

**SURGICAL DISORDERS AND TREATMENT OUTCOMES IN ELDERLY
PATIENTS AT MOI TEACHING AND REFERRAL HOSPITAL.**

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**A research thesis submitted in partial fulfillment of the
requirements for the award of Master of Medicine in General
Surgery of Moi University**

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DECLARATION

Declaration by the candidate:

This thesis is my original work and has not been presented to any other university/institution

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ABSTRACT

Background: The United Nations refers to older people as anyone above 60 years. Due to increase in life expectancy the world over, the elderly population is on the rise. This age group is greatly affected by social, economic and health challenges and have a higher morbidity and mortality rates. They also have a higher rate per population of undergoing surgical operation but our local statistics are unknown.

Objective: To determine the surgical disorders and treatment outcomes among elderly patients at Moi Teaching and Referral Hospital.

Methods: This was a cross sectional study that included patients aged 60 years and above who underwent major surgery at MTRH between December 2015 and September 2016. Using a consecutive sampling technique, data was collected on the social demographics, surgical conditions, comorbidities surgical intervention and clinical progress and outcome. Data analysis was done using R: A language and environment for statistical computing. Association between variables was done using Pearson's Chi Square test.

Results: The study included a total of 367 participants aged 60 to 94 years. The median age was 66.0 (IQR: 61.0, 71.0) years. The male to female ratio was 1.2:1. Majority (99.7%) were from a rural residence and 95.6% were married. Most had little or no formal education (93.4%). Majority were farmers (89.4%). The median monthly income was Ksh 7000 with 62.1% of the participants depending on relatives to settle their hospital bills. Malignancies accounted for most of the surgical operations (43.9%) followed by intracranial hematomas (13.1%) and abdominal surgical conditions (10.6%). Hypertension was the most common comorbidity at 11.7%. Other comorbidities included diabetes (6%) and HIV (1.1%) among others. The main surgeries conducted were gastrointestinal (27.5%) and genitourinary (27.2%) surgeries. Neurosurgery and orthopedic surgeries were conducted on 15.8%, and 8.2% of the participants respectively. Neck and spine surgeries accounted for 14.7% of all the surgeries done. Up to 15.3% of the patients had post-operative complications. Of those with complications, 39.3% had surgical site infections, and 16.1% had wound dehiscence, 12.5% had bleeding while 2.7% of the participants died after operation. The findings showed no correlation between the age group and either the presence of comorbidities ($p = 0.054$) or post-operative complications ($p = 0.292$).

Conclusions: A significant proportion of elderly surgical patients are undergoing surgical operations due to malignancies and neurosurgical emergencies. Postoperative morbidity and mortality is, however, low. The noted comorbidities include hypertension, diabetes and HIV while the most common postoperative complication is surgical site infection.

Recommendations: Management of the elderly surgical patient requires both the physician and the surgeon. HIV needs to be recognized as an emerging comorbidity amongst this age group. Elderly patients who need surgery should not be excluded from surgical procedures on the basis of their age.

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LIST OF ABBREVIATIONS

ATP	Adenosine Triphosphate
ECG	Electrocardiogram
MRSA	Methicillin Resistant <i>Staphylococcus aureus</i>
MTRH	Moi Teaching and Referral Hospital
NHIF	National Health Insurance Fund
SAB	<i>Staphylococcus aureus</i> bacteremia
WHO	World Health Organization

DEFINITION OF TERMS

Elderly – Any individual aged 60 years and above

Treatment outcomes – Consequences directly related to the surgical operation

Major surgery–Any operation within or upon the contents of the abdominal, pelvic, cranial or thoracic cavities or in which, given the locality, condition of patient, level of difficulty or length of time to perform, constitutes a hazard to life or function of an organ or tissue.

Comorbidity – Any disease a patient is presenting with in addition to the surgical disorder they are being managed for.

Post operative mortality- Death occurring as a direct result of a surgical operation.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

The health care system has to contend with the ever rising elderly population. Due to the decreased physiologic reserve, reduced efficiency, slowed building and replacement and loss of tissue, elderly patients are more predisposed to illnesses. The elderly are faced with numerous social, economic, and environmental conditions which are worsened by declining physical and health status and reduced economic productivity and these have contributed to their poor health seeking behavior despite being in greater need of health interventions (Eze et al, 2013).

In the last two decades, the number of older people undergoing surgical procedures has been on an upward trend (Patridge et al, 2012). Despite improvements in medical and surgical care, postoperative complications still remain common especially among the elderly surgical patients. This has led to surgeons often opting to withhold surgery from the elderly in fear of adverse outcomes (William et al, 2013).

Outcomes of surgery are dependent on several factors. These can be categorized into patient and surgical factors. The elderly surgical patient has upto four times greater risk of postoperative complications (Williams et al, 2013). Any treatment plan involving an elderly patient must take into consideration factors such as functional and nutritional status, comorbidities and social support. Since they are mostly dependent on family members and other caregivers, any medical

intervention should be aimed at maintaining functional capabilities and improving the quality of life.

This study endeavours to fill the knowledge gap on these aspects of the surgical care of the elderly patients in our setting.

1.2 Problem statement

The elderly population is on the rise due to the increasing life expectancy. This population, however, is more often uneducated, either widowed or separated and face severe forms of poverty and isolation and are more likely to be excluded from formal employment and financial social support systems (Eze et al, 2013).

Due to the declining physical and health status and reduced economic productivity old age is associated with high morbidity and mortality rates. Elderly patients have higher rates per population of undergoing surgical treatment. From hospital records, patients above 60 years made up 7% of the total number of patients admitted to the surgical wards at MTRH in 2014. Of these older patients 95% underwent surgical operations. This was against 83% of patients undergoing surgical operations amongst the total admission to the same wards. With increased risk of postoperative complications expected and prolonged hospital stay, the elderly population therefore puts a significant strain on healthcare resources.

This interplay between the social, economic, age, surgical conditions, comorbidities, surgical interventions and outcomes of care in our setting needs to be elucidated.

