PATTERNS OF CLINICAL PRESENTATION, TREATMENT MODALITIES AND OUTCOMES IN CHILDREN UNDER 5 YEARS WITH ACUTE KIDNEY INJURY AT KENYATTA NATIONAL HOSPITAL

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(H56/7811/2017)

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE IN NURSING (NEPHROLOGY) DEGREE IN THE SCHOOL OF NURSING SCIENCES, UNIVERSITY OF NAIROBI

2019

DECLARATION

I MWENDA DENNIS declare that this proposal is my original work and has not been submitted for award of degree in any university.

Signature …… Date ……

CERTIFICATE OF APPROVAL

We the undersigned certify that this proposal has been submitted for the degree in Masters of Science in Nursing (Nephrology) of the University of Nairobi with our approval as internal supervisors.

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LIST OF ABBREVIATIONS

AKI	**:**	Acute Kidney Injury
BUN	**:**	Blood Urea and Nitrogen
CKD	**:**	Chronic Kidney Disease
ERC	**:**	Ethics Review Committee
ICU	**:**	Critical Care Unit
KNH	**:**	Kenyatta National Hospital
NSAIDS	**:**	Non-Steroidal Anti Inflammatory Drugs
RRT	**:**	Renal Replacement Therapy
SPSS	**:**	Statistical Package for Social Studies
SPU	**:**	Special pediatric unit
UON	**:**	University of Nairobi

OPERATIONAL DEFINITION

Acute kidney injury: Acute kidney injury (AKI) is a sudden episode of kidney failure or kidney damage**.** It is characterized by an increase or decrease in serum creatinine of 0.3 mg/dl or greater, or an increase of 50% or more from the reference value within a period of less than three months.

Baseline creatinine; Theoretical creatinine level calculated using Schwartz formula; Creatinine clearance ml/min= k X length (cm)/ serum Creatinine (mg/dL). Where k=0.45 for infants, k=0.55 for children and adolescents.

Child: - In this study a child is one with the age of 0-5 years

Immediate Outcome: Is the change of kidney functions and clinical presentation within 2 hours after medical intervention.

Change of kidney functions: Is the changes on the level of urea, electrolytes and creatinine in comparison to the baseline prior to intervention.

Intervention: The mode of treatment that will be used to treat the patient with acute kidney injury and include Hemodialysis, peritoneal dialysis or medication or a combination of either.

Patterns of presentation: Is the signs and symptoms the patients with AKI present with which are likely to determine intervention modality.

Volume depletion; is a reduction in extracellular fluid volume that occurs when electrolytes and fluid losses exceed intake on a sustained basis. The patient manifest with loose skin turgor of more than three seconds after pinching, sunken eyes and dry mucous membranes.

ABSTRACT

Acute kidney injury (AKI) is a multifaceted ailment with clinical signs showing from minor dysfunction of the kidney to total malfunction of the kidney completely. The disorder is a type of emergency which is common in children who visit pediatric emergency units. It is a syndrome of diverse etiology characterized by fast decline of the functioning of the kidney resulting in accumulation of harmful nitrogenous wastes in the body and accumulation of extracellular fluid volume as well as electrolyte imbalance. No studies on the management and outcome of AKI in the children population in Kenya.

To establish the patterns of clinical presentation, treatment modalities and outcomes in children under 5 years with acute kidney injury at Kenyatta National Hospital

The study used a prospective research design that used quantitative approach to determine the patterns of clinical presentation, treatment modalities and their immediate outcome of children under five admitted with AKI in Kenyatta National Hospital (KNH). Stratified and Convenience sampling was used to recruit a total of 120 children with AKI admitted in pediatrics department KNH. The information was filled in the structured questionnaire. Quantitative data was analyzed using SPSS computer package, version 23. Normally distributed variables were reported as means with standard deviations and compared by Student's *t* test.

Assessment of parents/caregiver socio-demographic identified that, 96.7% were female , 41.2% secondary level education, 43.9% self-employed and 40% earning between Ksh. 10,001 and 20,000. The biographic characteristics of children, 50.4% were female,72% stay with their parents and 51.2% were firstborns. The common clinical presentation found in children included decrease in urine volume (69%), nausea (49.6%), shortness of breath (46.3%) and seizures (36.7%). In medication only clinical intervention, 75% fully recovered, 20.6% were at end-stage renal disease and 4.4% died. Peritoneal dialysis and medication intervention had 92.9% fully recovered, 5% were at end-stage renal disease and 2.1% died. There was statistically significant association in both medication and peritoneal dialysis and medication based on the clinical parameters (Creatinine, Urea, Na, K^{+}) ($p<0.05$).

Substantial number of children were put on medication only treatment modality compared to combined therapy. This is despite combined therapy showing a better outcome than medication only intervention. This underscores the need to implement combined therapy as the first modality in the treatment of children with acute kidney injury. In addition, to adopt improved mechanisms for early detection of AKI among children to guarantee improved clinical outcomes .

CHAPTER ONE: INTRODUCTION

Background information

Acute kidney damage (AKI) is characterized as an unexpected and for the most part, reversible renal capacity weakness, including the powerlessness to keep up the homeostasis, and may or not be joined by diminished diuresis. For the most part, AKI might be ordered as pre-renal, identified with diminished renal blood stream for improper cardiovascular yield or intravascular volume; inherent renal infection, from an affront to the renal parenchyma including ischemic, vascular, rounded or glomerular clutters; and post-renal, because of urinary tract impediment either in the single kidney or both kidneys. Globally, it is approximated that 2 million people die every year of acute kidney injury (Kam Tao Li, Burdmann, & Mehta, 2013). Findings from both developing and developed regions of the world have shown high frequency of AKI in young children (Esezobor, Ladapo, Osinaike, & Lesi, 2012). Acute kidney injury (AKI) is a global healthcare challenge (Lewington, Cerdá, & Mehta, 2013). It is calculated that one in five pediatric emergency admissions into hospital are associated with AKI (Wang, Muntner, Chertow, & Warnock, 2012) and up to 100,000 deaths in hospitals are associated with AKI (Harty, 2014).

