main organs/ systems involved, for patients admitted in CCU, were respiratory, cardiovascular, central nervous system and genito-urinary systems.

RECOMMENDATIONS:

1. Outline clear antenatal care for all women under universal protocols.
2. Continuous medical education and sensitization on close monitoring and follow-up of post-natal mothers should be instituted, in order to reduce admissions into CCU, of preventable and treatable causes such as Preeclampsia toxemia, Anemia and Sepsis.
3. Critical Care facilities should be put in place in Maternity wards, to improve on management of critical care patients, by avoiding delays in admission to the main CCU. Availability of the obstetricians in Maternity ward, will also improve on patient management.
4. Training of more personnel on Critical Care of patients and setting up more CCU's in the districts, to reduce the admissions in KNH CCU from the periphery hospitals.

Appendix 1: Consent for participation in maternal ICU admissions study

INFORMED CONSENT

My name is Dr. Mungai A. Kirumwa, a postgraduate student in Anesthesia at the University of Nairobi. As part of my course work I am required to perform clinical research. I am conducting a study at the Kenyatta National Hospital on obstetric admissions in KNH CCU, their morbidity and mortality outcomes. The aim of this study is to help doctors improve the care given to patients. To do this, I will review the notes on your relatives file and ask you a few questions regarding her parity and medical history before admission to CCU. I will look at the medical treatment she has receive so far, any surgical interventions done and the ongoing treatment. Thereafter I will do statistical calculations on this information and publish it in a book that will be in the custody of the University of Nairobi. I have been given permission by the management of the Hospital, to talk to you but I would first like to explain to you, what I intend to do so that you can decide whether you can participate or not.

This is a medical research study and you are requested to understand the following general principles, which apply to all in medical research:

Procedures of the study: the study will involve asking you questions concerning characteristics that describe you and your condition. As you give responses to the questions, a questionnaire will be filled according to your answers. No invasive procedures such as drawing blood will be involved.

Voluntary: your participation in this study is entirely voluntary and you are allowed to withdraw at any stage of the study. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled.

Benefits: the study will help identify cause of obstetric admissions in CCU and their outcomes. The information generated by this study will be important in guiding decisions to improve interventions and hence outcomes of such admissions.

Risk/ Discomfort: this involves invasion of personal life on questions related to your condition but only the researcher asking the questions will know the answers as an individual. Since it is a non-invasive procedure, it poses no risks associated with pain or infection.

Confidentiality: confidentiality will be observed. To protect your privacy, your names will not be used but instead a study number will be used. The researcher will keep the records in a safe place and only he will be allowed to access and use them. Your names and other facts that might identify you will not appear when the researcher presents this study and publishes the results.

You are free to ask any questions that will allow you to understand clearly the nature of the study. For further information and clarification you may contact:

Dr. Mungai A. Kirumwa. Telephone number – 0720860448

Dr. T. M. Chokwe – supervisor. Telephone number - 0722528237

KNH/UON – Ethics & Research Committee. Telephone number – 2726300

Consent Form

I _____ of _____ accept to take part in the study entitled “ANALYSIS OF OBSTETRIC ADMISSION PATTERNS AND MANAGEMENT IN THE CRITICAL CARE UNIT, KENYATTA NATIONAL HOSPITAL”.

I confirm that I have read the consent explanation form that outlines the nature of this study. I have also been explained to about the study by the researcher. I fully understand that this study will have no harmful effects to the participants and that confidentiality will be maintained. I also understand that this is a voluntary exercise and I have a right to withdraw from the study at any time.

I hereby give my informed consent.

Participants signature Date.....

Researcher’s signature Date.....

Idhini ya kushiriki katika utafiti

Maelezo.

Jina langu ni Daktari Mungai A. Kirumwa, mwanafunzi wa shahada ya pili katika chuo kikuu cha Nairobi. Kama sehemu ya masomo yangu ninastahili kufanya utafiti wa kitabibu. Lengo langu ni kufanya utafiti katika Hospitali ya Taifa ya Kenyatta juu ya idadi ya wanawake wajawazito wanao lazwa katika wadi ya watu wenye hali mahututi. Lengo la utafiti huu ni kusaidia madaktari kuboresha huduma unaotolewa kwa wagonjwa. Kwa kufanya hivyo, nitakuuliza maswali kuhusu matibabu aliyopata kabla ya kutumwa KNH, magonjwa mengine anayo tibiwa, matokeo ya mimba hizo zingine. Baada ya hapo nitafanya mahesabu ya takwimu na taarifa hii na kutangaza habari hiyo katika kitabu ambayo itakuwa chini ya ulinzi wa Chuo Kikuu cha Nairobi. Taarifa zote zilizokusanywa zitashughulikiwa na usiri. Hakuna majina au vitambulisho vingine zitakavyotumika katika utafiti. Kwa hiyo nitahitaji idhini yako kwa mwenzako (au tegemezi) kuwa mshiriki katika utafiti huu.

Ushiriki wako katika utafiti huu ni kwa hiari yako na unaweza kuondoa mwenzako (au tegemezi) katika hatua yoyote bila kuathiri matibabu atakayopewa mwenzako (au tegemezi) kwa njia yeyote. Taarifa zote zitakazopatikana katika mwendo wa utafiti huu ni manufaa kwa mgonjwa.

