PERI-OPERATIVE BLOOD TRANSFUSION IN PATIENTS UNDERGOING TRANSURETHRAL RESECTION OF THE PROSTATE IN KENYATTA NATIONAL HOSPITAL

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A DISSERTATION SUBMITTED TO THE DEPARTMENT OF SURGERY UNIVERSITY OF NAIROBI IN PARTIAL FULLFILMENT OF THE REQUIREMENTS FOR AWARD OF THE DEGREE MASTERS OF MEDICINE IN UROLOGY

DECLARATION

This dissertation is my original work and has not presented for award or any similar purpose.

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iv

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

KNH- Kenyatta National hospital

BPE- Benign Prostate Enlargement

BPH- Benign Prostate Hyperplasia

TURP- Transureteral Resection of the Prostate

LUTS- Lower Urinary Tract Symptoms

Hb- Haemoglobin

UTI- Urinary Tract Infection

PSA- Prostate Specific Antigen

SPSS- Statistical Package for the Social Sciences

ABSTRACT

Background: Transurethral resection of the prostate (TURP) is the most performed surgical procedures for Benign Prostate Enlargement (BPE) in Kenyatta National Hospital (KNH) in the urological unit. Even with the slightly invasive nature of the operation, blood loss is still the most common complication. In KNH, there is marked variation in the level of experience among surgeons performing the procedure and the incidence of blood transfusion is unknown. Factors associated with blood transfusion remain largely un-established.

Study Objective: The study‟s core objective was to establish the practices of peri-operative transfusion in Transurethral resection of the prostate and its determinants. **Study Design**: A prospective observational study was undertaken.

Patients and Methods: Using Systematic random sampling participants were recruited. The exposure variables for this study were patient's demographics, pre-operative Haemoglobin (Hb), size of the prostate, amount of blood loss. The main outcome variable was the occurrence of blood transfusion and the number of blood units transfused. Data was collected using a structured data sheet over a period of 9 months. Patients was followed up post operatively until discharge from the wards.

Data Management and Analysis: SPSS (Chicago Illinois) software version 22 was used for data analysis. Descriptive statistics such as frequencies and percentages were used to describe demographic characteristics like age, occupation, and preoperative variables like prostate size , duration of resection, preoperative Hb and presence of UTI . Relationship between outcome variable, that is presence or absence of blood transfusion, and predictor variables were established by correlation analysis such as Fisher‟s exact test. Data was reported in percentages, proportions, and presented in pie charts and bar graphs.

Results: 90 patients came into the study as recruits/participants. 21.1% of the patients were aged below 60 years while majority, 78.9% were aged above 60 years. The average pre-operative Hb was 13.27g/dl. Most of the patients had a post postoperative Hb of > 12g/dl. Patients who used 5 alpha reductase inhibitors were 77.8%. The mean prostate size taken for TURP was 72.26 grams. The median of the prostate size for TURP was 68.4 grams with a range of 31.6 -150 grams.The mean prostate size resected was 9.7 grams Patients who had urinary tract infections were 41.1%. 72.2% of patients had blood requested for TURP. 10% of patients received blood transfusion during TURP. 77.8% of the patients had clot retention post operatively while 80% of the

patients had persistent hematuria requiring irrigation for more than one day. Low preoperative Hemoglobin and increasing age were the most significant factors leading to blood transfusion. **Conclusion:**. The incidence of blood transfusion in this study was 10% which is comparable to the blood transfusion rate during TURP in modern centres. The main factors associated with blood transfusion in our study were increasing age, smoking and low preoperative Hemoglobin. Prostate size, urinary tract infection, duration of resection and surgeon‟s experience were not associated with increased risk for blood transfusion.

1.0 CHAPTER ONE: INTRODUCTION

Benign Prostate Hyperplasia (BPH) is one of the most common urological conditions affecting male over 45 years old. The prevalence of BPH among males over 60 years is estimated to be 50% with those over 85 years rising to 90%[9]. Trans Urethral Resection of the Prostate (TURP) is the most undertaken procedure for management of patients with BHP-induced bladder outlet obstruction. In the past, open prostatectomy was the more favored procedure for BPH accounting for over 80% of the procedures while TURP accounted for only 20% (Kiptoon et al, 2004).

Over the last decade, open prostatectomy has fallen out of favor for TURP in the management of BPH. TURP can either be monopolar or bipolar. The advantage of bipolar TURP is that it provides more time to resect and control hemorrhage without surgical complications such as dilutional hyponatremia[1]. In KNH, the bipolar TURP is commonly used. Even though the minimally invasive type of the procedure the most common complication is bleeding. Peri-operative blood loss is a significant cause of morbidity among patients undergoing TURP.

Blood transfusion is a commonly employed intervention to manage patients undergoing TURP with significant hemorrhage the decision to carry out blood transfusion is usually supported by the need to relieve symptoms and prevent morbidity and mortality. However, blood transfusion itself carries some risks and inconveniences. The risks and complications of RBCT include: the transmission of infectious diseases, immune suppression, acute respiratory distress syndrome, circulatory overload and errors in administration.

Equally, several units of blood habitually ordered by surgeons and anesthetists are not used but held in standby and thus inaccessible for other deserving patients. This growing demand for blood that exceeds resources affects the types of surgical lists that are prepared. Single unit transfusion is common during elective surgeries in KNH even though transfusion which is effective demands 2 units of blood at the minimum for an adult. According to the national guidelines for the appropriate use of blood and blood products, transfusion of one unit or less in adults implies that the transfusion was unnecessary[3].

When one takes these potential or actual negative/adverse impacts together with the significant variability in, specifically, observed prescriptions, evidence has determined that when confronted with "liberal" or "defensive" traditional/conservative transfusion criteria, more restrictive transfusion methods and practices are adopted. This is in addition to an enhanced usage of

alternative treatments with the goal being to avoid blood transfusion. However, lack of blood transfusion when necessary leads to patients experiencing risks of hypoxia and anemia[4].
There are a number of factors that may lead to peri-operative blood loss such as surgeon‟s experience, patient‟s age, infections, length of resection and type of anaesthesia.

In history, transfusion rates during TURP were stated to be as high as 20% Transfusion rates are now down to 2.9% in well-equipped modern centres[5]. Modern equipped centers have improved resectoscopes, optics, anaesthesia; use of bipolar TURP which is attributed to the falling rate bleeding requiring transfusion in a recent large prospective multi-center study in Germany was 2.9% of the patients who underwent TURP[5]. Furthermore, some of these centers have better blood transfusion guidelines issued by the health departments and subsequently the National Blood Transfusion Committees. In addition, processes that reduce perioperative blood loss in such centres during TURP include pre –assessment to identify and treatment of anemic patients and optimization of hemostasis during surgery.

2.0 CHAPTER TWO: LITERATURE REVIEW

2.1 BPH: Epidemiology, Risk Factors and Management Overview

BPH histologically defines a proliferative process of both the epithelial and stromal elements of the prostate gland and emanates from the peri-urethral and transitional zones of the prostate [8]. More than 90% of men will experience symptoms of BPH by their 8th decade of life [7]. Increasing male longevity poses a great economic burden due to the significant costs involved in diagnosis and treatment. Although age and genetics play an essential role in the causation of BPH and LUTS, there is new information that risk elements which include serum dihydrotestosterone (DHT), glucose homeostasis, alcohol intake, diet exercise and inflammation [9].

2.1.1 Genetics

Half of the male patients going through surgery for BPH and are younger than 60 years of age have a genetic linkage there is a tendency for younger men to have larger prostates and the pattern of inheritance via autosomal dominance [10,11]. One study estimates that genetic factors contribute a significant 72% towards the development of BPH and LUTs [13]

2.1.2 Sex Steroid Hormones

Currently, there is no study that supports that raised serum testosterone levels increase risk for development of BPH and LUTs [14]. However, testosterone replacement therapy does worsen BPH and LUTs. There is overwhelming evidence that raised DHT does increase risk for development of BPH and LUTs [15].

2.1.3 Lifestyle and Obesity

There is a positive correlation between increased risk for BPH and LUTs with inactivity.The greater the obesity, the higher the prostate volume [16]. Furthermore, interferences in glucose homeostasis is associated with higher chances of developing prostate enlargement and LUTs [17]

2.1.4 DIET

Micro and macronutrients may impact the risk of BPH and LUTS, although with mixed patterns. Increased intake of red meat, fat dairy products and starch increase risk for clinical BPH and LUTS [18]. On the other spectrum, high levels of lycopene, vitamin E, selenium and carotene reduce risk for BPH and LUTS [18].

2.1.5 Alcohol and Smoking

There are conflicting reports on the effect of smoking on the development of BPH as some studies show no risk and others increased risk[18]. Similarly to exercise, moderate alcohol intake seems protective against multiple outcomes related to BPH Interestingly, a large meta- analysis showed that drinking daily reduced BPH development by 35% but increased risk for LUTs[19]

2.1.6 TURP

TURP is indicated for men with moderate to severe symptoms of BPE as it is more effective than watchful waiting[21] Over 70% of men have improved symptoms after undergoing TURP[20]. Open prostatectomy is preferred over TURP if an extra open procedure on the bladder is to be done at the same time such as resection of a substantially-sized diverticulum or a bladder stone removal.

TURP is a general technique that makes use of a transurethral method to a prostatectomy that gets rid of obstructive prostate tissue hence facilitating better voiding parameters. TURP can either be monopolar or bipolar.

The traditional TURP was monopolar where electric current flows through the patient‟s body from a positive electrode which is placed on the resectoscope, towards the return sheath that to the patient leg via a diathermy. In the modern bipolar system, one places the ground electrode inside the sheath of a continuous flow resectoscope. The equipment is modified. It thus allows the cutting current to pass directly between the sheath and the wire loop. The advantage of bipolar TURP is that it provides more time to resect and control hemorrhage without surgical complications such as dilutional hyponatremia**.**

2.2 Patient Preparation and Operation

Patient is positioned in the position of dorsal lithotomy under anaesthesia. Preoperative use of anti-biotics is now the standard of care. One lubricates the resectoscope‟s outer sheath with sterile lubricant. The medic places the obturator through the sheath to make sure there is no sharp edges during urethroscopy. An urethrocystoscopy is performed. Resection begins at 1 o‟clock and is continues clockwise to 5 on the clock. The resection depth should be approximately down far enough to lay bare the prostatic capsule fibers around the bladder neck. The most critical element of performing a TURP is the formulation of a plan. One then proceeds in an orderly stepwise fashion. No consensus on the amount of prostate tissue to be resected during TURP but there are better clinical outcomes when more tissue is resected[25].