Fundamentally, AKI is related with high ill health and mortality, all the more so in areas where there is shortage of assets including renal substitution treatment (Asinobi, Ademola, & Alao, 2015)(Kayange et al., 2015). Compared to developed nations where AKI is progressively normal in more seasoned youngsters brought with various co-morbidities and multi-organ failures, past investigations of AKI in kids in developing nations has reported single ailment features, for example, sepsis, diarrheal ailments, intestinal sickness, hemolytic uremic disorder and intense glomerulonephritis as the significant reasons for AKI (Esezobor et al., 2012). Even though acute kidney injury from particular disease entities signifies better prognosis in comparison to AKI after multi-organ failure, in developing nations AKI still carries significant mortality.

The range and weight of AKI in developing nations might be unique in relation to that of developed nations. Patients from developing nations are of more youthful age, infection related AKI is progressively normal and a critical number may have gotten AKI at the period of hospitalization (Jha& Parameswaran, 2013:Cerdá et al., 2008;Lewington et al., 2013).

Evidence shows that the characteristics vary from one country to the other and that, however, as far as we know, there are no local data available on the socio-statistic and clinical features

of youngsters with intense kidney damage in Kenya. Therefore a study to determine the characteristic of children with AKI in Kenya is warranted. This may shape the interventional strategies.

Problem Statement

Acute kidney injury (AKI) is a typical and major issue disturbing millions, leading to death and incapacitating numerous individuals. The burden of AKI in developing countries is even worse and is more pronounced among younger children (Kayange et al., 2015). The trend of acute kidney injury among children is increasing in numbers and most of them end up getting multiple organ failure, dialysis and even death (Mehta et al., 2012). The common methods used in management of AKI include, peritoneal and Hemodialysis as well as medication and treatment of hydration (Kellum, & Lameire, 2013). Dialysis procedure is expensive and detrimental to the child both physically and psychologically. There are few studies if any that has been published within the country on the patterns of presentation, intervention and outcomes that gives the evidence on best modality of managing AKI to full recovery as per presenting characteristic

Kenyatta National Hospital as the main referral hospital in Kenya, has been receiving most of the children with AKI from across the country. However, there are no clear established guidelines available on treatment modalities as per patterns of clinical presentation of children with AKI. It is for this reason that a study to explore on the common patterns of clinical presentation of children with AKI, different treatment modalities and their specific outcomes is necessary so as to give evidence based recommendation on the best treatment modality. This will then act as a road map on how to manage different cases of AKI depending on the cause and presentation. The findings of this study could serve as a blue print in formulation of standard guidelines of AKI management in our health institutions across the country.

Research Questions

i. What the biographic characteristics of children admitted with AKI at Kenyatta National Hospital?
ii. What are the patterns of clinical presentation of children admitted with AKI at Kenyatta National Hospital?
iii. What are the different treatment modalities applied to paediatric patients with AKI at Kenyatta National Hospital?

iv. What are the treatment outcomes of paediatric patients with AKI at Kenyatta National hospital?

Objectives

1.1.1. Broad Objective

To establish the Patterns of clinical presentation, treatment modalities and immediate outcomes of children admitted with AKI at Kenyatta National Hospital

1.1.2. Specific Objectives

1. To determine the socio-demographic characteristics of parents or guardian of children admitted with acute kidney injury admitted in Kenyatta National Hospital.
2. To establish the biographic characteristics of children admitted with AKI at Kenyatta National Hospital
3. To determine the patterns of clinical presentation of children admitted with acute kidney injury at Kenyatta National Hospital.
4. To determine the treatment intervention of children admitted with AKI at Kenyatta National Hospital
5. To determine the treatment outcome of children admitted with AKI following interventions at Kenyatta National Hospital during hospitalization.

Hypothesis

1.1.3. Null hypothesis

The outcome of children admitted with AKI at Kenyatta National Hospital does not depend on treatment modalities offered**.**

Justification

The worldwide morbidity associated with acute kidney injury (AKI) is inadequately known in light of underreporting, local incongruities, and contrasts in definition and study populations especially in Kenya. KNH being the major referral hospital in cases of AKI need elaborative way of managing the disease. This study therefore aims to describe the patterns of clinical presentations of children admitted at KNH with AKI. This will help in giving evidence based best treatment modalities with good outcomes of children with AKI. This will act as guidelines and enable clinicians to intervene early and avert advancement to end stage renal disease, of which the treatment is renal replacement therapy that is expensive.

The finding will help in developing protocols in management of children with AKI which will act as reference materials in clinical areas. Further, to the policy makers in the ministry of health, the findings from this study will be used to review or develop policies and standard

operating procedures for management of children with AKI which then can be used nationwide.

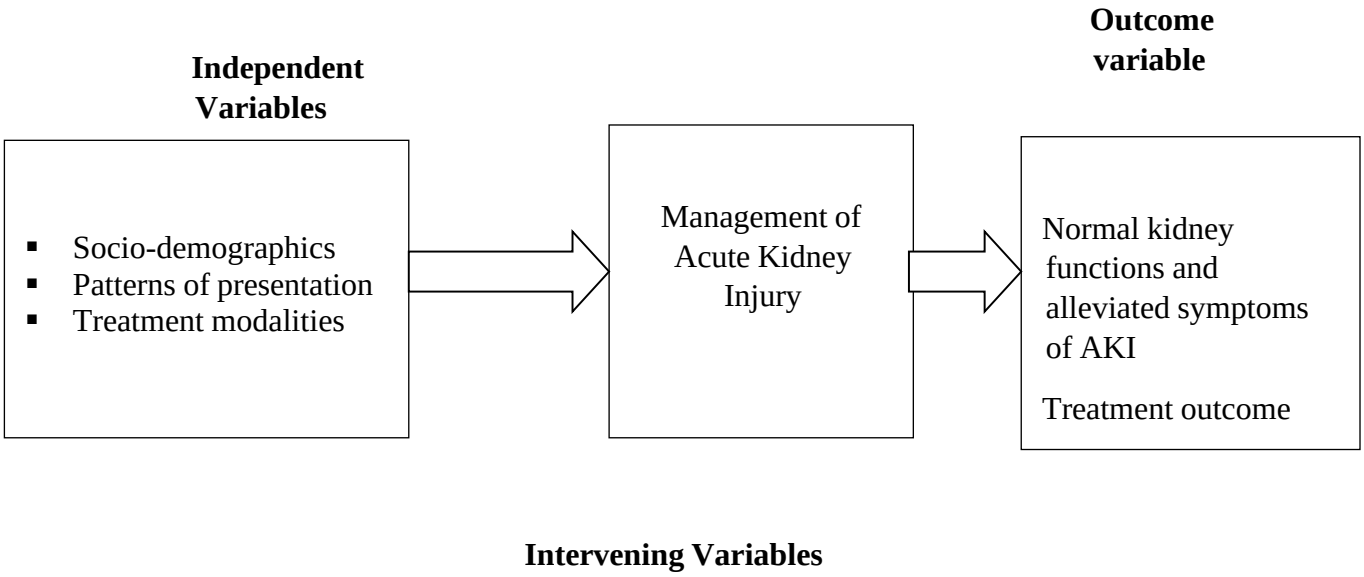
The findings of the study will also be beneficial in generating knowledge that will be used to develop capacity building packages for health care practitioners.