1.3 Justification of the study

This study sought to establish the surgical conditions seen in elderly patients and outcome of surgical interventions and factors contributing to these outcomes. Little research has been done in this area especially in Africa. There is therefore paucity of information. This study enables healthcare workers have a clearer picture of what to expect when handling patients above 60 years in the surgical units and theatres. It will also help the Kenyan government in health policy formulation and planning and form a basis for developing clinical guidelines targeting older surgical patients.

1.4 Research question

The following research question guided the study:

What are the surgical conditions and interventional outcomes following surgery in elderly patients seen at MTRH?

1.5 Broad objective

To determine the socio demographic characteristics, surgical disorders and treatment outcomes following surgery in elderly patients seen at MTRH.

1.6 Specific objectives

1. To describe the socio demographic characteristics of the elderly surgical patient presenting at MTRH.
2. To find out the surgical disorders seen in elderly patients at MTRH.
3. To determine comorbidities in elderly patients with surgical conditions seen at MTRH.
4. To determine the outcome of surgery in elderly patients at MTRH.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Pathophysiology of aging

Aging leads to degeneration in both the structure and function of organs and tissues (Kanonidou and Karystianou, 2007). The skin becomes thin, fragile and slow to heal. Thickness of the dermis decreases by about 20%. It loses vascularity, cellularity and sensitivity. It gradually loses its ability to exchange or retain internal heat. Sweat and sebaceous glands are reduced both in number and effectiveness. Sensory neurons are decreased by 30% from the age of 10 years to 90 years.

There is a gradual loss of neurons in both the brain and spinal cord. Loss of neuronal dendrites reduces the amount of synaptic transmission. The sense of smell, taste, sight, touch and hearing are also diminished.

There is a general reduction of ATP, glycogen, myoglobin reserves and the number of myofibrils. This leads to a decrease in the size, elasticity and strength of all muscle tissue. Muscle activity becomes less efficient.

Lung function also deteriorates with age. There is a progressive loss of elastic recoil within lung tissue, the chest wall becomes stiff, and a decrease in alveolar surface area. These changes diminish the efficiency of gas exchange and make it more difficult to exercise.

2.2 Demographics

Different societies define old age differently. The United Nations refers to older people as anyone above 60 years. Globally, the population aged 60 or over is growing at a faster rate than the total population. According to the 2008-09 Kenya Demographic and Health Survey, elderly people above 65 years comprised 4.1% of the total population in Kenya. WHO reports indicate the proportion of older people aged 60 years and above increased from 9.2% in 1990 to 11.7% in 2013 and is projected to reach 21.1% by the year 2050. It is, in fact, expected to exceed the number of children for the first time by 2047. Persons 80 years or more are the fastest growing section of the population and are expected to reach nearly 30% of the overall population in the richest nations by 2050.

Life expectancy stands at 78 years in developed countries and 68 years in developing countries at present. In Kenya, life expectancy stands at 65.8 years for females 61.1 years for males. By 2050, life expectancy is projected to be 83 years in developed regions and 74 years in developing countries.

This rise can be attributed to improved management of communicable and non-communicable diseases and the consequent fall in infant and adult mortality rates, and declining fertility. Fertility rates have declined by half from 5 children per woman in 1950 to 2.5 children in 2015. Globally, this decline is expected to continue.

In addition, older persons increasingly live either alone or with their spouse only, and in most countries, they support themselves financially with their own earnings, income from their assets, and through government cash transfer.

Currently, about two thirds of the world's older persons is concentrated in the less developed countries and by 2050, nearly 8 in 10 of the world's older population will live in the less developed regions.

The older population is predominantly female. This is because women tend to outlive men and women outnumber men in the general population. In 2013, globally, there were 85 men per 100 women in the age group 60 years or over and 61 men per 100 women in the age group 80 years or over.

Despite an estimated 50 million people aged 60 years and older health programs in Africa consistently have their focus on HIV/AIDS, infants, children, and women of reproductive age leaving the elderly disadvantaged (Falkingham et al, 2011).

The elderly are also vulnerable because of lack of universal social security systems, fragmentation of families and weakening of family organization and kinship networks in many parts of Africa (Mba et al, 2007). A majority of old people have no formal education. A significant proportion are not in marital relationships since they have lost spouse either due to death or separation. Most suffer physical or medical conditions that interfere with their ability to work or manage day-to-day activities. They therefore depend on their adult children, well-wishers and government cash transfer for monetary support.

Ezeh et al observed that there are growing numbers of older people in urban areas. These are individuals who moved to urban areas in search of social amenities and economic empowerment through employment and were expected to return to their rural origins upon retirement.

In Nairobi, the biggest city in Kenya, an estimated 60 to 70 percent of the population is currently thought to be living in informal settlements. Eze et al argued that ‘the social, economic, and environmental conditions prevailing in informal settlements provide a challenge to the wellbeing of older people living in this setting, given their increased vulnerability due to declining physical and health status and reduced economic productivity. A majority of the residents work in the informal sector, and even those who have formal employment often lack job security despite working in high-risk jobs. Older women who are largely uneducated and unmarried may face more severe forms of poverty, isolation, and vulnerability than men, and they may be more likely to be excluded from formal employment in the past and social support systems in the present, such as the country’s contributory pension scheme. The living arrangements of older people greatly affect their social, economic, and health status and overall well-being. Older people who live alone may lack the necessary social capital and networks to survive in urban informal settlements.’ As a result of these setbacks, older people are less likely to seek care even though they are sicker.

2.3 Health problems

Thakur et al 2013 found the common health problems among the elderly to include visual impairment, hearing impairment, urinary problems, weight loss, trauma, depression, anaemia, arthritis, hypertension, dental problems, cataract, diabetes, ischemic heart disease, asthma, malignancy, Parkinson’s disease and paralysis. Diabetes in the elderly can be attributed to many causes but a primary mechanism involves the inability of skeletal muscle to absorb glucose. Over time skeletal muscle becomes less responsive to insulin.

A retrospective study in a Nigerian Tertiary Health Care Institution (Abdulraheem and Abdulrahman, 2008) found joint pain and backache were the most common morbidities among the elderly followed by osteoporosis, hypertension, decreased visual acuity and difficulties in hearing. Other morbidities were diabetes mellitus, gastritis/gastric ulcer, liver cirrhosis and hepatoma, asthma, prostatic diseases. Malnutrition was also found to have high prevalence among the elderly. Women reported more health problems than men. Morbidity was significantly associated with gender, employment, household income, alcohol intake, and cigarette smoking. Malnutrition is potentially dangerous in surgical patients and adequate attention should therefore be given to the nutritional status in the peri-operative period (Akpan et al, 2002).