Kwa maelezo zaidi na ufafanuzi, unaweza kuwasiliana na:

Daktari Mungai A. Kirumwa. Nambari ya simu – 0720860448

Dr. T. M. Chokwe. Nambari ya simu - 0722528237

KNH/UON – Ethics & Research Committee. Nambari ya simu – 2726300

Fomu ya Idhini

Mimi _____ wa _____ ninatoa kibali kuhusishwa kwenye utafiti uitwao “ANALYSIS OF OBSTETRIC ADMISSION PATTERNS AND MANAGEMENT IN THE CRITICAL CARE UNIT, KENYATTA NATIONAL HOSPITAL”.

Nathibitisha kwamba nimeelewa maelezo yote kutoka kwa daktari kuhusu utafiti huu. Nimetoa kibali hii cha kushiriki kwa huu utafiti kwa hiari yangu binafsi. Nimeelewa kwamba ninaweza kujiondoa kutoka utafiti huu wakati wowote bila masharti yoyote na kujiondoa kwangu hakutadhuru matibabu yangu kwa njia yoyote. Pia nimeelewa ya kwamba, habari yoyote nitakayoitowa itahifadhiwa kwa siri.

Sahihi ya Mhusika _____ Tarehe _____

Sahihi ya Mtafiti _____ Tarehe _____

Appendix 2: Data Collection Tool:

Serial number

- 1) IP No.: Date
- 2) Age:Parity; Locality
- 3) Gestational age Marital status
- 4) Diagnosis
- 5) Co-morbidities
- 6) Causes for CCU admission:
- i) Respiratory distress
 - ii) Hypotension
 - iii) Post –cardiac arrest
 - iv) Low GCS
 - v) Poor reversal of G.A
 - vi) Others
- 7) Mode of admission;
- a) Referral from another hospital
 - b) Transfer from the ward(KNH)
 - c) Transfer from theater
 - d) From home
- 8) Associated risk factors
- a) Abortion
 - b) Multiple pregnancies
 - c) Duration of referral
 - d) Others

9) Systemic or organ involvement:

a) CVS

(a) Cardiac arrest

(b) On inotropes

b) RESPIRATORY

(1) On mechanical ventilation

(2) Oxygen by mask

(3) Oxygen by nasal prongs

(4) Tracheostomy

(5) Thermovent

c) GIT

i) Deranged LFT's

ii) Abdominal sepsis

iii) Patients on TPN

d) GUT

i) Deranged U/E/C

ii) Oliguria

e) CNS

i) GCS 3 and below

ii) Brainstem death

f) MUSCULOSKELETAL

i) DVT

ii) Cellulitis

iii) Bedsores

iv) Fracture

10) Types of treatment administered:

a) Mechanical ventilation

b) Dialysis

c) Surgery

d) I.V antibiotics

- e) Anti-emetics
- f) Anti-thrombotics
- g) Inotropes
- h) Anticonvulsants
- i) Analgesics
- j) Others

11) Duration of stay in CCU :

- a) 0 – 7 days
- b) 8 – 14 days
- c) 15 – 21 days
- d) 22 – 28 days
- e) More than 28 days

12) Outcome of the disease process:

- a) Discharged to ward
- b) Transferred to another hospital
- c) Death

Appendix 3: Anti-plagiarism Declaration

Plagiarism Statement

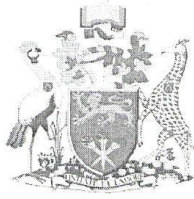
This project was written by me and in my own words, except for quotations from published and Un-published sources which are clearly indicated and acknowledged as such. I am conscious that the incorporation of material from other works or a paraphrase of such material without acknowledgement will be treated as plagiarism, subject to the custom and usage of the subject, according to the University Regulations on Conduct of Examinations. The source of any picture, map or other illustration is also indicated, as is the source, published or unpublished, of any material not resulting from my own experimentation or observation.

(Name)

(Signature)

.....

.....



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Ref: KNH-ERC/A/24

Link: www.uonbi.ac.ke/activities/KNHUoN

6th February 2014

Dr. Mungai A. Kirumwa
Dept. of Surgery
School of Medicine
University of Nairobi

Dear Dr. Kirumwa

RESEARCH PROPOSAL: ANALYSIS OF OBSTETRIC ADMISSION PATTERNS AND MANAGEMENT IN THE CRITICALCARE UNIT, KENYATTA NATIONAL HOSPITAL (P412/07/2013)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and approved your above proposal. The approval periods are 6th February 2014 to 5th February 2015.

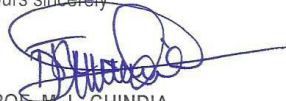
This approval is subject to compliance with the following requirements:

- a)R Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- b)R All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- d)R Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
- e)R Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
- f)R Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
- g)R Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- h)R Submission of an *executive summary* report within 90 days upon completion of the study
This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website www.uonbi.ac.ke/activities/KNHUoN.

Protect to Discover

Yours sincerely



PROF. M. L. CHINDIA
SECRETARY, KNH/UON-ERC



- c.c. Prof. A.N.Guantai, Chairperson, KNH/UoN-ERC
The Deputy Director CS, KNH
The Principal, College of Health Sciences, UoN
The Dean, School of Medicine, UoN
The Chairman, Dept. of Surgery, UoN
Assistant Director/Health Information, KNH
Supervisor: Dr. T.M. Chokwe, Dept. of Surgery, UoN

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