To the scholars, the study will act as a source of literature to individuals interested in conducting studies on acute kidney injury management in children.

Conceptual Framework

The study will be guided by the following conceptual model.

Figure 1: Conceptual framework



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CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction to Acute Kidney Injury

Acute kidney injury (AKI) is a critical and reversible rise in serum creatinine levels related or not with a decrease in amount of urine (oliguria/anuria). It is a complex disorder with clinical manifestations ranging from mild injury to complete kidney failure, generally requiring renal replacement therapy, peritoneal dialysis or hemodialysis. Evidence shows that it is not just a marker of illness severity in the pediatric patients but that it has a direct association with poor outcomes.

It is a multifaceted ailment with clinical signs stretching from slight damage to whole kidney failure, for the most part requiring renal substitution treatment, peritoneal dialysis or hemodialysis. Evidence demonstrates that it is not only a marker of disease seriousness in the pediatric patients however that it has a clear relationship with poor results.

2.2 Socio-demographic characteristics

2.2.1. Age

Acute renal failure (ARF) is one of the regular crises in pediatric practice and is a genuine condition in fundamentally sick children. In a study carried out in India, Children less than one year of age were 16.7%; neonates comprised almost 7.8% of the group (Mehta et al., 2012). Children between one and five years comprised 30.5%, while children more than five years of age comprised the maximum 52.8%(Hui, Chan, & Miu, 2013). Majority of the affected children were from poor socio-economic background (Prasetyo et al., 2014)

Acute kidney injury (AKI) is a severe condition that contrarily influences the result of different conditions, especially in neonates and newborn children. Babies with AKI have diminished survival in contrast with those without AKI (Filler, 2011)(Girardi et al., 2015).

2.2.2. Sex

Machado et al., (2010) in their study that involved 235 children, revealed a significant male sex predominance as a risk factor among cases that developed AKI; the male–female ratio was (1.5:1)(Eswarappa, Gireesh, Ravi, Kumar, & Dev, 2014). This was in line with the results of Mortazavi and colleagues, who reported the male–female ratio to be 2:1 in neonates with AKI(Makar et al., 2015). The high frequency of AKI in boys may be due to the higher susceptibility of boys to some perinatal disorders like sepsis and respiratory distress syndrome (Mortazavi, Hosseinpour Sakha, & Nejati, 2009)

2.2.3 Intensive Care admission

The occurrence of acute kidney injury (AKI) in the emergency unit has augmented in the previous decade because of expanded insight as well as increased acknowledgment (James Case, Khan, Khalid, & Khan, 2013). Clinical examinations surveying the accurate number of occurrence of AKI in the ICU demonstrated scanty and were frequently entangled by varying criteria for the meaning of AKI (J Case, Khan, Khalid, & Khan, 2013). ICUs have seen an expansion in the number of admissions comprising AKI extending from 13% up to 78% (Prasetyo et al., 2014).

2.3 Patterns of Clinical Presentation

2.3.1 Oliguria

Oliguria is a common finding among patients presenting with Acute Kidney Injury. It is characterized as a urine output that is under 1 mL/kg/h in newborn children, under 0.5 mL/kg/h in youngsters, and under 400 mL every day in grown-ups (Prowle et al., 2011). It has been utilized as a model for diagnosing and staging acute kidney injury, recently alluded to as acute renal failure (Thomas et al., 2015). At beginning, oliguria is every now and again acute (Majumdar, 2010). It is usually the most earlier indication of weakened renal capacity and denotes a challenge in diagnosis and treatment by the clinician (Ganesan & Maynard, 2011). Few cases of acute kidney injury are described by reduction in urine output (Rimmelé & Kellum, 2010). Renal failure that occurs from nephrotoxic damage, interstitial nephritis, or neonatal asphyxia is as often of the non-oliguric type, is identified with a less extreme renal damage, and has a superior outcomes (Vaidya, Ferguson, & Bonventre, 2008).Urine output monitoring is almost universal in critically ill patients worldwide (Prowle et al., 2011). Traditionally, maintenance of the output of urine has been viewed as being synonymous with the protection of renal capacity and reduction in urine output routinely prompt a range of clinical mediations with the point of counteracting or weakening acute kidney injury (Prowle et al., 2011) As indicated by this worldview, after elimination of impediment, diminished urine output is considered a clinically helpful biomarker of diminished glomerular filtration rate (GFR), which happens before the perceptible aggregation of biochemical markers of AKI (Lameire, J, & W, 2012).Most but not all AKI patients are oliguric. To correctly determine AKI diagnosis you need to consider other clinical characteristics. Most yet not all AKI patients are oliguric. To effectively decide AKI diagnosis, you have to think about other clinical features.

2.3.2 Sepsis

Sepsis, and extraordinarily the septic shock, is one of the fundamental driver of acute kidney injury in children (Zarjou & Agarwal, 2011). AKI frequency in sepsis ranges from 9% to 40%, includes poor prognosis, and is associated with a 70% mortality rate(Freire, Bresolin, Farah, Carvalho, & Góes, 2010)(Schor, 2002)(Rewa & Bagshaw, 2014).

Acute kidney injury (AKI) is a thought-provoking issue in Africa in view of the high weight of communicable maladies, late presentation of patients to medicinal services and the absence of income to help patients with well set up AKI (Bagasha, Nakwagala, Kwizera, Ssekasanvu, &Kalyesubula, 2015)(Jha & Parameswaran, 2013)(Lewington et al., 2013)(Kilonzo et al., 2012). Sepsis is the most common cause of AKI in critically ill patients (47.5%) (Gurjar et al., 2013)(Zarbock, Gomez, & Kellum, 2014). Sepsis-associated AKI has been related with a more noteworthy seriousness of ailment, an expanded danger of death, longer medical admission stays contrasted with non-septic AKI yet renal recuperation and freedom from renal substitution treatment is more noteworthy in sepsis-related AKI (Cruz et al.)