Elderly patients represent a significant proportion of patients in the surgical wards. Aging is associated with several nervous, cardiovascular, respiratory, hepatic and renal disorders. It is also associated with a prolonged wound healing period, poor metabolism of drugs and postoperative reduction in physiologic reserve, which can lead to organ failure (Palmer, 2009). Aging therefore pose a challenge both to the surgeon and the anesthesiologist.

Cancer incidence and mortality markedly increase after age 60. The incidence of cancer in the elderly is upto 10 times greater than in the young while the cancer death rate is 16 times greater (Berger et al, 2006). Cancers associated with highest mortality include prostate, bladder, colon, uterus, pancreas, stomach, rectum and lung cancers. In a study carried out in the Yaounde Population Cancer Registry in Cameroon, Enow-Orock et al established that breast cancer was common in the upper social class while malignancies of the cervix, endometrium, and vagina was

common in the low and middle classes. Illiteracy and low to average socioeconomic status was associated with late presentation. Only a small percentage of the patients had undergone cancer screening.

In a cross sectional prospective study conducted at three of Kampala's main hospitals (Njoroge et al, 2001), operations on the gastrointestinal tract were the commonest followed by surgery of the genitourinary and cardiovascular systems. Most of the operations were palliative. Postoperative wound sepsis was the commonest complication. The overall mortality rate was 9.6% most occurring after operations on the gastrointestinal tract. The mean hospital stay was 11.6 days. They concluded that age should not be a contraindication to surgery as the outcome of surgical interventions was generally good.

Traumatic injuries are also common among the elderly. Chyalia et al (2012) found that soft tissue injuries and fractures involving musculoskeletal and head regions were the most common at a regional hospital in Shinyanga, Tanzania. Outcome of injuries in the elderly is worse than in the young and lead to prolonged morbidity, increased mortality and a huge strain on healthcare resources. In the same study, complications occurred in 39.4% of the patients. The mean length of hospital stay was 28.6 days and it was much longer on those with comorbidities. Mortality was also high especially in those with advanced age, comorbidities and high injury severity. A similar outcome is seen among patients with traumatic intracranial hematomas. (Kithikii and Githinji, 2011)

A study by Scott et al comparing *Staphylococcus aureus* bacteremia (SAB) among elderly and young patients found that elderly patients had higher total mortality and higher mortality directly attributable to SAB. The elderly were more than

twice as likely to die as a direct consequence of SAB than younger patients. Mortality directly attributable to SAB occurred in 14.5% of the older and 6.3% of the younger patients. Total mortality in older patients 29.7% compared to 15.0% in younger patients. The elderly patients were more likely to have a pacemaker or prosthetic heart valve, less likely to present with fever and more likely to have MRSA. MRSA bacteremia is associated with higher mortality among the elderly. Elderly patients were more likely to have a longer hospital stay.

2.4 Preoperative assessment

Preoperative assessment of the elderly surgical patient should involve a physician, the surgeon and an anaesthesiologist. Preoperative evaluation of the elderly patient includes a detailed history and thorough physical examination. Lab tests routinely recommended include hemoglobin/hematocrit level and renal function tests. Other important tests recommended are blood sugar levels, leukocyte count, bleeding and coagulation times and liver and thyroid function tests. A baseline ECG and a chest x ray are also recommended. However, due to the prohibitive cost of these investigations the American College of Surgeons recommends that the test be guided by patient history, physical exam findings and the procedure to be performed. In their study to determine if routine preoperative chest x-rays are justifiably indicated for elderly patients undergoing elective surgery, Nze and Njike (2008) concluded that routine preoperative chest X-rays in the elderly patients are worthwhile even when there is no indication.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

This was a cross sectional study.

3.2 Study site

The study was conducted in all the adult surgical wards at the Moi Teaching and Referral Hospital. These include the general surgery, orthopaedics, neurosurgery, urology, cardiothoracic surgery, plastic surgery, ear nose and throat, ophthalmology and gynaecology wards. MTRH is located in Uasin Gishu county about 300km North West of Nairobi, Kenya. It is the largest referral hospital in the western region and serves as a teaching hospital for the Moi University School of Medicine. On average, 8000 patients undergo surgical operations per year. It offers surgical treatment in all surgical specialties.

3.3 Study population

All patients above 60 years admitted to the surgical wards at Moi Teaching and Referral Hospital.

3.4 Sample size determination

The sample size was determined using Fisher's formula:

$$n = \frac{Z^2 pq}{d^2}$$

$$d^2$$

where,

n = desired sample size

Z = the standard normal deviation, usually set at 1.96 which corresponds to 95% confidence level

p = estimated characteristic of the study population. In this study incidence of postoperative complications in the elderly at Shinyanga Regional Hospital in Tanzania as found by Chalya et al, 2012 was used due to the similarity of the study population in location and age. Incidence of postoperative complications forms one of the main objectives of this study. Chalya et al found an incidence of 39.4%.

$$q = 1 - p$$

d = the minimum error or the desired accuracy, which is usually set at 5%

Therefore;

$$= \frac{(1.96)^2 \times 0.394 \times 0.606}{(0.05)^2}$$

$$(0.5)^2$$

$$= 366.89$$

$$= 367$$

3.5 Sampling technique

Consecutive sampling technique was used to select patients who fit the inclusion criteria.

3.6 Inclusion criteria

-All patients aged 60 years and above who underwent major surgery after admission to the surgical wards at MTRH during the period of study.

3.7 Exclusion criteria

- Those who declined to give their informed consent.

- Those presenting after undergoing surgical operations elsewhere.

- Readmissions who had already been included in the study previously.

3.8 Study methods

Interviewer administered questionnaires were used to collect data.