The recommended technique of TURP is complete resection of the adenomatous tissue inside the surgical capsule. Care should be undertaken when resecting the apical tissue proximal to the external sphincter as extensive resection may lead to increased risk for incontinence.Once resection is complete, an Ellik evacuator is used to rid the bladder of adenoma chips. One achieves final hemostasis by coagulation of any bleeding points. A 22FR three way simplistic catheter is inserted and a continuous slow irrigation commenced.

In a study in Nigeria, the mean amount of prostate resected was 59.8g with mean resection time of 64 minutes[31]. In the renowned study by Mebust et al where he reviewed 3885 TURPs, the mean weight of prostate resected was 22g[27].

TURP has been the mainstay of minimally invasive surgery for symptomatic BPH patients Bleeding post TURP is the most important complication[27]. There is better estimation of blood loss during TURP because most of the lost blood is disseminated into the irrigating fluid[6]

2.3 Factors Associated with Blood Transfusion

Bleeding during TURP is mainly due to patient and surgeon factors. Patient related factors include age, prostate size, presence of infection and anemia. Surgeon related factors include duration of resection and experience of the surgeon.

Bleeding has many causative factors including aspirin use, activation of fibrinolytic system, prostate size, and weight of the resected gland, duration of resection, histological presentation of the gland and presence of UTI[27].Macroscopic hematuria even a month post TURP is a well-recognized problem[28]. Although bleeding is less common with TURP, it may be a fatal complication. A meticulously performed TURP with reasonable speed and attention to detail is the mainstay in reducing perioperative blood loss[29]. Over the last 4 decades, the blood transfusion rates and mortality associated with the procedure has reduced[30]. In a Nigerian Study, the post op transfusion rate was 0.8%[31]. For these patients, the preoperative mean Hb was 12.7g/dl with patients who had Hb less than 10g/dl transfused preoperatively[31]. Still regionally, blood transfusion rate for TURP in Ghana was 8%[32] interestingly; no blood transfusion was needed for 100 cases of patients who underwent TURP in a tertiary hospital in Karachi[33]. Low Preoperative Hb is the only modifiable factor in reducing transfusion during TURP. Those patients with an indwelling urinary catheter, big prostates and coexisting urinary tract infection have the highest risk of TURP associated bleeding[34,35]. Patients on antiplatelet drugs nowadays

pose a new high risk factor for hemorrhage during TURP[36].Stopping anticoagulation before TURP does not increase perioperative cardiovascular complications[37]
Men with prostate size more than 52g, older than 70 years were more likely to be transfused after TURP[38] However, Ibrahim et al noted that age of the patient does not influence blood loss but presentation (LUTs vs Acute urine retention) did[39]. However, there was no greater risk of bleeding for patients on Aspirin or NSAIDs[40]. It is recommended that patients should not take Vitamin E supplements before TURP as this considerably reduces platelet adhesion and therefore increase bleeding[41].

5-ARIs have proven to decrease bleeding during TURP[42]. Pre-operative use of dutasteride a fortnight before TURP decreases surgical blood loss and length of hospital stay after TURP[43]. Furthermore, patients‟ pre operatively given finasteride showed that the transfusion rates reduced in those patients with prostate sizes more than 30g who underwent resection. Four Randomized controlled trials showed that finasteride reduced bleeding perioperatively[44]. Microvascular density and vascular endothelial growth factor were significantly reduced with finasteride use[44]. Despite the overwhelming evidence, Finasteride has not been recommended in the guidelines for its routine use.

Significant blood loss occurred with resection of bigger prostates[45]. Size of the prostate is the single most important measurable factor in determining blood loss[46]. A study done at KCMC showed that those who were transfused at least two units of blood had resection of at least 40g of the prostate[47]. Those undergoing resection of the prostate with a normal pre surgical Hb and small sized prostate of less than 30g do not routinely require blood transfusion[46]. The average amount of blood lost was approximately 21.1ml/mg[47]. Resection time more than 45 minutes also had a positive correlation with amount of hemorrhage[47]. Furthermore, surgeon‟s experience is a determinant factor as patients were thrice as likely to be transfused if operated by residents[48]. Lack of hospital-based blood transfusion policy was also cited as contributory factor for their high blood transfusion rate[48].
It is recommended to do selective blood testing on need basis as opposed to routine postoperative Hb testing after TURP as this does not alter clinical management[49]. A risk stratification strategy has been suggested to determine which kind of patients requires post-operative Hb testing[50].

Risk stratification for blood transfusion has been postulated into three groups. In the Low risk group; the prostate size is less than 45ml[50]. Post-operative Hb and electrolytes monitoring are not required. In the intermediate group is prostate size is 45-80ml[50]. In such patients, post-operative Hb and electrolyte monitoring is optional and age, comorbidity and general condition of the patient should be considered. In the High Risk group: resection time is more than 1 hour, use of irrigation fluid of more than 40L, prostate size of more than 80ML[50]. In such patients, post-operative Hb and electrolytes monitoring should be strongly considered. Absorption of irrigating fluid may cause coagulopathy as the fluid may impede blood coagulation cascade by causing a disruption in the coagulation factor activity. It can also do so by reducing the concentration of the coagulation factor using dilution[51].

Repeat resection and fulguration is essential for patients with recurrent hematuria[52]. In endeavors to reduce hemorrhage during TURP, use of tranexamic acid has shown promising results. Treatment with tranexamic acid may reduce bleeding hence favorable surgical outcomes and consequently shorter operating time and smaller volume of irrigating fluid use[53]. Further, a number of studies have established that use of Tranexamic acid does not predispose patients to thromboembolic events[54].

The amount of blood loss is multifactorial and it is difficult to measure the effect of one factor while controlling all others. However, the size of the prostate is the most important determinant in deciding a cross matching policy[27].

Despite the widespread knowledge about the advantages of blood transfusion, few studies exist to guide clinical practice guidelines[56]. The best practice taught in the 1970s instructed one to cross match 2 units of blood for all patients undergoing TURP[56]. In 1984, Fraser et al asserted that the routine cross-matching previously recommended is unnecessary for TURP unless the pre-operative Hb is less than 11.5g/dl or there is a major medical risk[57].

There is less need for transfusion with use of bipolar TURP compared to monopolar TURP[62]. In as much as bipolar TURP results in less Hb drop compared to monopolar TURP it takes longer resection time[63]. The use of thick vapor resection loop coupled with higher generator setting especially for prostates larger than 40g is associated with less blood loss, lesser irrigate fluid use, less operating time and provides clear vision for resection[64].

In some developing countries, use of video camera assisted TURP and virtual; reality training greatly improves technical skills of surgeons hence resulting in few perioperative complications

Furthermore, whereas senior urologists resected more prostate tissue than residents, the risks of complications were the same The benefit of experience was however noted because secondary TURP was reduced if initial TURP was done by a more experienced Urologist.

The unnecessary blood transfusion can be avoided with better patient optimization before surgery, blood conserving techniques during surgery and with anaesthesia that reduces blood loss.

2.4 Statement of the Problem

Blood transfusion is a common intervention among patients undergoing TURP in KNH. Factors and aspects associated with blood transfusion in the country remain unknown. Therefore this study sought to determine the incidence of blood perioperative blood transfusion among patients undergoing TURP and factors that influence blood transfusion during TURP for Benign Prostatic Enlargement.

There is no blood transfusion protocol for patients undergoing TURP and the routine is to group and save for all patients undergoing the procedure. Routinely for many international and national centres group and save with or without cross match blood before TURP Unnecessary grouping and save for a patient who may not require transfusion is costly to the patient.

2.5 Study Justification

TURP remains among the most common surgical procedures done in KNH. Unfortunately; there has not been a local study on the blood transfusion practices that will form evidence for better patient care and surgical outcomes. Awareness of these factors will facilitate rational blood transfusion during TURP.

In KNH, Rational use of blood will ensure that blood is available for those in need. Most of the patients undergoing elective TURP for BPH have good pre-operative hemoglobin levels of at least 10g/dl and may have allowable blood loss. There is no need of exposing them to unnecessary risk associated with blood transfusion. Using less blood means cost cutting for the blood bank unit and laboratory agents. Predicting estimated blood loss during surgery will help both the surgeon and the anesthetist on planning for elective cases and advice patients who refuse blood transfusion for religious or personal reasons. This study will help develop a protocol and guidelines for blood transfusion during TURP.

2.6 Study Question

What factors are associated with blood transfusion related to TURP at KNH?

2.7 Main Objective

To determine what factors are associated with blood transfusion related to TURP at KNH

2.8 Specific Objectives

a) To determine the incidence of blood transfusion.

b) To describe the factors associated with blood transfusion related to TURP at KNH.

3.0 CHAPTER THREE: METHODOLOGY

3.1 Study Design

This was a prospective observational study conducted between February 2020 and February 2021. The exposure status to factors associated with significant blood loss and subsequent transfusion were determined at the baseline before patients undergo TURP. Outcome measures including amount of blood loss, need for transfusion, and transfusion related complications were measured during and after the procedure,

3.2 Study Setting

The study was conducted in KNH surgical wards and theatre. This is a national teaching and referral hospital, with a capacity of 1800 beds. It functions as a teaching facility for the University of Nairobi; College of Health Sciences for both the undergraduate and postgraduate programs. The Urology Clinics are conducted from Monday to Wednesday by three different firms. Patients was recruited from urology clinics and followed up in the general ward, 5B. Additionally, private patients admitted at private wings in level 9 and 10 wards were also recruited into the study. Each firm had one operating day to conduct surgeries from Monday to Wednesday. The private urology patients are operated on in the main theatre any time of the week depending on availability of theatre space.