2.3.3 Diarrhea

In a study conducted in Egypt, the most regular reason for renal disability was extreme dehydration, generally auxiliary to serious gastroenteritis (Tawfik, Ragab, & Gad, 2002). In a little level of cases the parchedness was post-surgery. Lack of hydration results in a diminished plasma volume, extracellular dehydration and a subsequent disability of renal perfusion.

2.3.4 Nephrotoxins exposure

Nephrotoxins are an important cause of AKI (Perazella, 2009)(Andreoli, 2009). Some important Nephrotoxins are Aminoglycoside antibiotics, radio contrast media, NSAIDs, cisplatin, and amphotericin B (Akcay, Turkmen, Lee, & Edelstein, 2010)(Choudhury & Ahmed, 2006)(Decloedt & Maartens, 2011). The aminoglycosides are real anti-microbial in the treatment of genuine gram-negative diseases (Tamma, Cosgrove, & Maragakis, 2012)(Izadpanah & Khalili, 2015). Their expanded use and potential nephrotoxic hazard have made them a successive reason for AKI (Moffett & Goldstein, 2011)(Bird, Etminan, Brophy, Hartzema, & Delaney, 2013)(Perazella, 2012). AKI occurs in 10–25% of patients on aminoglycosides even with careful dosing and therapeutic plasma levels (Akcay et al., 2010). Aminoglycoside-actuated nephrotoxicity is portrayed by moderate ascents in serum creatinine, tubular necrosis, and checked reductions in GFR and in the ultrafiltration coefficient (Martínez-Salgado, López-Hernández, & López-Novoa, 2007)(Sepehri, Derakhshanfar, & Saburi, 2013). A few variables may cause aminoglycoside nephrotoxicity (Sandhu, Sehgal, Gupta, & Singh, 2007)(Pazhayattil & Shirali, 2014). These incorporate propelling age, basic

renal infection, volume consumption, hypertension, and late presentation to aminoglycosides or other nephrotoxic medications (Akcay et al., 2010)(Perazella, 2009). The clinical course of aminoglycoside nephrotoxicity is typically progressive in beginning and is identified with the portion and span of medication presentation (Oliveira, Cipullo, & Burdmann, 2006). As often as possible, mellow proteinuria, lysozymuria, an imperfection in concentrating capacity, and polyuria are seen before a decrease in glomerular filtration (Akcay et al., 2010).

2.4 Treatment modalities of acute kidney injury

2.4.1 Conservative management

Ideal treatment of acute kidney injury requires close coordinated effort among essential doctors, nephrologists, and different subspecialists partaking under the watchful eye of the patient. Patients with acute kidney injury by and large ought to be hospitalized except if the condition is not serious and obviously coming about because of an effectively reversible reason (Shamel, 2014). The significant treatment is guaranteeing sufficient renal perfusion by accomplishing and keeping up hemodynamic dependability and maintaining a strategic distance from hypovolemia. In certain patients, clinical appraisal of intravascular volume status and shirking of volume over-burden might be troublesome, in which case estimation of central venous pressures in a serious consideration setting might be useful (Shad, Smith, & Rahman, 2012).

Fluid replacement is required in view of intravascular volume consumption. Isotonic arrangements like typical saline are favored over hyperoncotic solutions. A reasonable goal is a mean arterial pressure greater than 65 mm Hg, which may require the use of vasopressors in patients with persistent hypotension. Cardiac function need to be optimized using positive inotropes, or afterload and preload reduction (Prasetyo et al., 2014).

Electrolyte imbalances which include hyperkalemia, hyperphosphatemia, hypermagnesemia, hyponatremia, hypernatremia and metabolic acidosis need to be monitored and managed accordingly. Extreme hyperkalemia is characterized as potassium proportions of 6.5 mEq per L is treated by utilizing 5 to 10 units of regular insulin and dextrose 50% intravenously move potassium out of circulation into the cells. Calcium gluconate 10 mL of 10% given intravenously to stabilize the membrane and decrease the danger of arrhythmias when there are electrocardiographic changes appearing. Sodium polystyrene sulfonate is given to lower potassium levels(Girardi et al., 2015).

Loop diuretics are utilized in patients who are receptive to diuretics to treat volume over-burden. Intravenous loop diuretics, as a bolus or ceaseless imbuement, can be useful for this reason. In any case, diuretics don't improve illness, mortality, or renal outcomes, and ought not be utilized to avoid or treat acute kidney injury without volume over-burden (Filler, 2011).

All medications that may conceivably influence renal capacity by direct toxicity or by hemodynamic instruments ought to be suspended, if conceivable. The doses of basic medication ought to be balanced for the lower dimension of kidney work. Evasion of iodinated contrast media and gadolinium is vital and, if imaging is required, noncontract studies are suggested (Ahmed, 2016).

Supportive treatments which incorporate anti-infection agents, support of enough nutrition, mechanical ventilation, glycemic control, anemia treatment ought to be sought after dependent on essential cause of AKI. In patients with rapidly dynamic glomerulonephritis, treatment with pulse steroids, cytotoxic treatment, or a blend might be considered (Shamel, 2014)..

2.4.2 Peritoneal dialysis among patients with AKI

Peritoneal dialysis (PD) is the principal practice of renal substitution treatment utilized for acute Kidney injury patients (Ponce et al., 2012). Peritoneal dialysis (PD) is the principal practice of renal substitution treatment utilized for acute Kidney injury patients (Esezobor, Ladapo, & Lesi, 2013). Without dialysis, the momentary result of AKI is as often as possible poor in extreme instances of AKI (Ademola, Asinobi, Ogunkunle, Yusuf, & Ojo). For most instances of AKI, peritoneal dialysis (PD) is practically identical in viability to other renal substitution treatment (RRT) in dealing with the difficulties of AKI (Ansari, 2011) since less mastery and more affordable equipment is required, the utilization of PD in creating areas of the world is prescribed (Jain, Blake, Cordy, & Garg, 2012)(Callegari et al., 2013).