Demographic data was recorded including age and sex, residence, marital status, occupation, level of education, monthly income, history of smoking and use of alcohol. The diagnosis and comorbidities were obtained from the patient's file and entered in the data collection tool. The surgical operation was noted. The patient was followed up until discharge. Data was obtained on the length of stay, incidence of postoperative complications and mortality.

3.9 Data management

3.9.1 Data collection

Data was collected using a structured data collection form (see Appendix 1). The data was coded and entered into a Microsoft Excel spreadsheet.

3.9.2 Data storage

Data was stored in a computer hard drive and back up on two flash disks. Data collection forms were kept safe under lock and key for future reference.

3.9.3 Statistical data analysis

Data analysis was done using R: A language and environment for statistical computing (R Core Team, 2017). Categorical variables such as gender, religion,

marital status, education level, and source of income were summarized using frequencies and the corresponding percentages. Continuous variables such as age, income, and duration were summarized using mean and the corresponding standard deviation if Gaussian assumptions hold. If the Gaussian assumptions were violated, then median and inter quartile range (IQR) were used to summarize these variables. Association between categorical variables (categorized age, presence of comorbidities, occurrence of post-operative complications, and surgical procedure) was done using Pearson's Chi Square test. Results were presented using tables, charts and graphs.

3.10 Study limitations

1. Some comorbidities and postoperative complications like electrolyte disorders may have been missed since not all patients were routinely screened using lab tests like kidney and liver function tests. However, if present these complications were not only few and widely apart but also subclinical enough not to be detected.
2. The findings may not be in keeping with other hospitals because MTRH mostly receives mostly referrals from lower levels of care hospitals. This means it can only be generalized for tertiary institutions.

3.11 Ethical consideration

Approval of the study was sought from the Moi University School of Medicine/Moi Teaching and Referral Hospital Institutional Research and Ethics Committee (IREC) before conducting the study (Approval number 0001462). A written informed consent was sought from each participant or their caretaker. Data collection sheet only bore a serial number, name initials and inpatient number.

The information was treated with utmost confidentiality. It could only be accessed by authorized individuals. Patients no longer interested in the study had the option of pulling out at a time of their choice and still receive equal standard of care as those in the study. Patients who withheld consent were treated equally as those who gave consent. There was no monetary reward or preferential treatment for participating in the study.

Research findings were made available to any interested participants. The findings were presented to Moi University and MTRH through thesis and thesis defense. It will also be sent for publication in peer reviewed medical journals.

CHAPTER FOUR

4.0 RESULTS

A total of 367 participants aged 60 to 94 years were included in the analysis. The median age was 66.0 (IQR: 61.0, 71.0) years. The sample comprised 198 (54.0%) male and 169 (46%) female, giving a male to female ratio of 1.2:1. Majority were from rural residence(99.7%), Christians (99.7%) and married (95.6%).

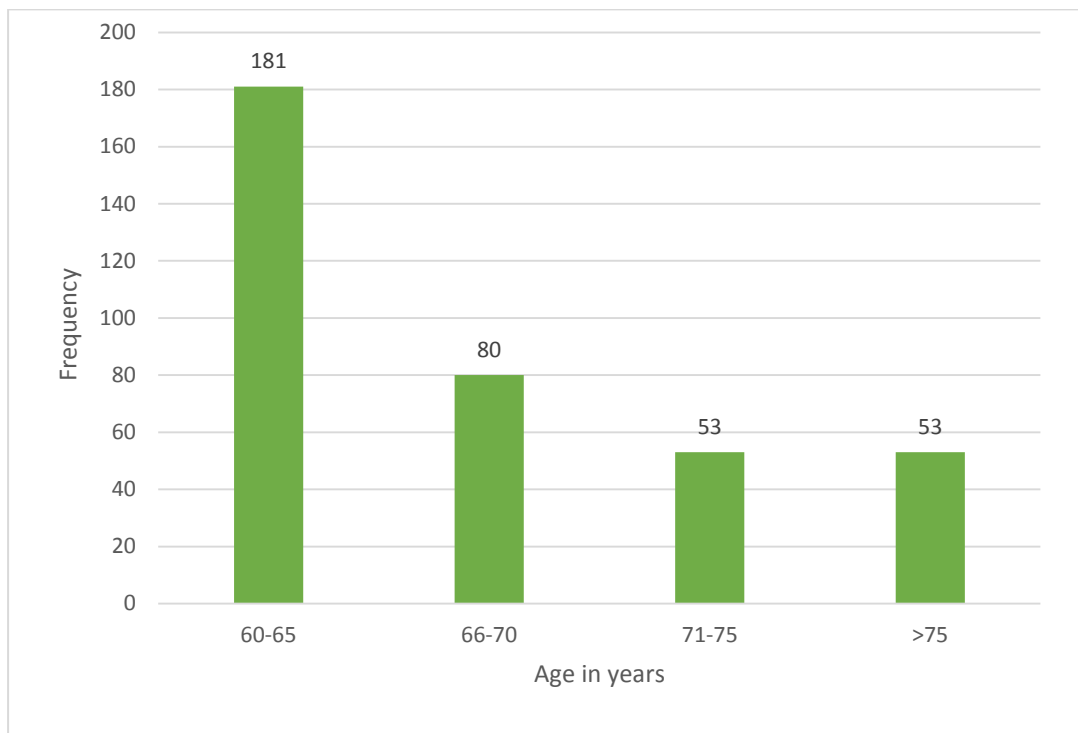


Figure 1: Age distribution of participants

Table 1: Socio-demographic characteristics

Variable	N	n (%) or Median (IQR) or Mean (SD)
	36	
Age (Years)	7	66.0 (61.0, 71.0)
Range (Min. - Max.)		60.0 - 94.0
Gender		
Male	36	198 (54.0%)
Female	7	169(46.0%)
Residence		
	36	
Rural	7	366 (99.7%)
Urban		1 (0.3%)
Religion		
	36	
Christian	7	366 (99.7%)
Muslim		1 (0.3%)
Marital status		
Single		3 (0.8%)
	36	
Married	7	351 (95.6%)
Divorced		1 (0.3%)
Widowed		12 (3.3%)
Formal education		
None		290 (79.0%)
Primary		64 (17.4%)
	36	
Secondary	7	6 (1.6%)
College		7 (1.9%)
Occupation		
None		2 (0.5%)
	36	
Farming	7	328 (89.4%)
Housewife		4 (1.1%)
Business		5 (1.4%)
Driver		15 (4.1%)
Other		13 (3.5%)
	36	
Number of children	6	7.0 (6.0, 8.0)
Range (Min. - Max.)		1.0 - 40.0
Monthly income (Shillings)	35	
	8	7000.0 (5000.0 - 10000.0)
Range (Min. - Max.)		200.0 - 50000.0

Up to 79.0% had no formal education, and 89.4% were farmers.