3.3 Inclusion Criteria

Patients undergoing elective TURP for BPE in KNH who had consented for the study

3.4 Exclusion Criteria

Patients with a known bleeding disorder Patients undergoing re do TURP for BPE.

Known prostatic carcinoma as the disease pathophysiology is different.

Patients on antimitotic drugs. The anticancer drugs affect platelet function leading to more bleeding.

Patients who decline blood transfusion due to religious believes such as Jehovah Witness or personal reasons.

3.4 Sample Size

All patients who consented to take part in the study and met the inclusion criteria were given consecutive unique codes for ease of follow up.

The following formula was used to calculate sample size in the prospective study:

$$\frac{}{}$$

Where,

= Desired sample size

= value from standard normal distribution corresponding to desired confidence level (Z=1.96 for 95% CI)

= is the estimated portion of an attribute that is present in the population (2-7% is the proportion of patients who get blood transfusion during TURP {Rassweiler J et al, 2006**}).**

= desired precision (0.05)

$$\text{Sample size} = \frac{1.96^2 \times 0.07(1-0.07)}{0.05^2}$$

Sample Size =100.035

Therefore, a sample size of **100** was targeted.

With an anticipated number of at least 12 TURPS per month, data was to be collected over a period of 9 months.

3.5 Sampling Method

Convenience sampling was used to recruit subjects until the required sample size was achieved. Consecutive patients meeting the inclusion criteria were sampled.

3.6 Screening and Recruitment

The Principal researcher and trained research assistant screened patients who werej due for elective TURP due to BPH from the urology clinics, KNH wards (both private and general) for eligibility. Those that met the eligibility criteria were recruited. All of the relevant and available information regarding the study was availed to the patients and those who provided informed written consent were recruited into the study.

3.7 Data Collection

The data collection tool was a Structured Interview Form. The trained interviewers were two qualified medical officers who were appraised about the study. They were educated and trained on the details of the study and they fully understood the questionnaire before the study began.

3.8 Study Variables

3.8.1 Independent Variables

Age: The official documented date of birth

Pre-Operative Hb

Size of the prostate

Presence of UTI

The information obtained included age, residence, and occupation, presence of Diabetes Mellitus and hypertension and use of 5-ARIs. Preoperative Full Haemogram, urinalysis and prostate size was obtained from ultrasound reports. Prostate size (mls) was estimated from the pelvic ultrasound by using the formula: prostate volume = height x width x length x 0.52 (Mc Vary et al, 2003).

Intraoperatively, surgeon‟s experience, the mode of anesthesia, length of resection, weight of prostate tissue resected (g), histopathological diagnosis, duration of postoperative irrigation and catheterization was recorded

3.8.2 Dependent Variables

Occurrence of blood transfusion

Amount Blood loss

Patient Post-operative Hb

Post transfusion related complications

Number of blood transfusion units requested/GXMed for procedure and whether used or not.

3.9 Data Collection Procedures

The Principal researcher and research assistant were instrumental in data collection where a structured interview form was filled. The weight of prostate tissue resected was measured on a digital and modern weighing scale (FX-2000i digital gram scale, Mitutoyo, Japan) accurate to 0.01g. The amount of effluent collected was used to deduct the amount of irritant fluid used to get the approximate amount of blood loss per patient. After surgery patients were reviewed every 24 hours until discharge. Post-operative Hb levels were recorded.

3.10 Data Analysis and Presentation

The data collected was cross-checked, sanitized, categorized and recorded using the statistical analysis software package, SPSS version 22. The folder in which the research data was contained was password-protected and uploaded dutifully to a cloud storage drive. The researcher conducted back-up every day deal missing entries. Metrics of central tendency including mean and standard deviation were deployed to define variables with regular distribution. The skewed distributions, on their part, were described in terms of medians and interquartile ranges. Descriptive statistics such as frequencies and percentages was used to describe demographic characteristics like age, occupation, and preoperative variables like prostate size categories, Hb categories and presence of UTI categories. Relationship between our outcome variable, that is presence or absence of blood transfusion, and predictor variables was established by correlation analysis such as Fisher‟s Exact test. . Data was presented in form of tables, graphs and pie charts. Examples of dummy tables we will use for our data analysis are shown below;

3.11 Quality Control

The evaluation forms were pre tested before data collection

The Patient‟s history and physical examination was conducted by the principle investigator

All laboratory investigations were carried out at UoN/ KNH laboratory facilities.

Approximation of estimated blood lose may be subjective. This was mitigated by subtracting amount of irrigation fluid used and amount of total fluid in the collecting jar during TURP

Approximation of prostate size by ultrasound is user dependent. This was mitigated by use of KNH radiology department.

3.12 Ethical Review and Approval

The Study began in February 2020 upon authorization by the Department of Surgery (UoN) and KNH Ethics and Research Committee (Ref: P892/11/2019).The researchers recruited the patients into the study after they obtained written and verbal informed consent. The benefits and value of participating in the research was explained to the patient and the decision to participate was voluntary.

The Ethics and Research Committee (ERC) Kenyatta National Hospital/ University of Nairobi (KNH/UoN) provided clearance. A go ahead to conduct this study was applied for from the KNH Research and Programs department. An informed consent form was developed. No names were included on the datasheet and information garnered was utilized for research only. Ethical principles of autonomy, justice, beneficence, and confidentiality was adhered to . There were no risks involved in this study. Subjects who declined to participate in the study were not denied treatment

4.0 CHAPTER FOUR: RESULTS

This chapter discusses the results of the study which undertaken for a duration of one month from 1st march 2021 to 31st march 2021 in renal wards, at Kenyatta National Hospital. The study targeted 100 patients who had undergone kidney stones extraction. The principal investigator was able to collect 90 questionnaires which a well filled. This is 90% response rate among the respondents which is permitted analysis since it was consistent with the data analysis response rate range which is normally in the range of 75%-100%.

4.1 Demographic Characteristics

Age

21.1% (n =19) of patients were below 60 years while 78.9% (n=71) were above 60 years of age.

Smoking

Patients who smoked were 63.3% (n= 57) while the non-smokers were 36.7% (n=33).

Residence

Out of the 90 participants, fifty-five (61.1%) participants were of urban residence compared to 35 (38.9%) of rural residence

4.2 Pre-Operative Variables

4.2.1 Pre-Operative HB

The average pre-operative HB recorded was 13.27g/dl, the standard deviation of 2.32. The pre-operative HB for the patients in the range 8-12g/dl was 33.3% (n= 30) while that of >12g/dl was 66.7% (n= 60). There were no patients with a pre-operative HB of <8g/dl.

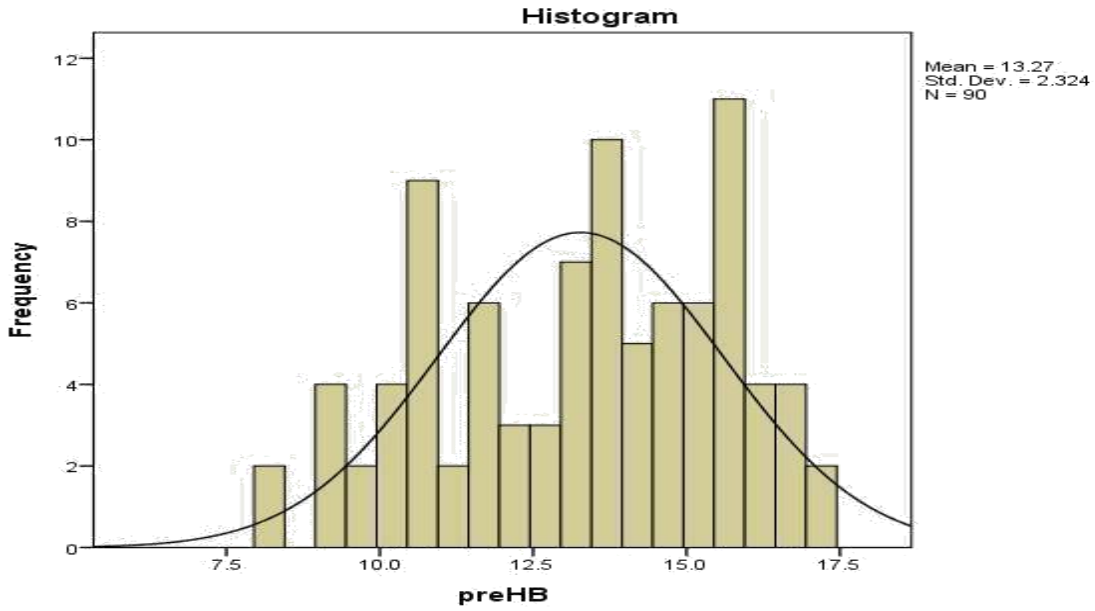


Figure 1:Pre-operative HB descriptive

Medications

Patients who used 5 alpha reductase inhibitors drugs were 77.8% (n=70) and those who were not on the drugs were 22.2% (n= 20).

Prostate size

The mean prostate size was 72.26 (Figure 2)

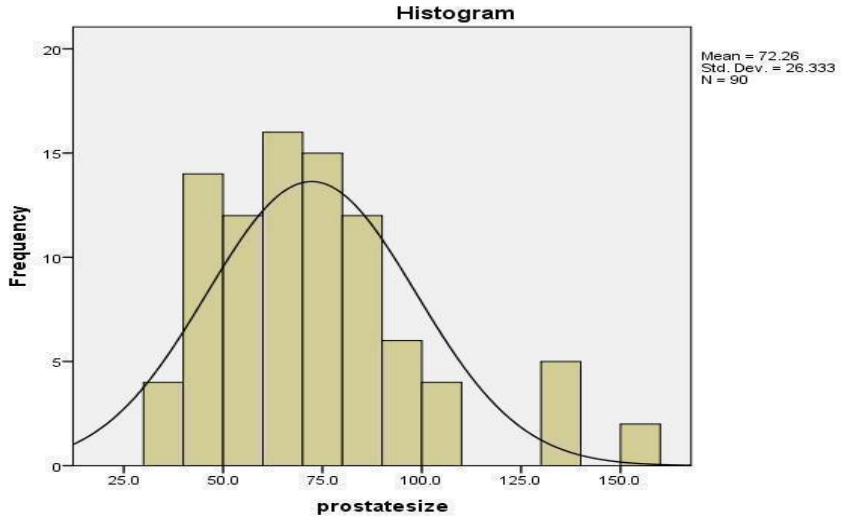


Figure 2: Prostate

4.2.2 Presence of Urinary Tract Infection (UTI)

Patients who had urinary tract infections were 41.1% (n=37) while those who did not have were 58.9% (n= 53).