Dialysis prerequisite is viewed as an indication of poor visualization in AKI. One of the various examinations regarding this matter by Liano and Pascual detailed no dialysis necessity in 65.9% of patients, while 33.2% required dialysis (Ulusoy, Arı, Ozkan, Cansız, & Kaynar, 2015).

Creating maintainable treatment programs for kidney disappointment in many nations of sub-Saharan Africa keeps on outstanding an overwhelming test. While long haul renal substitution treatments in end-organize renal infection show up past national monetary abilities, there exist open doors for a present moment and moderate treatment of intense kidney damage (AKI) (Callegari et al., 2013).

2.5 Serum Creatinine and urea

The meaning of pediatric acute kidney injury (AKI) use changes of serum creatinine (Filler, 2011) and happens when standard serum Creatinine (Cr) >1.5 mg/dL6-9 as well as blood urea nitrogen (BUN) >20 mg/dL4 on two separate events somewhere around 12 h separated (El-badawy, Makar, & Elaziz, 2015). Lamentably, Creatinine is a questionable marker amid intense changes in kidney work since, first, serum Creatinine levels can shift broadly with age, sexual orientation, fit bulk, muscle digestion, and hydration status (Nguyen & Devarajan, 2008)(Krastiòð, 2014). Second, serum creatinine focuses may not change until about half of kidney work has just been lost (Nguyen & Devarajan, 2008). Third, at lower rates of glomerular filtration, the measure of tubular release of creatinine results in overestimation of renal capacity. At long last, amid intense changes in glomerular filtration, serum creatinine does not precisely portray kidney work until enduring state harmony has been achieved, which may require a few days. Expanding serum creatinine level is generally considered as a marker for renal brokenness anyway this is intricate issue in neonates as; postnatal serum creatinine level is an impression of maternal serum Creatinine level for the initial 72 hours after birth (Raiati, 2013)

2.5. 1 Hemodialysis in treatment of acute kidney injury

Hemodialysis is typically viewed as the last alternative in AKI the executives in children (Callegari et al., 2013).. The pooled rate of dialysis necessity for AKI on the planet was assessed at 2.3% (Susantitaphong , Cruz , Cerda, et al. 2016). One major explanation of the low rate of dialysis need among the children with AKI is early diagnosed and managed reducing the need of dialysis. The challenge involving vascular access also limits the use of hemodialysis due to anatomical structure of children blood vessels.

2.6 Summary

According to the literature reviewed, Acute Kidney injury is common among the children under five years and mainly of male gender. Majority of them presents with oliguria, sepsis, diarrhea, and nephrotic exposures. Peritoneal dialysis is the main mode of treatment, followed by conservative management and medications. However, Hemodialysis id the last option in treatment of AKI in children while peritoneal dialysis is the most preferred method of intervention

CHAPTER THREE: METHODOLOGY

3. 1 Introduction

This chapter discusses the methods and materials that will be used in this study. The chapter also highlights the study design, the study site; population under study and the sample size the participants who fit in the study, the tools that will be used to collect the data. It further describes the validity and reliability of the tools data collection, data analysis and presentation ethical consideration among others.

3.2 Study Design

The study design was a prospective study that followed over time a group of similar individuals (cohorts) who differed with respect to certain factors under study, to determine how these factors affect rates of a certain outcome. The design aimed at assessing patterns of clinical presentations, treatment modalities and outcome of pediatric patients admitted with AKI at Kenyatta National Hospital. Longitudinal prospective design was appropriate for this study since the researcher was able to follow patients for a period of two weeks from the time of admission to assess the progress, interventions till discharge.

3.3 Study Site

The study was carried out at the pediatrics department (NICU, pediatric wards and specialized pediatric unit) Kenyatta National Hospital (KNH). KNH is a National Referral and Teaching Hospital, which is about 4km from the central business district of Nairobi city, off Ngong' Road, on Hospital Road. The hospital was started in 1901 with a bed capacity of 40 and became a state corporation in 1987 with a board of management and the apex of referral system in the health sector of Kenya. Currently the hospital has a bed capacity of 2000 and is partially supported by the government. The hospital provides facilities for medical education to the University of Nairobi, at undergraduate and post graduate levels and to Kenya Medical Training College at certificate, diploma and higher diploma levels. The hospital also provides facilities for training in nursing and other health allied courses at KNH Staff Training Centre.

The hospital receives patients referred from other hospitals in Kenya and sometimes from Eastern and Central Africa for specialized health care in its specialized units such as Renal Unit, Critical Care Unit, Burns Unit, Newborn Unit etc.

The Renal unit, pediatrics specialized units are located on the first floor of the main hospital building towards old hospital wing. The pediatric wards are located on the third floor and are

labelled as 3A, 3B, 3C and 3D.These wards admit all children from the age of 0-12 years with all medical conditions inclusive of the children suffering from AKI. While the main renal unit, NICU and Pediatrics renal unit are located within the first floor of the main hospital tower block. The parents of the children aged below 5 years are constantly with the children in the wards until discharge. Pediatric specialized unit is which include peritoneal dialysis unit, neonate intensive care unit and new born unit.

3.4 Study Population

The study population consisted of all inpatient parents of children aged 0-5 years who were admitted with AKI within all the study areas. According to the hospital records from Kenyatta National Hospital health information department, an average of 90 children are admitted with AKI per month (KNH HIS, 2017/2018).

3.4.1 Inclusion criteria and exclusion criteria

Inclusion criteria

i. All children who were admitted with diagnosis of AKI whose parents were willing to consent
ii. Children aged 0-5 years

Exclusion criteria

i. Children who had chronic kidney disease (CKD) on admission
ii. Children who were admitted with congenital kidney or birth defects.
iii. Children who were admitted with genetic metabolic diseases.
iv. Children who were admitted with known CKD whose AKI on remission.

3.5 Sample Size Determination

The sample size was calculated using Cochrane's formula.

It was as follows; $n = \frac{z^2pq}{d^2}$

Where n= desired sample size (if the population is greater than 10,000).