The median monthly income was 7000.0 (IQR: 5000.0 - 10000.0) shillings.

There were 17 (4.8%) participants in a polygamous marriage, 13 (76.5%) with two wives and 4 (23.5%) with three wives.

The median number of children was 7.0 (IQR: 6.0, 8.0) with a minimum and a maximum of 0.0 and 40.0 respectively.

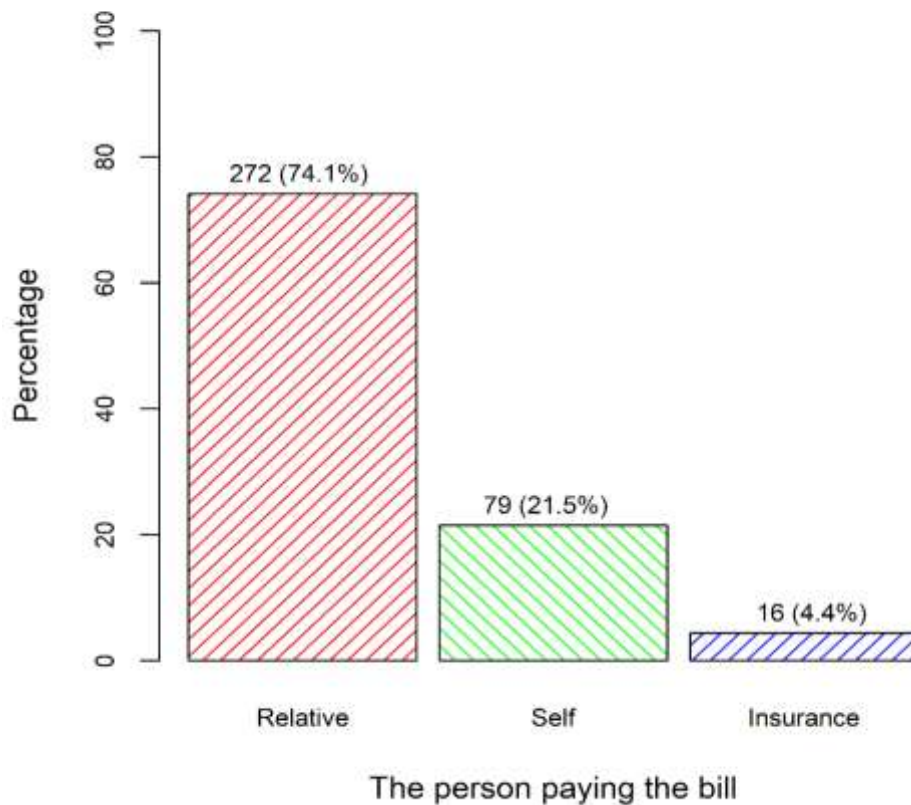


Figure 2: Persons paying the hospital bill

Up to 228 (74.1.1%) participants had their bills being settled by a relative, 79 (21.5%) by themselves and 16 (4.4%) had their bills being settled by the insurance.

Table 2: Substance use

Variable	N	n (%) or Median (IQR)
Smoking	367	15 (4.1%)
Alcohol use	367	45 (12.3%)

Fifteen (4.1%) of the participants had a history of smoking tobacco, and 45 (12.3%) had a history of use of alcohol.

Table 3: Comorbidities

Variable	n (%) (N =367)
Hypertension	41 (11.7%)
Diabetes	21 (6.0%)
HIV	4 (1.1%)
Pneumonia	2 (0.6%)
Tuberculosis	1 (0.3%)
Peptic ulcers	2 (0.6%)
Other	6 (1.6%)

The most prevalent comorbidity reported was hypertension among 41 (11.7%) followed by diabetes among 21 (6.0%), then HIV among 4 (1.1%).