4.3 Co-Morbidities

Diabetes

Patients who had diabetes were 30.0% (n= 27) while those without were at 70% (n= 63). (Figure 3).

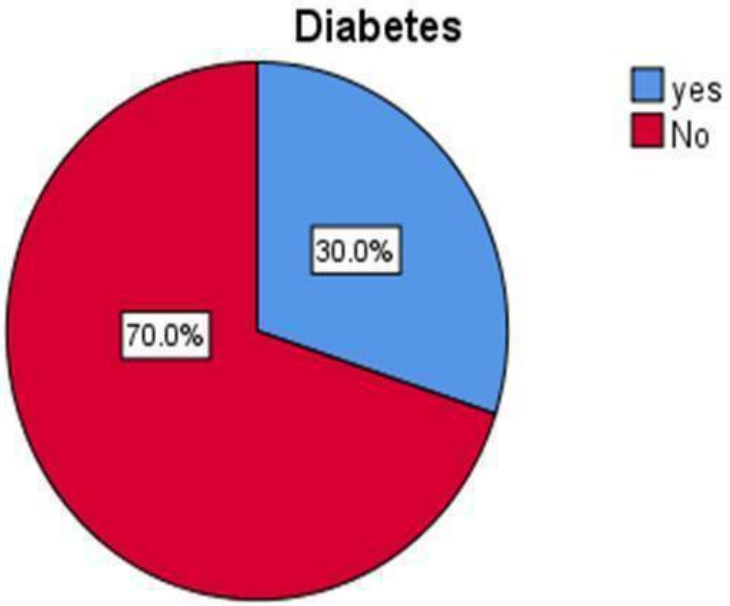


Figure 3: Diabetes

4.4 Hypertension

37.8% (n= 34) of patients had hypertension while 62.2% (n= 56) did not (Figure 4).

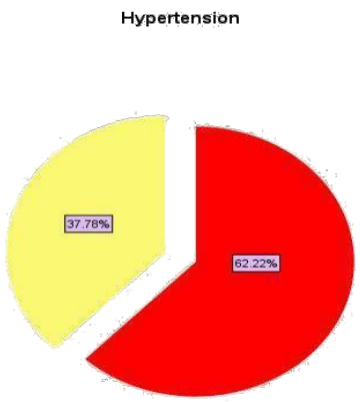


Figure 4: Hypertension

4.5 Heart Disease

There were 48.9% (n= 44) of the patients who had a heart disease and 51.1% (n= 46) did not have the disease (Figure 5)

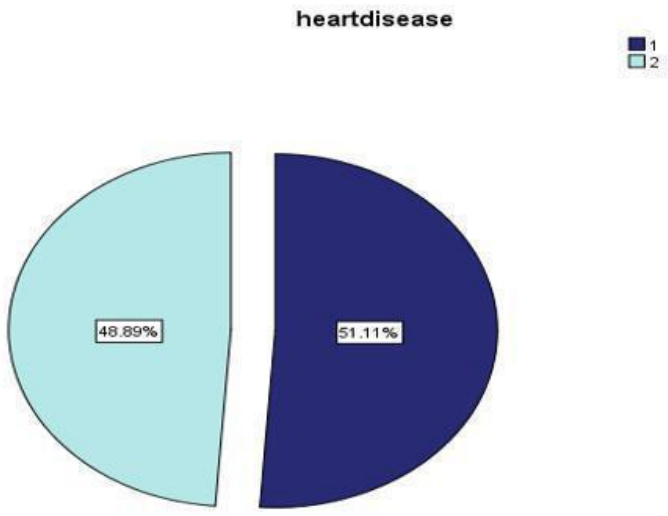


Figure 5: Heart Disease

4.6 Intra Operative and Post-Operative Variables

4.6.1 Use of anesthesia

The patients who received general anesthesia were 6.7% (n= 6) while 93.3% (n= 84) received spinal.

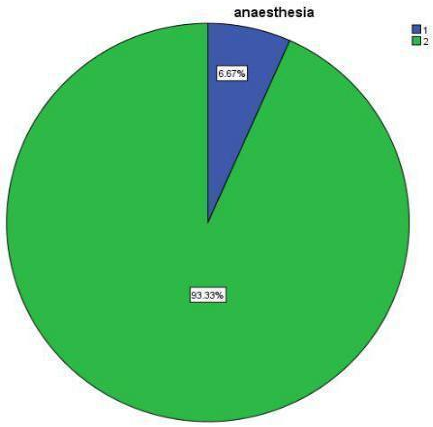


Figure 6: Use of anesthesia

4.7 Length of Resection

The length of resection for most patients was 2-3 hours which was 92.2% (n= 83) compared those whose resection took <2 hours 2.2% (n= 2) and >3 hours 5.6% (n= 5) (Figure 7).

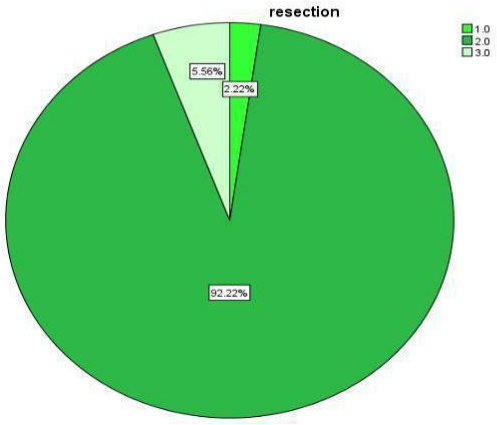


Figure 7: Resection

4.8 Surgeon's Experience

Most of the surgeons had experience of 5-10 years which was 61.1% (n= 55) compared to those who had experience of <5 years 38.7% (n= 35).

Table 1: surgeons experience and transfusion rates

Experience	Transfused		
	yes	No	Total
Urologist	3	29	35
Trainee	6	52	55
Total	9	81	90

4.9 Weight of the Prostate

The mean weight of the resected prostate was 9.76 grams while the smallest was 5grams and the largest was 15 grams.

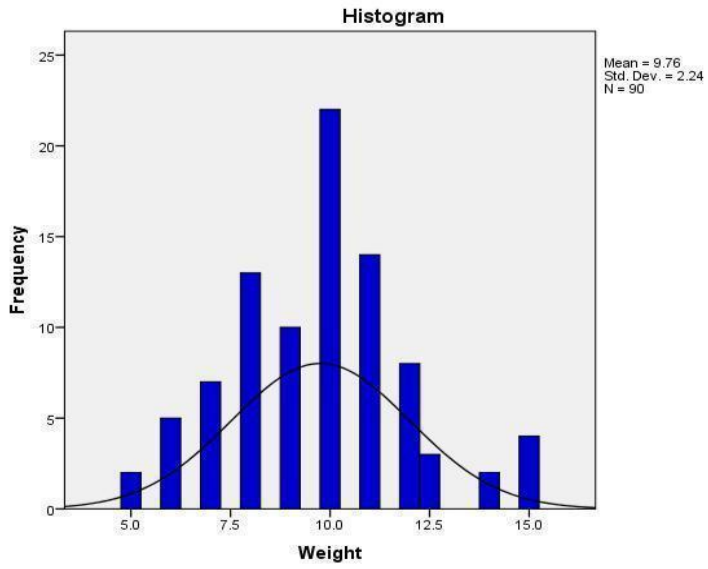


Figure 8: Histogram on weight of resected prostate (grams)

4.10 Duration of Post-Operative Irrigation

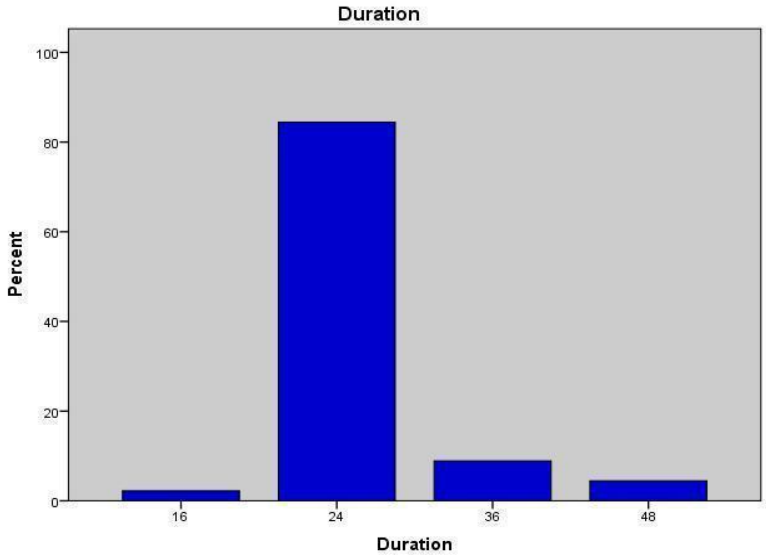


Figure 9: Duration of postoperative irrigation

Most of the patients had a post-operative HB >12g/dl while the rest of the patients had a post-operative 8-12g/dl.