Z= Standard normal deviation at the required confidence interval. In this case it was 1.96

P=the proportion in the target population estimated to have characteristics being measured 20% (Tao Li et al, 2013)

$q = (1-p)$

Hence $q = (1-0.2)$

d = the level of statistical significance set as 0.05

Hence $n = \frac{(1.96)^2 (0.2)(0.8)}{(0.05)^2}$

$n = \frac{0.614656}{0.0025} = 245.8624$

n = 246 patients was the desired sample size for the study

3.6 Sampling Method

According to the health information records at Pediatric ward in Kenyatta National hospital 3 patients are admitted with acute kidney injury every day. In a month they admit 90 patients with AKI and in 3 months they admit 270 patients with AKI. This forms our sampling frame.

In order to get the number of patients in every ward at the pediatric department, stratified sampling methods was used. Each ward/unit represented a stratum. Stratified sampling method was used to get the number of respondents per stratum (Ward/unit). The Systematic random sampling was then used to select each participant per strata using the following formula; Systematic Sampling for interval (i) = N/n, where N = size of the population, n= size of the sample. Therefore, i=270/246 = 1.09.

The interval of selection was every n^{th} patient with AKI was recruited into the study until the sample size is attained.

Expected sample representation per stratum

Ward	Approx. Admissions per month	Expected representation		
NICU	15	15/90 X246	=	41
SPU	63	63/90 X246	=	172
Renal Unit	12	12/90 X246	=	33
TOTAL	**90**			**246**

3.7 Variables

3.7.1 Dependent variables

- Fully recovery from acute kidney injury
- End stage renal disease
- Death

3.7.2 Independent variables

- Age
- Sex
- Dates
- Source of admission
- Educational level of parents
- Income of the parents

3.8 Data Collection Procedure and Tools

Data was collected using a semi structured questionnaire from parents of the children admitted with AKI mainly from the renal unit, the specialized pediatric wards or NICU. The interviewer read the information letter and explain the research to the parent of the child. Each participant who was willing to participate in the study was sign the consent to participate. The interview was then conduct the interview in the language of choice of the participant. In situation where the interviewer did not understand the language of choice for the patient, an interpreter was picked to interpret the questionnaire. Information of the child which include the clinical presentation and the outcome was abstracted from the patients file after seeking consent form the study participant. Data collected at the time of admission and this included baseline parameters and clinical presentation. The recruited patients was followed and data on type of intervention as well as the patient progress following intervention taken. Standard

demographic and clinical data was retrieved from the patients' medical records. Demographic information included age, sex, and dates and source of admission. Clinical data was collected from the patients' medical records and encompassed clinical presentation at admission primary diagnosis, presence of co-morbidities, serum pH, serum sodium, potassium, hematocrit and white cell count. Modality of treatment applied was retrieved. Data on kidney function included serum creatinine, urea and urine output. Neonates was evaluated for the development of AKI [Creatinine >1.5 mg/dL and/or blood urea nitrogen (BUN) >20 mg/dL]). These values guided in determining the outcome of the management as per applied modality. Consent was obtained from the caregivers and permission to conduct the study obtained from the hospital management to allow access to the files. Patients with missing data will was excluded from the study. To enhance quality of the data, double entry from two researcher assistance was applied.

3.9 Recruitment and training research assistants

Two registered BScN nurses were trained as research assistants to help in getting consent from the parents, retrieving the needed information, filling questionnaire during data collection and verification of the questionnaires.

3.10 Pre-testing of the study tool

Pre-testing of the study tool was conducted in pediatric renal unit in Mbagathi County referral Hospital. A pre-test was carried out before the actual research is done to determine possible problems or shortcomings in the study instrument. Seven questionnaires (10% of the sample size) was used for the pretest. The results of the pre-test was used to modify the final draft of the questionnaire. This was used in fine-tuning the instrument to ensure that the study tool captures all the study objectives.

3.11 Data Storage

The questionnaires had a code and didn't bear patient name or in- patient number. Once they were filled, they were locked up in a safe cupboard. The laptop that was be used in the analysis of the data had a password so that limited access to only authorized personnel.

3.11 Data analysis and presentation

Analysis of the data was performed using SPSS version 23 (SPSS Inc., Chicago, IL, USA). Continuous data were summarized as mean or median as appropriate, while categorical data was presented as percentages. Outcome of AKI treatment was calculated as the number of AKI episodes during the study period divided by the total number of children aged one day to 5

years admitted into the pediatrics' wards and emergency room during the study period. The clinical and laboratory features of children, 5 years with AKI were compared among children using either Student t test or Chi square test as appropriate. Similar comparison was made between children who survived and those who died during the study period. A p value of 0.05 will be considered to be statistically significant(Shad et al., 2012). Findings was presented in tables and graphs as well as written narratives.

3.13 Ethical Considerations

Approval to conduct the research was sought from the Ethics and Research Committee of KNH/UON. Authority to carry out the study was sought from the Hospital administration. All the information gathered was confidential. Informed consents from the caregivers of the children was obtained before data collection. The purpose of the study, potential risks/benefits, right to confidentiality was explained to the hospital management and the study participants. There was no risk or harm to the study participants during the study. Other than contributing towards determining best treatment modalities with good outcomes to all patients with AKI, no other direct benefits will be accorded to the participants.

3.14 Dissemination Plan

The results of the study was presented to the University of Nairobi, School of Nursing faculty members and to Kenyatta National Hospital. The results of the study will also be published in scientific peer reviewed nursing journals for public access. The abstract will be presented in scientific conferences

CHAPTER FOUR: RESULTS

4.1. Introduction

The research was conducted to determine patterns of clinical presentation, treatment modalities, and outcomes in children under 5 years with acute kidney injury at Kenyatta National Hospital. A total of120 questionnaires were filled entirely and surpassed the analysis threshold and formed the basis of the research analysis.

4.2. The socio-demographic characteristics of parents or guardian of children admitted with acute kidney injury admitted in Kenyatta National Hospital

The sociodemographic of parents/caregivers shown in table 1 showed that majority (96.7%) of the parents/caregivers who brought their children were female with an average age of 29 years. Regarding the relationship to the child, 96.7% were mothers, 41.2% had secondary level education , 43.9% self-employed and 40% earn between Ksh. 10,001 and 20,000.