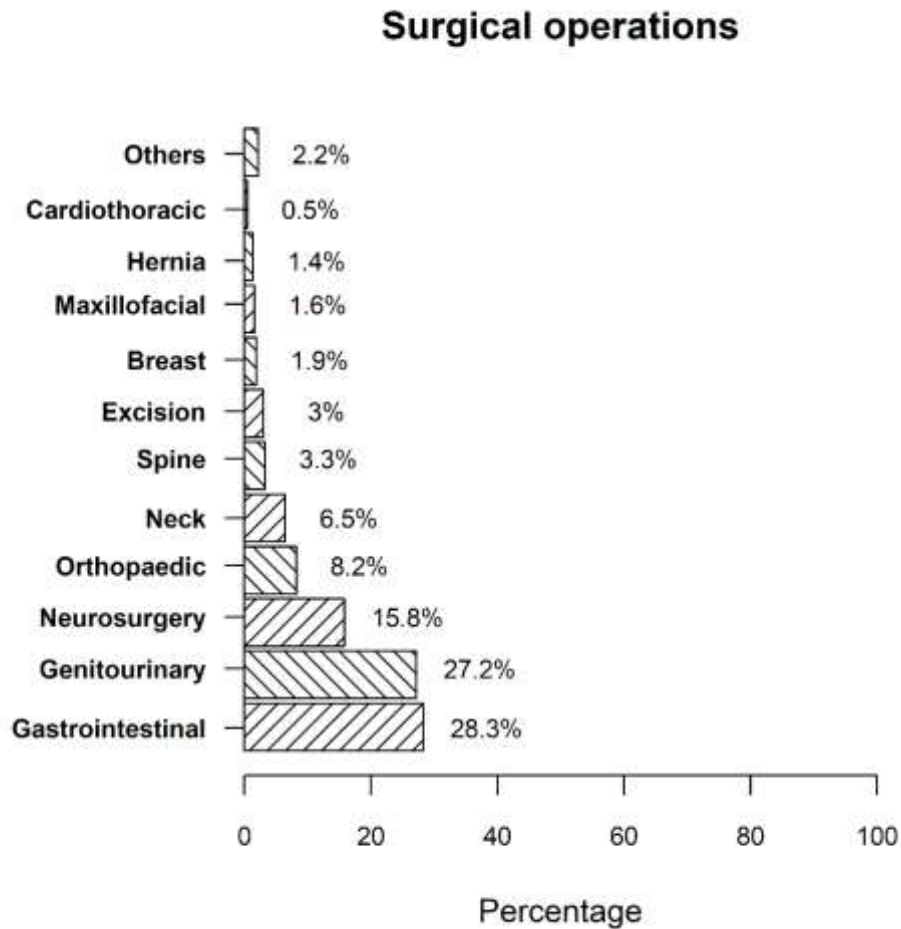


Figure 3: Surgeries that were performed

Diagnosis revealed that 43.9% of the participants were undergoing treatment as a result of malignancies. Thirteen percent were being treated for intracranial hematomas, and 10.6% were being treated for abdominal complications.

The main surgeries conducted were gastrointestinal and genitourinary surgeries including abdominal tumor resection, gut repair or resection and anastomosis, appendectomy, hysterectomy and salpingoophorectomy, peritoneal lavage, stoma fashioning, prostatectomy, urethroplasty, orchiectomy and hernia repairs. Neurosurgery and orthopedic surgeries like open reduction and internal fixation of fractures, arthroplasty, craniotomy, burr hole evacuation and elevation of

depressed skull fractures were done for 15.8%, and 8.2% of the participants respectively. Neck and spine surgeries accounted for 14.7% of all the surgeries done. These included anterior cervical discectomy and fusion, microdiscectomy, posterior interbody fusion and foraminotomy.

Table 4: Surgical characteristics

Variable	N	n (%) or Median (IQR)
Time from admission to surgery	367	2.0 (1.0, 3.0)
Range (Min. - Max.)		1.0 - 30.0
<i>Surgical operation</i>		
Elective	367	262 (71.8%)
Emergency		103 (28.2%)
<i>Anaesthesia</i>		
General	367	350 (95.4%)
Spinal		17 (4.6%)

The participants stayed for a median duration of 2.0 (IQR: 1.0, 3.0) days before the surgery was performed. The minimum and maximum durations were 1.0 and 30.0 days respectively.

Elective surgeries accounted for 261 (71.8%). General anaesthesia was given to 95.4% of the participants while 4.6% underwent surgery under spinal anaesthesia.

Post-operative complications were observed in 56 (15.3%) of the participants. The complications are as shown in Figure 3.

Complications

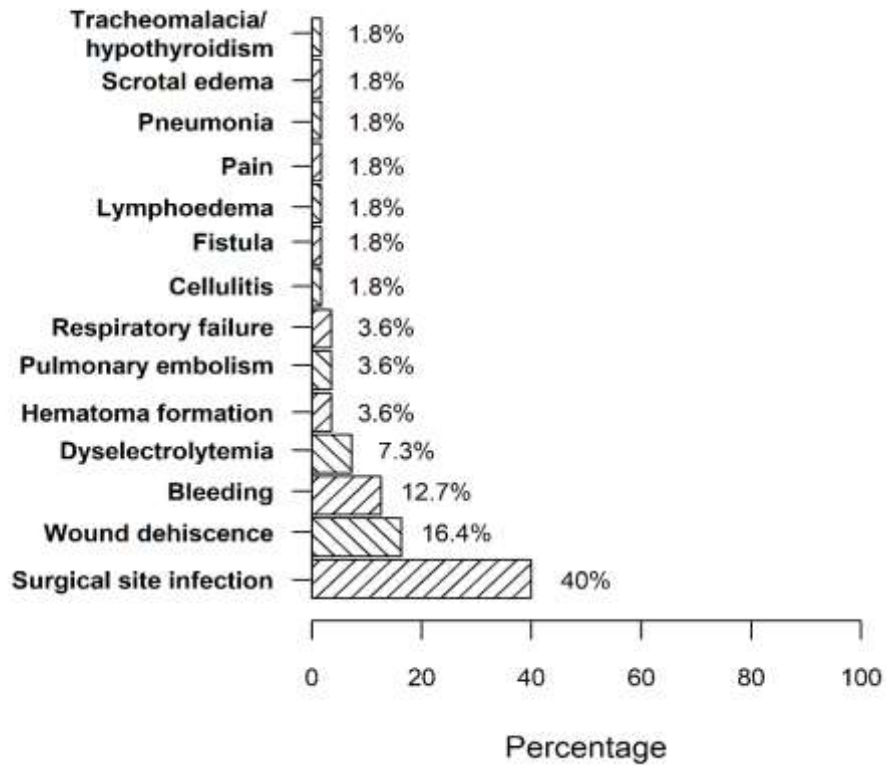


Figure 4: Complications reported.

Up to 39.3% had an infection of the surgical site, and 16.1% had wound dehiscence. Bleeding resulted in 12.5%,.

Table 5: Association between the presence of comorbidities and age

<i>Had</i>	<i>Age groups</i>				Total	P
	60-65	65-70	70-75	> 75		
<i>comorbiditis</i>						
No	130 (71.8%)	58 (72.5%)	43 (81.1%)	47 (88.7%)	278 (75.7%)	
Yes	51 (28.2%)	22 (27.5%)	10 (18.9%)	6 (11.3%)	89 (24.3%)	0.054
Total	181	80	53	53	367	

The findings show no evidence of association between age and the presence of comorbidities ($p = 0.054$).

Table 6: Association between the occurrence of post-operative complications and age

<i>Had</i>	<i>Age groups</i>				Total	P
	60-65	65-70	70-75	> 75		
<i>complications</i>						
No	153 (84.5%)	73 (91.2%)	43 (81.1%)	43 (81.1%)	312 (85.0%)	
Yes	28 (15.5%)	7 (8.8%)	10 (18.9%)	10 (18.9%)	55 (15.0%)	0.292
Total	181	80	53	53	367	

There was no association between the age and the occurrence of post-operative complications ($p = 0.292$).