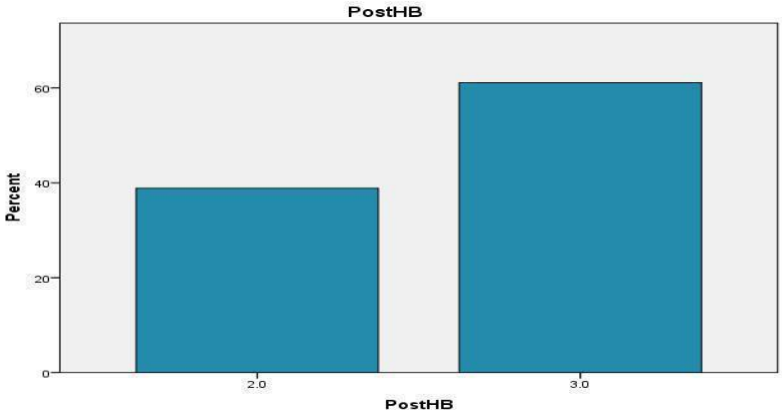


Figure 10:Post-Operative Hb

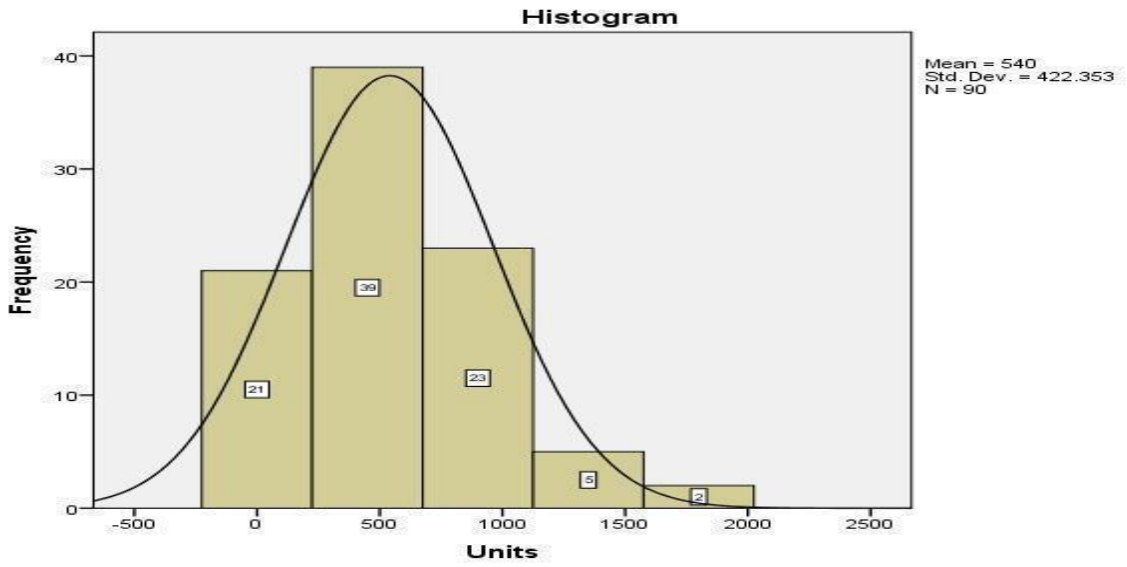
Table 2: Blood requested for TURP

Activity	No	Yes
TURP	25(27.8%)	65(72.2%)
Cross matched	17(18.9%)	73(81.1%)
Transfused (Theatre)	81(90%)	9(10%)
Blood transfusion (72hrs post operatively)	86(95.6%)	4(4.4%)

4.11 The Incidence of Blood Transfusion

The average blood transfused was 500 ml (1 pint), 43.3% (n= 39) of the patients received 450 ml of blood transfusion.

Figure 11: Average blood transfused



4.12 Intra Operative and Post-Operative Complications

Patients with blood clot or urine retention complications were 77.8%, while those with persistent hematuria were 88.9% and everyone experience adverse effects

Table 3: Clot/Urine

Complication type	**Yes**	**No**
Clot	70(77.8%)	20(22.2%)
Hematuria	80(88.9%)	10(11.1%)
Adverse	90(100%)	0

4.13 Factors Associated With Blood Transfusion Related To TURP.

The variables that were found to be significant at 10% were drugs, transfusion after surgery, smoking, pre-operative HB and age. Drug has a p value=0.007 which was significant at 5% and it implies that there was an association between blood transfusion and age. After surgery has a p value=0.072 which was significant at 10% implying there was an association with transfusion. Smoking had a p value of 0.022 which was significant at 5% implying there was an association between smoking and transfusion Pre-HB had a p value of 0.008 which was significant at both 1% and 5% implying there was a strong relationship between pre-HB and transfusion. Age had a p value of 0.000 which was significant at both 1% and 5% implying there was a strong relationship between age and transfusion. However, blood loss, theatre, weight, apha-reductase UTI and surgeons experience were not significant factors.

Table 4: Risk factors for transfusion

Risk factor	Odds ratio	Confidence intervals	P value
Drugs	4.3	1.5 – 12.6	0.007
Smoking	3.5	1.2 – 10.2	0.022
Pre-op HB	1.2	1.1 – 1.4	0.008
Age	21.9	5.6 – 85.3	0.001
Blood loss	1.0	0.9 – 1.0	0.58
Weight of prostate	0.99	0.9 – 1.2	0.991
Surgeon‟s experience	1.5	0.7 – 3.3	0.255

4.14 Timing of Transfusion

In total, 8 out of the 90 patients were transfused. On the timing of transfusion, only 3 patients received blood transfusion in the theatre. One patient received transfusion within 72 hours after surgery.

5.0 CHAPTER FIVE: DISCUSSION, CONCLUSION, AND RECOMMENDATION

5.1 Discussion

Blood transfusion remains a key component in the resuscitation of surgical patients. There is increased clinical evidence as regards to appropriate transfusion. In this study, approximately 10% of the patients in our study received blood transfusion during TURP. Different studies have found varying rates of transfusion in different centers. This figure is slightly higher than the anticipated 2-7% transfusion rates in some centers[7].

The findings in our study are similar to a study by Kirollos and Campbell, 1997, which found transfusion rates of 10.2% which were further reduced to 8.2%. On the contrary, a study by Mteta, Musau and Keiza, 2012 in Tanzania, found higher rates of transfusion of upto 58.2% after TURP. Still, a study in the same country, Tanzania, in 2016 by Swai, Nyongole and Mteta also found higher rates of transfusion of upto 68.1%[45].

The mean amount of whole blood transfused was 540mls. 43.3% of the patients who were transfused received 450ml of whole blood representing a unit. This finding is similar to a study by Mteta, Musau and Keiza, 2012 which found the mean amount of transfusion being 1.2 units with a range of 1 – 4 units. Majority of the patients undergoing TURP were smokers at 63.3% and this was a significant factor in blood loss (P=0.022) resulting in blood transfusion in our study. Smoking was similarly shown to increase blood loss during TURP[72]

The pre-operative Hb for the patients for the range 8-12g/dl was 33.3% while those with Hb above 12g/dl was 66.7%. The mean preoperative Hb was 13.27g/dl. Low preoperative Hemoglobin was a significant factor in risk for blood transfusion in our study (P= 0.008). Similarly, other a similar study by Ather showed that optimization of preoperative Hemoglobin reduced transfusion requirement[34]

Another factor for blood transfusion according to our study was increasing age. A retrospective study involving 5832 patients also revealed age to be a significant factor in blood transfusion for patients undergoing TURP[30.] Majority of patients, 77.8% used 5 alpha reductase inhibitors, and this could explain the low transfusion rate. Finasteride reduces blood transfusion rate[44.] The mean prostate size for transurethral resection in our study was 72.26grams. Larger prostates have been shown to have increased risk for blood transfusion[45.] Our study shows that less than 22.2% of patients had prostate size less than 50 grams.

41.1% of the patients had urinary tract infection but this did not significantly increase the risk for blood transfusion probably because of the use of antibiotics. The main mode of anaesthesia used was spinal, at 93.3%. Hatch noted that general anaesthesia resulted in twice the transfusion rate compared to spinal anaesthesia[67]. Some authors have demonstrated reduced blood transfusion rate when spinal anaesthesia is used for resection[70]. However, some authors have failed to show this relationship of reduced rate for blood transfusion[71]. The length of resection was mainly 2-3hours at 92.2% and only 5.6% of patients had resection more than 3 hours. Other studies have shown that longer resection time is a risk factor for increased blood transfusion[29].

The study did not show any correlation between blood loss and the type of anesthesia administered, resection time and weight of the resected prostate and UTI. Size of the prostate was the single most important factor leading factor leading to increased risk for blood transfusion according to a previous study[46]. TURP resection of preoperative prostate of size more than 30grams was reported to be significant[46]. Unlike the study done in neighboring Tanzania[45], surgeon‟s experience was not a major factor in determining risk for blood transfusion according to our study. In addition, contrary to the Tanzanian study[45], there was no correlation with blood loss in resection done more than 45 minutes in our study. Blood was transfused according to the anesthetist demand in our study. This is comparable to a similar study finding that blood was transfused due to lack of principle of fluid management[68]

While TURP is the gold standard of BPH management, the main morbidities include clot retention, bladder irrigation and occasionally need for blood transfusion[69]. The most common immediate post-operative complication was clot retention at 77.8% and persistent hematuria requiring continuous bladder irrigation more than one day at 88.9%. This is a similar finding to a research in 2008 carried out at Kathmandu University involving over 100 consecutive patients who had undergone TURP[29].

5.2 Conclusion

Blood transfusion can be rationalized and reduced. Blood loss during TURP in our study is correlated positively with increasing age, smoking and low preoperative Hemoglobin. Patients with normal preoperative hemoglobin do not require blood transfusion. The incidence of blood transfusion was 10% which is slightly higher than the rate at modern centers of health provision. Size of the prostate, Urinary tract infection, Surgeon‟s experience, resection time and type of

anaesthesia were not correlated with blood loss and transfusion rate. TURP can be safely done without the need for blood transfusion routinely. While a significant proportion of blood was requested and reserved, fewer patients were transfused meaning some more deserving patients for other elective surgeries could have missed.

5.3 Recommendations

Patients taken for elective TURP should have adequate preoperative HB of at least 12.0g/dl to reduce the risk of blood transfusion.

Patients should be advised to stop smoking at least 8 weeks prior to surgery to reduce the risk for blood loss and blood transfusion.