Table 1:socio-demographic factors of the parents/ caregivers

Factor	**Frequency (%)**
Gender	
Male	4 (3.3)
Female	**116(96.7)**
Age	*M*=29
Relationship to the child	
Mother	**116(96.7)**
Father	3(2.5)
Guardian	1(0.8)
Your level of education	
Never attended	26(21.8)
Primary	19(16)
Secondary	**49(41.2)**
Tertiary	25(20.2)
Your Occupation	
Salaried employee	38(31.9)
Self-employed	**52(43.7)**
Unemployed	29(24.4)
Marital status	
Single	32(27.1)
Married	**83(70.3)**
Divorced or Separated	3(2.5)
Average monthly income	
Below Ksh.10,000	26(22.6)
Ksh. 10,001 - 20,000	**46(40)**
Ksh.20,001 - 30,000	25(21.7)

Above Ksh. 30,000	18(15.7)

4.3. The biographic characteristics of children admitted with AKI at Kenyatta National Hospital Biographic data of the children

The assessment of children biographic characteristics was done where different variables were evaluated as presented in table 2 where 50.4% of the children were female with an average age of 1 year to their next birthday. Majority (72%) of the children were staying with both parents, 51.9% born as firstborn children. Concerning presence of other children, 51.9% of the parents/caregivers had other children with an average age of 2 years.

Table 2:Biographic data of the children

Factor	**Frequency (%)**
Gender	
Male	59(49.6)
Female	**61(50.4)**
Age of the child at next birthday	M= 1
Child live with?	
Single parent	35(29.2)
Both parents	**83(69.2)**
Guardian	2(1.6)
Birth order of the child	
First	**62(52.1)**
Second	28(23.5)
Third	20(16.8)
After Third	9(7.6)
Have other children?	
Yes	57(47.9)
No	**63(52.1)**
If yes how many	M=2
Is there another child with a similar condition?	
Yes	3 (2.8)
No	**117(97.2)**

4.3.1. Assessment of previous diagnosis and admission among children with AKI

Previous diagnoses and admissions were evaluated as shown in Table 3. Many (72.5%) of the children did not have their children admitted in the last 1 month, 85% had not been screened for renal disease such as acute kidney injury. Regarding admission elsewhere, 69.2% had been admitted elsewhere before.

Table 3:Respondents assessment factors associated previous child AKI diagnosis and admission

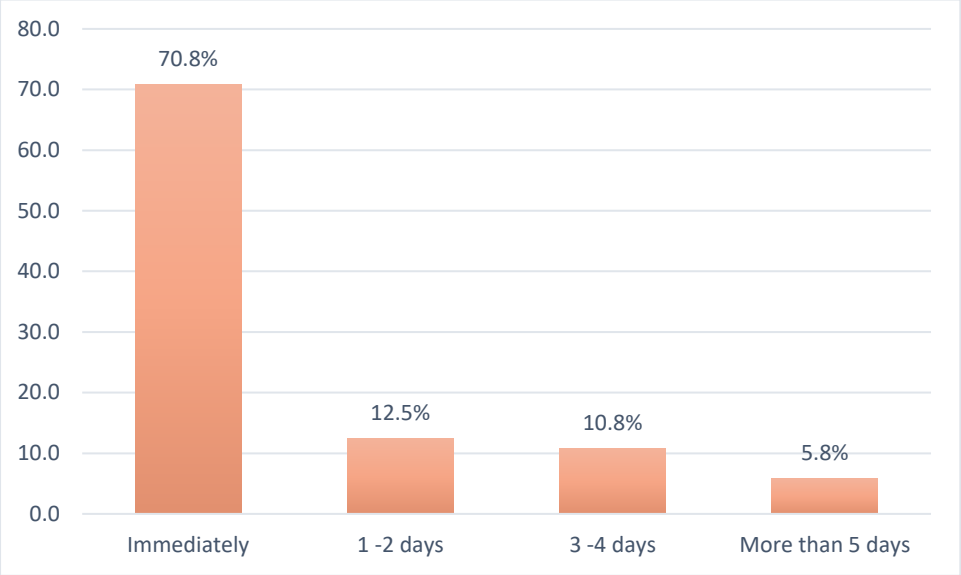
Variable	Yes (%)	No (%)
Has your child been admitted before in the last 1 month?	33(27.5)	**87(72.5)**
Has your child been screened for renal disease such as AKI before?	18(15)	**102(85)**
Has the child been admitted elsewhere?	**83(69.2)**	37(30.8)

4.4. The patterns of clinical presentation of children admitted with acute kidney injury at Kenyatta National Hospital.

4.4.1. Number of days before an intervention was made

Most (70.8%) of the children had intervention made immediately as shown in figure 1. Some of the participants highlighted that the delay to start of an intervention was mainly due to financial constraints to procure catheter immediately as well as the time taken before insertion of catheter.

Figure 2:Number of days taken before intervention was made



4.4.2. Relationship between number of days and outcome based on clinical intervention

The association between number of days and outcome showed that there was no significant association between number of days taken before intervention and the outcome status based on clinical treatment intervention, ($p>0.05$) as shown in table 4.

Table 4:Association between time before intervention and the clinical outcome based on clinical intervention

Which intervention was given			*The Outcome status* *Fully recovered*	*End stage renal disease*	*Died*	X^2	*P-value*
Medication only group	Number of days	Immediately	43 (71.7)	14(23.3)	3(5.0)	3.022	0.806
		1 -2 days	4(100)	0	0		
		3 -4 days	2(100)	0	0		
		More than 5 days	2(100)	0	0		
		n	51(75)	14(20.6)	3(4.4)		
Peritoneal dialysis and Medication group	Number of days	Immediately	39 (95.1)	1(2.4)	1(2.4)	0.306	0.989
		1 -2 days	4(100)	0	0		
		3 -4 days	2(100)	0	0		
	n		45(92.9)	3(5.0)	1(2.1)		

4.4.3. Chief clinical presentation at the time of admission

The major clinical presentations, as shown in Table 5, were assessed to determine the key factors that led to the admission of children. The common clinical presentations were decreased urine, 69%. Nausea 49.6%, shortness of breath 46.3%, fever 36.7% and seizures

(36%). Other clinical presentations that were identified include diarrhea, inability to breastfeed, and jaundice.