Table 7: Association between the occurrence of post-operative complications and presence of comorbidities

	<i>Had complications</i>			
<i>Had comorbidities</i>	No	Yes	Total	<i>P</i>
No	236 (75.6%)	42 (76.4%)	278 (75.7%)	
Yes	76 (24.4%)	13 (23.6%)	89 (24.3%)	0.908
Total	312	55	367	

The results show that there was no association between the presence comorbidities and the occurrence of post-operative complications (0.908).

The median length of stay in the hospital was 10.0 (IQR: 7.0, 13.0) days with the shortest and the longest recorded durations being 2.0 and 90.0 days respectively.

Post-operative mortality was 2.7%.

CHAPTER FIVE

5.0 DISCUSSION

The male to female ratio in this study was 1.2:1. This differed with the findings of Njoroge et al (2001) where they had a male to female ratio of 4:1 in a similar setting. This study included all elderly patients undergoing major surgery while they excluded gynecological cases.

This study found that majority of the elderly (79%) were married while only 4% were either single or divorced and 12% were widowed. Similar findings were seen in a study by Shah et al, 2017 where more than two thirds of elderly patients were married. Among the married, 95.2% were monogamous. The study subjects were mostly Christians (99.7%) from rural residences (99.7%). This could be attributed to the fact that the catchment area was western Kenya which is predominantly a Christian population.

The elderly people included in this study were from a low socioeconomic background characterized by little or no formal education (96.4%), low monthly income (mean- 7000 Kenya shillings) and dependence on relatives (74.1%) to pay the hospital bill. The study was conducted in the general wards of MTRH where most of the patients who cannot afford private healthcare are admitted.

In a study done in Tandale in Tanzania, Rose et al (2015) found that most elderly patients have poor access to medical care due to inability to pay for health services. Just like in this study they found that the elderly patients seen in Tandale had little formal education, were mostly unemployed and lacked a regular source of income.

In this study only 4.4% of these patients had a health insurance cover. Rose et al found that 88% of their patients did not have a health insurance cover. The 2008-09 KDHS revealed that only 7% of Kenyan women and 11% of men were covered by medical insurance. This was mostly employer based health insurance. The elderly are largely unemployed and would therefore lack this health insurance cover. The Kenyan government has introduced a monthly stipend and a free NHIF medical cover for all people above the age of 70. This was intended to alleviate poverty, hunger and prevent premature death amongst people in this age bracket (Igadwah L, 2017).

A majority (89.4%) of our study participants depend on peasant farming. According to the Uasin Gishu County Integrated Development Plan 2013-2018, over 80% of the rural population of Uasin Gishu County depends on farming for household income and food security. It also notes that the full potential of the region's agricultural production has not been realized as most people carry out small scale farming.

Malignancies were most commonly diagnosed 43.9% in the study subjects. The malignancies included oesophageal, prostate, breast, stomach, cervical and uterine, ovarian, pancreatic, colorectal, nasopharyngeal and brain cancers. Others included rhabdomyosarcomas and mandibular/maxillary adenocystic carcinomas. Chibundu (2002) found an incidence of 25.2% of breast cancer among the elderly in a Benin Hospital, Nigeria. They also found that elderly patients with breast cancers presented late. From the Yaounde Population Cancer Registry in Cameroon, Enow-Orock et al found that breast cancer was common in the upper

social class while malignancies of the cervix, endometrium, and vagina was common in the low and middle classes.

Other common surgical conditions were intracranial hematomas (13.1%) and benign abdominal surgical conditions (10.6%). Subdural hematomas commonly affects elderly men. The causative factors include alcohol use, trauma and use of anticoagulants. (Babatola, et al, 2002).

Hypertension was the most prevalent morbidity amongst the elderly patients (11.7%) compared to diabetes (6%) and HIV (1.1%). In a study done amongst urban males in Mombasa, Salehmohamed (2008), found that the prevalence of hypertension in the population was 6.7% and advancing age and cigarette smoking were found to be the major predisposing factors. In their study Chalya et al found that 38.3% of their elderly patients presented with comorbidities including chronic chest infections in 22.2%, cardiac diseases in 16.7%, diabetic mellitus in 16.7%, hepatic disease in 13.9%, renal disease in 11.1%, cancer in 11.1% and hypertension in 8.3%.

Gastrointestinal and genitourinary surgeries were more commonly done (27.5% and 27.2% respectively). This was almost similar with Njoroge et al's findings where surgeries on the gastrointestinal tract topped the list of operations at 36.9% followed by surgeries of the genitourinary (30.8%).

The incidence of postoperative complications was 15.3%. Surgical site infection accounted for 39.3%, wound dehiscence 16.1% and bleeding resulted in 12.5%, and 2.7% of the participants died following operation. This was similar to Njoroge et al's findings where sepsis was the commonest postoperative complication and accounted

for 17.8% of all complications. Similar findings were also obtained by Nyundo M et al (2013) where the common postoperative complications included wound infection (8.7%) and septicaemia (4.8%) in a review of patients undergoing abdominal surgery at Kigali University Teaching Hospital.

The median length of stay in the hospital was 10 days among our participants as compared to Njoroge et al's 9.1 days for emergency operations and 12.5 days for elective operations and Sanya et al's (2008) 15.6 days amongst elderly patients in Ilorin, Nigeria.

Post-operative mortality in our study stood at 2.7%. This differs with Njoroge et al's 9.6% and Chalya et al who recorded a mortality rate of 14.9%. Chalya et al noted that mortality was related to advanced age, presence of comorbidities, high injury severity score, severe head injuries and respiratory failure among elderly patients presenting with musculoskeletal injuries.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

1. Hypertension, diabetes and HIV are the most prevalent comorbidities among the elderly surgical patients in MTRH.
2. The elderly admitted to the surgical wards in MTRH are majorly undergoing surgery due to malignancies and neurosurgical emergencies.
3. Elderly surgical patients in MTRH were noted to get surgical site infections in significantly high rates but their postoperative mortality is low.