Patients older than 60 years of age are at increased risk for blood loss and blood transfusion. Therefore, elderly patients should be optimized and counselled about their increased risk for blood transfusion.

There is no need to routinely group and cross match and reserve blood for patients undergoing TURP since the transfusion rate is low meaning some patients for other elective cases may miss the surgeries due lack of blood.

This study can be replicated in other centres to study the other variables that may influence blood transfusion during TURP.

5.4 Limitations

Inability to attain the desired sample size of 100 patients due to the covid19 pandemic that led to reduced number of elective procedures done.

This was a one centre study and therefore may not present the true picture as regards blood transfusion practices as regards TURP.

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STUDY BUDGET

ITEM	**COST (KSHS)**
RESEARCH FEE – KNH/ERC	2000
STATISTICIAN CONSULTATION FEE	30,000
STATIONERY	
Printing	10,000
Photocopying	15,000
Binding	10,000
Pens	1000
RESEARCH ASSISTANTS	30,000
CONTINGENCY	10000
TOTAL	108,000

STUDY TIMELINE

	August-September 2019	October2019-January 2020	February 2020 – February 2021	March 2021- April 2021	May 2021
PROPOSAL DEVELOPMENT					
ETHICAL CLEARANCE					
DATA COLLECTION					
DATA PROCESSING AND ANALYSIS					
REPORT WRITING					

REFERENCES

1. Wendt-Nordahl G, Hacker A, Fastenmeier K, Knoll T, Reich O, Alken P, Michel MS (2005) New bipolar resection device for transurethral resection of the prostate: first ex-vivo and in-vivo evaluation. J Endourol 19(10):1203–1209 CrossRef Google Scholar https://link.springer.com/chapter/10.1007/978-4-431-35642-4_10
2. J.M Ross. Practice strategies for elective red blood cell transfusion. American College of Physicians.Annuals of internal medicine. 1992. Vol 119 Page 402-406
3. Ministry of Health, National Blood Transfusion Services, Government of Kenya. Guidelines for the use of blood and blood products. 2nd Edition, 2004: 2: 5-6
4. Salem-Schatz S, Avorn J, Soumerai SB JAMA. Influence of clinical knowledge, organizational context, and practice style on transfusion decision making. Implications for practice change strategies. 1990;264:476–483. [PubMed] [Google Scholar
5. Reich O, Gratzke C, Bachmann A, Seitz M, Schlenker B, Hermanek P, Lack N, Stief CG. Urology Section of the Bavarian Working Group for Quality Assurance. Morbidity, mortality and early outcome of transurethral resection of the prostate: a prospective multicenter evaluation of 10,654 patients. J Urol. 2008; 180:246–249. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3974478
6. Jansen H, Berseus O, Johansson JE.A simple photometric method for determination of blood loss during transurethral surgery.Scand J UrolNephrol. 1978;12(1):1-5.
7. Rassweiler J1, Teber D, Kuntz R, Hofmann R.Complications of transurethral resection of the prostate (TURP)--incidence, management, and prevention.Eur Urol. 2006 Nov;50(5):969-79; discussion 980. Epub 2006 Jan 30.
8. Berry SJ, Coffey DS, Walsh PC, Ewing LL.The development of human benign prostatic hyperplasia with age.J Urol. 1984 Sep;132(3):474-9.
9. Parsons JK. Benign Prostatic Hyperplasia and Male Lower Urinary Tract Symptoms: Epidemiology and Risk Factors. Curr Bladder Dysfunct Rep. 2010;5(4):212–218. doi:10.1007/s11884-010-0067-2
10. Sanda MG1, Beaty TH, Stutzman RE, Childs B, Walsh PC.Genetic susceptibility of benign prostatic hyperplasia.J Urol. 1994 Jul;152(1):115-9

11. Sanda MG1, Doehring CB, Binkowitz B, Beaty TH, Partin AW, Hale E, Stoner E, Walsh PC. Clinical and biological characteristics of familial benign prostatic hyperplasia.J Urol. 1997 Mar;157(3):876-9.

12. Pearson JD1, Lei HH, Beaty TH, Wiley KE, Isaacs SD, Isaacs WB, Stoner E, Walsh PC. Familial aggregation of bothersome benign prostatic hyperplasia symptoms.Urology. 2003 Apr;61(4):781-5.

13. Partin AW1, Page WF, Lee BR, Sanda MG, Miller RN, Walsh PC.Concordance rates for benign prostatic disease among twins suggest hereditary influence.Urology. 1994 Nov;44(5):646-50.

14. Bhasin S1, Singh AB, Mac RP, Carter B, Lee MI, Cunningham GR.Managing the risks of prostate disease during testosterone replacement therapy in older men: recommendations for a standardized monitoring plan.J Androl. 2003 May-Jun;24(3):299-311.

15. Parsons JK1, Palazzi-Churas K, Bergstrom J, Barrett-Connor E.Prospective jjkj study of serum dihydrotestosterone and subsequent risk of benign prostatic hyperplasia in community dwelling men: the Rancho Bernardo Study Urol. 2010 Sep;184(3):1040-4. doi: 10.1016/j.juro.2010.05.033.

16. Parsons JK1, Carter HB, Partin AW, Windham BG, Metter EJ, Ferrucci L, Landis P, Platz EA. Metabolic factors associated with benign prostatic hyperplasia. J ClinEndocrinolMetab. 2006 Jul;91(7):2562-8. Epub 2006 Apr 11.

17. Sarma AV1, Kellogg Parsons J.Diabetes and benign prostatic hyperplasia: emerging clinical connections.CurrUrol Rep. 2009 Jul;10(4):267-75.

18. Parsons JK1.Modifiable risk factors for benign prostatic hyperplasia and lower urinary tract symptoms: new approaches to old problems.J Urol. 2007 Aug;178(2):395-401. Epub 2007 Jun 11.

19. Parsons JK1, Im R.Alcohol consumption is associated with a decreased risk of benign prostatic hyperplasia.J Urol. 2009 Oct;182(4):1463-8. doi: 10.1016/j.juro.2009.06.038. Epub 2009 Aug 15.

20. Fitzpatrick JM, Minimally invasive and endoscopic management of benign prostatic hyperplasiaKirby R, Lepor H. Evaluation and nonsurgical management of benign prostatic hyperplasia. In: Kavoussi LR, Novick AC, Partin AW, Peters CA, editors. Campbell-Walsh urology. 9th ed. China: Elsevier Inc; 2007. pp. 2803-2844.

21. McNicholas T, Kirby RBenign prostatic hyperplasia and male lower urinary tract symptoms (LUTS).BMJ ClinEvid. 2011 Aug 26;2011. pii: 1801.

22. Mebust WK1, Holtgrewe HL, Cockett AT, Peters PC.Transurethral prostatectomy: immediate and postoperative complications. A cooperative study of 13 participating institutions evaluating 3,885 patients.J Urol. 1989 Feb;141(2):243-7.

23. Erturhan S1, Erbagci A, Seckiner I, Yagci F, Ustun A.Plasmakinetic resection of the prostate versus standard transurethral resection of the prostate: a prospective randomized trial with 1-year follow-up.Prostate Cancer Prostatic Dis. 2007;10(1):97-100. Epub 2006 Aug 22.

24. Holtgrewe HL. Transurethral prostatectomy.UrolClin North Am. 1995 May;22(2):357-68.

25. S.-S. Chen J.-G. Hong Y.-J. Hsiao L.S. Chang. The correlation between clinical outcome and residual prostatic weight ratio after transurethral resection of the prostate for benign prostatic hyperplasia.BJUI.Vol 85. Jan 2000 pages 79-82

26. SU Alhasan, SA Aji, AZ Mohammed & S Malami.Transurethral resection of the prostate in Northern Nigeria, problems and prospects.BMC Urology volume 8, Article number: 18 (2008

27 M.M Kirollos , N. Campbell. Factors influencing blood loss in transurethral resection of the prostate (TURP): auditing British Journal of Urology (1997), 80, 111-115

28. Sriprasad S, Subramonian K, Thompson P. Ann R CollSurg Engl. Postoperative haemorrhage following transurethral resection of the prostate (TURP) and photoselectivevaporisation of the prostate (PVP). Lynch M1, 2010 Oct;92(7):555-8

29. Shrestha BM, Prasopshanti K, Matanhelia SS, Peeling WB. Blood loss during and after transurethral resection of prostate: A prospective study. Kathmandu University Medical Journal (2008), Vol. 6, No. 3, Issue 23, 329-334

30. Uchida T1, Ohori M, Soh S, Sato T, Iwamura M, Ao T, Koshiba K. Factors influencing morbidity in patients undergoing transurethral resection of the prostate. Urology. 1999 Jan;53(1):98-105

31. Alhasan SU, Aji SA, Mohammed AZ, Malami S. Transurethral resection of the prostate in Northern Nigeria, problems and prospects. BMC Urol. 2008;8:18. Published 2008 Dec 6. doi:10.1186/1471-2490-8-18

32. Kyei MY1, Mensah JE, Morton B, Gepi-Attee S, Klufio GO, Yeboah ED. Surgical management of BPH in Ghana: A need to improve access to transurethral resection of the prostate. East Afr Med J. 2012 Jul;89(7):241-5.

33. Rajpar S1, Surya B2, Mobin K2, Kumar S2.Experience of hundred cases of transurethral resection of prostate at tertiary care hospital in Karachi.J Pak Med Assoc. 2018 May;68(5):783-786.

34. M. H. Ather, Optimization of low pre-operative Hemoglobin reduces transfusion requirement in Patients undergoing Transurethral Resection of Prostate. JPMA. March 2003, Volume 53, Issue 3

35. AnethSwai, ObadiaNyongole. A one year trend of blood loss during TURP as seen at Urology department, Kilimanjaro Christian Medical Centre, In Moshi, Tanzania: Do we avoid unnecessary blood transfusion. JMR 2016 , 2(6): 150-154

36. Pawan Vasudeva, ApulGoel, Vengetesh K. Sengottayan, SatyanarayanSankhwar, and DivakarDalel Antiplatelet drugs and the perioperative period: What every urologist needs to know. Indian J Urol. 2009 Jul-Sep; 25(3): 296–301. doi: 10.4103/0970-1591.56174

37. Howard Lau , Simon Bariu. Stopping anticoagulation before TURP does not appear to increase perioperative cardiovascular complications.