6.2 Recommendations

1. Health workers should be on the look out for HIV as an emerging comorbidity amongst elderly surgical patients.
2. A multidisciplinary approach is important in the management of the elderly surgical patient. Management of the elderly surgical patient requires both the physician and the surgeon.
3. The elderly should not be excluded from surgical procedures on the basis of their age.

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APPENDICES

Appendix 1: Consent Form

My name is Dr Nicholas Kimutai Mitei, a postgraduate student in Moi University College of Health Sciences. I am a medical doctor registered with the Kenya Medical Practitioners and Dentists Board. I am doing a study on the socio-demographic characteristics, surgical conditions and interventional outcomes of surgery in elderly patients in MTRH. The study has been approved by the relevant institutional authority.

The purpose of the study is to determine the social and cultural characteristics, the surgical illnesses common amongst people aged 60 and above and the outcomes of surgery in this population. This will help health workers understand the health problems of the elderly.

Your demographic data, diagnosis, surgical operation and any postoperative findings will be entered in a data collection form. You will receive the standard care according to the standard operating procedures of the hospital. You are free to withhold consent or to withdraw from this study at any time and still receive standard care in the hospital. Information concerning you will be treated with confidentiality.

I of (address).....

agree to participate in the above named research.

I confirm that the nature of the research has been explained to me and I understood and accepted. I understand that my consent is entirely voluntary and that I may withdraw from the study and this will not affect the legal rights I have.

In case you have further questions or need any information regarding the study you can contact Dr Nicholas Mitei on the following telephone number or address.

Telephone number: No 0723758675

Address P. O. Box 281, Sotik.

If you have any question about your rights as a research subject, you should contact the Chairman, Institutional Research and Ethics Committee, Moi University/Moi Teaching and Referral hospital.

Telephone number: 053-2033471/2/3 Extension 3008

P.O. Box 3, Eldoret.

Appendix 2: Data Collection Form

1. DEMOGRAPHIC DATA

Serial number..... Name initials

Inpatient number Ward.....

Age.....

Gender.....

Area of Residence

Rural

Urban

If urban: Informal settlement

Middle class

Religion.....

Marital status

Married

Divorced

Single

Separated

Widowed

If ever married

Monogamous

Polygamous

If polygamous, how many wives in total

Number of children.....

Level of education

No formal

Primary

Secondary

College

University

If university: Basic Masters PhD

Occupation.....

Current source of living.....

Estimated earning per month

Who will pay your bill

Self Relative

Others

Do you smoke?.....

Do you take alcohol?.....

1. CLINICAL DATA

Diagnosis.....

Comorbidity

Hypertension

Diabetes

Kidney disease

Liver cirrhosis

Malnutrition

HIV/AIDS

Other.....

Time from admission to surgery

Surgical operation.....

Elective Emergency

Type of anaesthesia

General Spinal Local

Postoperative complications

Haematomaformation

Surgical site infection

Pneumonia

Wound dehiscence

Bleeding

Dyselectrolytemia

Death

Other.....



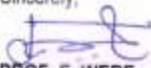

Length of hospital stay

Condition at the end of care

Discharge

Death

Appendix 3: IREC Approval

 <p>MOI TEACHING AND REFERRAL HOSPITAL P.O. BOX 3 ELDORET Tel: 334711/2/3</p>	 <p>MOI UNIVERSITY SCHOOL OF MEDICINE P.O. BOX 4606 ELDORET</p>												
<p>INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)</p>													
<p>Reference: IREC/2015/119 Approval Number: 0001462</p>	<p>17th August, 2015</p>												
<p>Dr. Nicholas Mitei, Moi University, School of Medicine, P.O. Box 4606-30100, ELDORET-KENYA.</p>													
<p>Dear Dr. Mitei,</p> <p>RE: FORMAL APPROVAL</p> <p>The Institutional Research and Ethics Committee has reviewed your research proposal titled:-</p> <p><i>"Sociodemographic Characteristics, Surgical Conditions and Interventional Outcomes of Major Surgery in Elderly Patients at Moi Teaching and Referral Hospital, Eldoret, Kenya".</i></p> <p>Your proposal has been granted a Formal Approval Number: FAN: IREC 1462 on 17th August, 2015. You are therefore permitted to begin your investigations.</p> <p>Note that this approval is for 1 year; it will thus expire on 16th August, 2016. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.</p> <p>You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.</p> <p>Sincerely,</p>  <p>PROF. E. WERE CHAIRMAN INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE</p>													
<table border="0" style="width: 100%;"> <tr> <td style="width: 33%;">cc</td> <td style="width: 33%;">Director - MTRH</td> <td style="width: 33%;">Dean - SOP</td> </tr> <tr> <td></td> <td>Principal - CHS</td> <td>Dean - SON</td> </tr> <tr> <td></td> <td></td> <td>Dean - SOM</td> </tr> <tr> <td></td> <td></td> <td>Dean - SOD</td> </tr> </table>		cc	Director - MTRH	Dean - SOP		Principal - CHS	Dean - SON			Dean - SOM			Dean - SOD
cc	Director - MTRH	Dean - SOP											
	Principal - CHS	Dean - SON											
		Dean - SOM											
		Dean - SOD											

Appendix 4: Approval from MTRH



MOI TEACHING AND REFERRAL HOSPITAL

Telephone: 2033471/2/3/4
 Fax: 61749
 Email: director@mtrh.or.ke
Ref: ELD/MTRH/R.6/VOL.II/2008

P. O. Box 3
 ELDORET

17th August, 2015

Dr. Nicholas Mitel,
 Moi University,
 School of Medicine,
 P.O. Box 4606-30100,
ELDORET-KENYA.

RE: APPROVAL TO CONDUCT RESEARCH AT MTRH

Upon obtaining approval from the Institutional Research and Ethics Committee (IREC) to conduct your research proposal titled:-

"Sociodemographic Characteristics, Surgical Conditions and Interventional Outcomes of Major Surgery in Elderly Patients at Moi Teaching and Referral Hospital, Eldoret, Kenya".

You are hereby permitted to commence your investigation at Moi Teaching and Referral Hospital.


DR. JOHN KIBOSIA
DIRECTOR
MOI TEACHING AND REFERRAL HOSPITAL

CC - Deputy Director (CS)
 - Chief Nurse
 - HOD, HRISM