38. Teo, Jonathan Shunming et al. "An update on transurethral surgery for benign prostatic obstruction." Asian journal of urology vol. 4,3 (2017): 195-198. doi:10.1016/j.ajur.2017.06.006

39. ElMalik EM1, Ibrahim AI, Gahli AM, Saad MS, Bahar YM.Risk factors in prostatectomy bleeding: preoperative urinary infection is the only reversible factor.Eur Urol. 2000 Feb;37(2):199-204.

40. Mohamed Khalid Enver, Ivan Hoh, and Frank I Chinegwundoh, The Management of Aspirin in Transurethral Prostatectomy: Current Practice in the UK. Ann R CollSurg Engl. 2006 May; 88(3): 280–283. doi: 10.1308/003588406X95084 .

41. Petry JJ.Surgically significant nutritional supplements.PlastReconstr Surg. 1996 Jan;97(1):233-40.

42. Donohue JF1, Hayne D, Karnik U, Thomas DR, Foster MC. Randomized, placebo-controlled trial showing that finasteride reduces prostatic vascularity rapidly within 2 weeks. BJU Int. 2005 Dec;96(9):1319-22.

43. KyuShik Kim, Won SikJeong, Sung Yul Park, Yong Tae Kim, and Hong Sang Moon. The Effect of Two Weeks of Treatment with Dutasteride on Bleeding after Transurethral Resection of the Prostate World J Mens Health. 2015 Apr; 33(1): 14–19.

44. O. M. Aboumarzouk,1 M. Z. Aslam,1 A. Wedderburn,2 K. Turner,2 O. Hughes,1 and H. G. Kynaston, Should Finasteride Be Routinely Given Preoperatively for TURP? 1 Volume 2013, Article ID 458353, 7 pages http://dx.doi.org/10.1155/2013/458353

45. K.A. Mteta1 , P. Musau2 , N. Keiza3. Blood Transfusion in Transurethral Resection of the Prostate (TURP): A Practice that Can be Avoided. ISSN 2073 ISSN 2073-9990 East Cent. Afr. J. Surg

46. Kirollos MM1, Campbell N Factors influencing blood loss in transurethral resection of the prostate (TURP): auditing TURP. Br J Urol. 1997 Jul;80(1):111-5

47. AnethSwai, ObadiaNyongole. A one year trend of blood loss during TURP as seen at Urology department, Kilimanjaro Christian Medical Centre, In Moshi, Tanzania: Do we avoid unnecessary blood transfusion. JMR 2016 , 2(6): 150-154

48. Martin M, Anton P, Marlies P. Transurethral resection of the prostate. Eur Urol.2009; 504-512.

49. Abdul R Hakeem, Krishnamurthy Sairam, Roger O Plail. The Value of Blood Tests Following Transurethral Resection of the Prostate.Department of Urology, Conquest Hospital, East Sussex, England. www.urotodayinternationaljournal.com Volume 2 - April 2009

50. Muhammad Hammad Ali Mithani, Salman El Khalid, ShariqAnis Khan, Imran Sharif, Adnan Siddiq Awan. Is Routine Measurement of Post-operative Hemoglobin and Electrolytes Necessary in Every Patient After Transurethral Resection of the Prostate? Journal of Urological Surgery, 2018;5(4):157-164

51. Shin, Hyun-Jung et al. “The impact of irrigating fluid absorption on blood coagulation in patients undergoing transurethral resection of the prostate: A prospective observational study using rotational thromboelastometry.” Medicine vol. 96,2 (2017): e5468. doi:10.1097/MD.0000000000005468

52. Khan M1, Khan AL, Khan S, Nawaz H. Benign prostatic hyperplasia: mode of presentation and postoperative outcome. J Pak Med Assoc. 2005 Jan;55(1):20-3.

53. Sergio Hernando Mina, Herney Andres Garcia-Perdomo. Effectiveness of tranexamic acid for decreasing bleeding in prostate surgery: a systematic review and meta-analysis. Cent European J Urol. 2018; 71(1): 72–77.

54. Berntorp E, Follrud C, Lethagen S. ThrombHaemost. No increased risk of venous thrombosis in women taking tranexamic acid. 2001 Aug;86(2):714-5.

55. Madjpour C, Sphan DR. Allogenic red blood cell transfusions. Efficacy, risks, alternatives and indications. British journal of anaesthesia, 2005: Vol95: pg 33-42

56. Blandy JP. Operative Urology.Blackwell Scientific Publications: 1978: page 142

57. Wendt-Nordhal, Bucher B, Hacker A, Knoll T, Alken P, Michel MS. Improvement in mortality and morbidity in transurethral resection of the prostate over 17 years in a single centre. J Endourol. 2007 Sep;21(9):1081-7.

58. Poporsky MA, Robillard P. Working party on haemovigilance; Proposed standard definitions for surveillance of noninfectious adverse transfusion reactions

59. Sahu, Sandeep et al. "Adverse events related to blood transfusion." Indian journal of anaesthesia vol. 58,5 (2014): 543-51. doi:10.4103/0019-5049.144650

60. Hendrickson JE1, Hillyer CD. Noninfectious serious hazards of transfusion. Anesth Analg. 2009 Mar;108(3):759-69. doi: 10.1213/ane.0b013e3181930a6e.

61. Domen RE1, Hoeltge GA. Allergic transfusion reactions: an evaluation of 273 consecutive reactions. Arch Pathol Lab Med. 2003 Mar;127(3):316-20.

62. Hazel Smith, Rachel Falconer, Justyna Szczachor and Sarfraz Ahmad. Routine preoperative group and save for TURP and TURBT – need and cost effectiveness. Journal of Clinical Urology 2018, Vol. 11(1) 33–37 © British Association of Urological Surgeons 2017 Reprints and permissions: sagepub.co.uk/journalsPermissions.nav DOI: 10.1177/2051415817717908 journals.sagepub.com/home/uro

63. Mohamed Hafez El Saied Hafez,Mona Hossam El Din Abd El Hamid,Sabah Abd El Raouf. Bipolar versus monopolar transurethral prostate resection: Comparison of hemodynamic and biochemical changes. Egyptian Journal of Urology, Vol 30. Issue 3

64. Gupta NP1, Doddamani D, Aron M, Hemal AK Vapor resection: a good alternative to standard loop resection in the management of prostates >40 cc. J Endourol. 2002 Dec;16(10):767-71.

65. . P.J.R. Shah, , K. Bryning , C.G.C. Gaches , M.H. Ashken, N.A. Green. Blood loss during transurethral resection of the prostate. Anaesthesia. Volume37, Issue1 January 1982. Pages 71-73

66. Yu X1, Elliott SP, Wilt TJ, McBean AM. Practice patterns in benign prostatic hyperplasia surgical therapy: the dramatic increase in minimally invasive technologies. J Urol. 2008 Jul;180(1):241-5.K.

67. P D Hatch. Surgical and anaesthetic considerations in transurethral resection of the prostate. Anaesth Intensive Care . 1987 May;15(2):203-11

68. P M Ngugi 1, P W Saula. Open simple prostatectomy and blood transfusion in Nairobi. East Afr Med J. 2007 Sep;84(9 Suppl):S12-23

69. Franck Bruyère 1, Damien Huglo, Benjamin Challacombe, Olivier Haillot, Chantal Valat, Nicolas Brichart. Blood loss comparison during transurethral resection of prostate and high power GreenLight(™) laser therapy using isotopic measure of red blood cells volume. J Endourol. 2011 Oct;25(10):1655-9

70. P H Abrams, P J Shah, K Bryning, C G Gaches, M H Ashken, N A Green. Blood loss during transurethral resection of the prostate. Anaesthesia. 1982 Jan;37(1):71-3

71. K K Nielsen 1, K Andersen, J Asbjørn, F Vork, A Ohrt-Nissen. Blood loss in transurethral prostatectomy: epidural versus general anaesthesia. Int Urol Nephrol . 1987;19(3):287-92

72. R G Hahn. Smoking increases the risk of large scale fluid absorption during transurethral prostatic resection. J Urol. 2001 Jul;166(1):162-5.

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APPENDICES

Appendix I: Participant Information and Consent Form (English)

Adult Consent Form

For Enrollment in the Study

(To be administered in English or any other appropriate language e.g Kiswahili translation)

Title of Study: **___ PERI-OPERATIVE BLOOD TRANSFUSION IN PATIENTS UNDERGOING TRANSURETHRAL RESECTION OF THE PROSTATE IN KNH.**

Principal Investigator\and institutional affiliation: **___Mokua Winstar Ombuki / University of Nairobi**

Research Assistant: Dr. Allan Yienya/ University of Nairobi

Introduction:

I would like to tell you about a study being conducted by the above listed researchers. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in a medical research: i) Your decision to participate is entirely voluntary ii) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal iii) Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities. We will give you a copy of this form for your records.

May I continue? YES / NO

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol No. _____

What is this Study About?

This study is about the magnitude of blood transfusion and associated factors for patients undergoing Transurethral resection of the Prostate (TURP) for Benign Prostate Enlargement (BPE). TURP is a minimally invasive type of surgery where the enlarged prostate is resected to improve micturition symptoms. Participants in this study were asked questions about their biodata, drug history, transfusion history and clinical information about their prostate. There were about 80 participants in this study. We are seeking permission from you to participate in this study.

What Will Happen If You Decide To Be In This Research Study?

If you agree to participate in this study, the following things will happen:

You was interviewed by a trained interviewer in a private area where you feel comfortable answering questions. The interview will last approximately 30minutes. 24 hours after the operation (TURP), 2ml of blood sample was drawn to measure your Haemoglobin levels.

Are There Any Risks, Harms Discomforts Associated With This Study?

Medical research has the potential to introduce psychological, social, emotional and physical risks. Effort should always be put in place to minimize the risks. One potential risk of being in the study is loss of privacy. We will keep everything you tell us as confidential as possible. We will use a code number to identify you in a password-protected computer database and will keep all of our paper records in a locked file cabinet. However, no system of protecting your confidentiality can be absolutely secure, so it is still possible that someone could find out you were in this study and could find out information about you.

Also, answering questions in the interview may be uncomfortable for you. If there are any questions you do not want to answer, you can skip them. You have the right to refuse the interview or any questions asked during the interview.

In case of an injury, illness or complications related to this study, contact the study staff right away at the number provided at the end of this document. The study staff will treat you for minor conditions or refer you when necessary.

Are There Any Benefits Being In This Study?

You may benefit by receiving free health information.. Also, the information you provide will help us better understand what influences blood transfusion during TURP. This information is a contribution to science and better management of Benign Prostate enlargement in Kenya.

Will participating In This Study Cost You Anything?

The tests to be carried out are routine for surgery and usually covered by National Health Insurance Fund (NHIF)

What If You Have Questions In Future?

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page.

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke.

The study staff will pay you back for your charges to these numbers if the call is for study-related communication.

What Are Your Other Choices?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice or loss of any benefits.

CONSENT FORM (STATEMENT OF CONSENT)

Participant's statement

I have read this consent form or had the information read to me. I have had the chance to discuss this research study with a study counselor. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

I understand that all efforts was made to keep information regarding my personal identity confidential.

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study: **Yes/ No**

Participant printed name: _____

Participant signature / Thumb stamp _____ Date _____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and have willingly and freely given his/her consent.

Researcher,,s Name: _____ Date: _____

Signature _____

For More Information, Contact

Dr. MokuaWinstarOmbuki

P.O. Box 30197-00100,

Department of Surgery, University of Nairobi

winsta35@gmail.com

0724092037

Appendix II: Participant Information and Consent Form (Swahili)

Cheti Cha Ridhaa

Tukio ya Kuongeza Damu na mambo Yanayohusianana Opareshenі ya Tezi (isiyo na Saratani) Katika hospitali Kuu ya Kenyatta.

Mtafiti Mkuu: Dr. MokuaWinstar Ombuki/ Chuo Kikuu cha Nairobi

Mtafiti Msaidizi: Dr. Allan Yienya / Chuo Kikuu cha Nairobi

Utambulisho

Ningependa kukuambia kuhusu utafiti unao fanywa na watafiti waliotajwa hapo juu. Lengo kuu la hiki cheti cha ridhaa ni kukupea habari ili uamue kushiriki kwa huu uchunguzi.Kuwa na huru kuuliza maswali yoyote kuhusu uchunguzi huu. Ukiamua kutoshiriki katika utafiti huu, hautanyimwa matibabu katika hospitali hii.Kushiriki kwa huu utafiti ni kwa hiari yako na tutakupea nakala ya cheti.

Naweza Endelea? Ndio/ La

Uchunguzi huu umeruhusiwa na tume ya maadili inayoidhinisha utafiti (KNH-UoN Ethics and Research Committee) kuanzia tarehe _____ hadi tarehe _____

LengoKuu la hii Utafiti

Utafiti huu ni kuhusu Tukio la Kuongeza damu na mambo yanayo husiana na opareshenі ya Tezi(isiyo na Saratani) katika hospitali kuuya Kenyatta. Watakao shiriki wataulizwa miaka yao, matumizi ya dawa, historia ya kuongezwa damu, na mengineyo yanayo husu ugonjwa wa tezi. Tunatarajia watu mia moja kushiriki katika huu utafiti.

Nini kitakachokufanyikia utakapokubali kushiriki katika huu utafiti?

Utahitaniwa kwa takribani dakika ishirini pahali pazuri. Baada ya saa ishirini nne, tarakibu ya damu itachukuliwa kupima kiwango cha damu mwilini.

Kuna ajali au dhiki itakayo ambatana na kushiriki katika utafiti huu?

Utafiti wa kisayansi mara kwa mara unaweza leta dhiki au ajali. Juhudi zinastahili kupunguza ajali.Tutaweka habari tutakayo pata kutoka kwako iwe binafsi na siri. Hatutarajii uwezekano wa ajali lakini kukiwa na jambo la dharura utapata matibabu yanayofaa.

Faida za Kushiriki huu utafiti

Elimu ya matokeo ya oparesheni ya wanaougua ugonjwa wa tezi (sio saratani) kitasaidia kutoa mwanga juu ya ugonjwa huu. Elimu hii pia itatusaidia kutambua namna ya kuwatibu wagonjwa wengine katika siku zijazo.Uchunguzi huu utafaidi maelezo kuhusu ugonjwa wa kima (siosaratani) nahivyokuchangia katika kutengeza matibabu yenye manufaa kwa wanaougua ugonjwa huu

Gharama ya kushiriki katika utafiti?

Bima kuu ya taifa, NHIF, itagharamia ripoti zitakazotakikana kawaida katika oparesheni.

Ombi

Ili kutekeleza uchunguzi huu, tutahitaji ruhusa yako yakuweza kujiunga na utafiti huu. Iwapo haujaelewa maagizo haya una hiari ya kumuuliza mtafiti maswali yoyote kuhusu matumizi hayo .Nambari ya simu ya mtafiti huyuni 0724 092037. Pia, iwapo una malalamishi yoyote kuhusu utafiti huu, mwenyekiti wa tume ya maadi liinayo idhinisha utafiti huu (KNH-UoN Ethics and Research Committee), anaweza kupatikana

Kupitia nambari 020 7263009

Kukubali kujiunga katika uchunguzi huu si lazima na hauna gharama yoyote.

.**Usiri**

Hatutafichua wala kuchapisha mambo yoyote kukuhusu ila yale tu yanayo husiana na uchunguzi huu. Nathibitisha nimeyafahamu aliyonieleza mtafiti na nimekubali kwa hiari yangu mwenyewe kushiriki katika uchunguzi huu.

Sahihi/kidole cha gumba…… Tarehe _____

Mimi, mtafiti nimemweleza mgonjwa kuhusu uchunguzi huu ipasavyo.

Sahihiyamtafiti _____ Tarehe _____

Dr. Mokua Winstar Ombuki

S.L.P. 30197-00100, Department of Surgery, University of Nairobi.

Kipepesi: winsta35@gmail.com

Appendix III: Data Collection Tool

TOPIC: FACTORS THAT INFLUENCE BLOOD TRANSFUSION FOR PATIENTS UNDERGOING TRANSURETHRAL RESECTION OF THE PROSTATE FOR BENIGN PROSTATE HYPERPLASIA IN KNH

DATA ABSTRACTION TOOL

Part 1: Demographic data

1. IP number_____
2. Age in years_____
3. Residence_____
4. Occupation _____

Part 2: Pre-operative variables

Variables	**Results**
Pre-operative Hb	**_____g/dl**
Use of drugs (5 alpha reductase inhibitors)	**Yes or No (Circle)**
Prostate size (via ultrasound)	**_____grams**
Presence of UTI	**Yes or No (Circle)**

Part 3: Comorbidities; Tick as appropriate

1. DiabetesYes / No ☐
2. Hypertension Yes / No ☐
3. Heart Disease (specify) Yes /No ☐

   ……

4. Smoking…….[YES] [NO]

5. Drugs (aspirin related drugs, antimitotic drugs) [YES] [NO]

6 .Others (specify) ☐

……

……

Part 4: Intraoperative and post-operative variables

Variables	**Results**
Mode of anesthesia (General or Spinal)	
Length of resection	
Surgeon‟s experience (Urologist or trainee) in years.	
Weight of resected prostate (in grams)	
Duration of post-operative irrigation (in hours)	
Post-Operative Hb (g/dl)	

Part 5: Blood requested for TURP

a. Was blood requested for TURP YES [ ] NO [ ]

b. Was the blood cross-matched YES [ ] NO [ ]

c. Was the blood transfused in theatre YES [ ] NO [ ]

d. Did the patient receive blood transfusion during 72 hours after surgery

YES [ ] NO [ ]

e. Units of blood requested (in mls)_____

f. Units of blood transfused/given in (in mls)_____

g. Type of blood transfused(tick as appropriate)

i. Whole blood [ ] ii. Packed red blood cells [ ]

Part 6: Intra-operative and post-operative complications. (Tick as appropriate)

a. Clot/urine retention YES [ ] Persistent hematuria NO [ ]

b. YES[] NO [ ]

c. Estimated Blood loss……(intra operatively)

d. Adverse events of blood transfusion (specify)……

Appendix IV: KNH/UoN-ERC Letter of Approval

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/78

21st February 2020

KENYATTA NATIONAL HOSPITAL APPROVED 21 FEB 2020 KNH/UoN-ERC P. O. BOX 20723 - 00202 NAIROBI

Dr. Mokua Winstar Ombuki
Reg. No.H58/87797/2016
Dept. of Surgery
School of Medicine
College of Health Sciences
University of Nairobi

Dear Dr. Ombuki

RESEARCH PROPOSAL - PERI-OPERATIVE BLOOD TRANSFUSION IN PATIENTS UNDERGOING TRANSURETHRAL RESECTION OF THE PROSTATE IN KENYATTA NATIONAL HOSPITAL (P892/11/2019)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 21st February 2020 – 20th February 2021.

This approval is subject to compliance with the following requirements:

a. Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b. All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
c. Death and life threatening problems and serious 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.
d. 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.
e. Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
f. 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. 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.

Protect to discover

For more details consult the KNH- UoN ERC website**http://www.erc.uonbi.ac.ke**

Yours sincerely,

PROF. M. L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Director, CS, KNH
The Chairperson, KNH- UoN ERC
The Assistant Director, Health Information, KNH
The Dean, School of Medicine, UoN
The Chair, Dept. of Surgery, UoN
Supervisors: Prof. Oliech Joseph (UoN), Dr. Francis Owilla(UoN), Dr. Jamilla A. Rajab(UoN)

Appendix V: Certificate of Plagiarism

Perioperative blood transfusion in patients undergoing TURP in KNH

ORIGINALITY REPORT

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