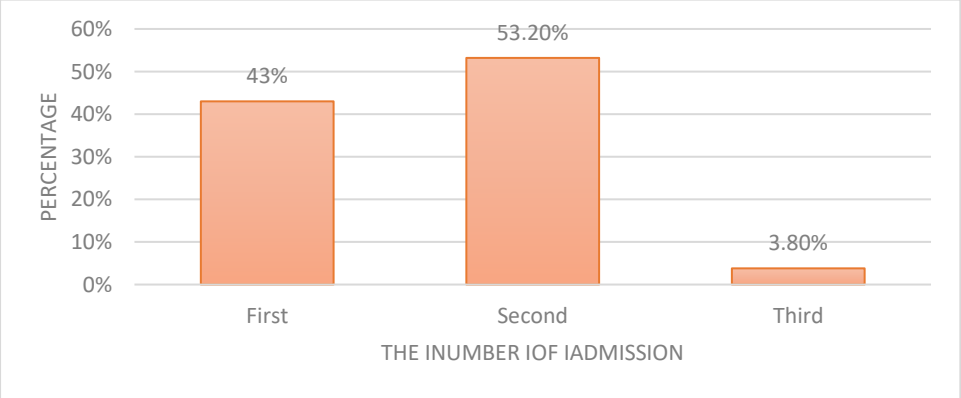
Table 5:Major clinical presentations

Clinical presentation	Frequency (%)
A Decreased urine	**98(69)**
Nausea	60(49.6)
Shortness of breath	56(46.3)
Seizure	44(36.7)
Fever	45(36.7)
Weakness	18(14.6)
Irregular heartbeat	7(5.8)
Fatigue	6(4.6)
Confusion	5(4.2)
Fluid retention	2(1.3)
Chest pain or pressure	1(0.8)

4.4.4.The number of admissions into the hospital

The analysis in figure 3 focused on clinical presentations patterns which focused on the number of previous admissions, diagnosis, and the major clinical presentations that were identified. Majority (53.2%) of the parents/caregivers indicated that this was the second admission, 43% indicated the first admission.

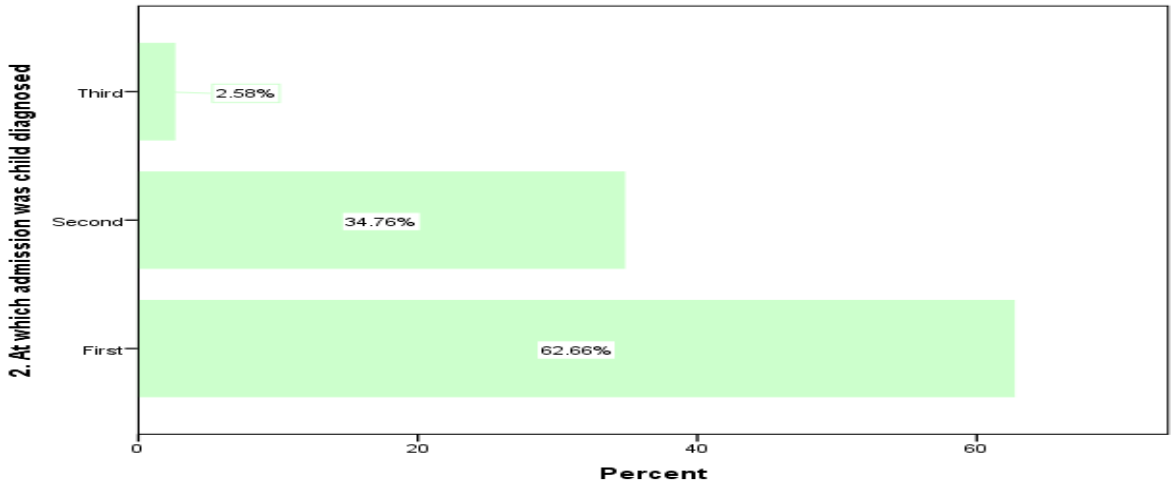
Figure 3:The number of admissions to the hospital



4.4.5.The number of admissions during which the child was diagnosed with AKI

The analysis as indicated in figure 4 shows that the majority (62.7%) of the parents/caregivers specified that their children were diagnosed with acute kidney injury on the first admission and 34.8% indicated that their children were diagnosed on the second admission.

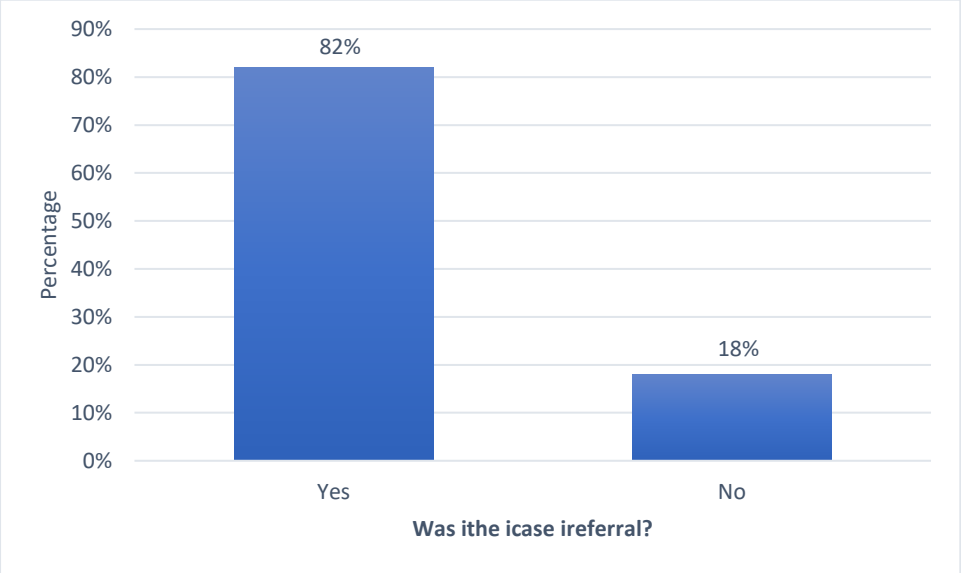
Figure 4:The number of admissions at which the child was diagnosed with Acute Kidney Injury.



4.4.6. Was the patient a referral?

The analysis also showed that 82% of the cases were referrals as shown in figure 5.

Figure 5:Referral



4.5. Treatment intervention of children admitted with AKI

4.5.1. Treatment/interventions

Most (60.4%) of children were given medication only, 39.6% were given a combination of peritoneal dialysis and medication. Of those who were given medication, 92.5% were treated

with both antibiotics and intravenous fluid as shown in Table 6. The common antibiotics that were given as medication t the children were flucloxacillin and gentamycin.

Table 6:Treatment interventions given to children with Acute Kidney Injury

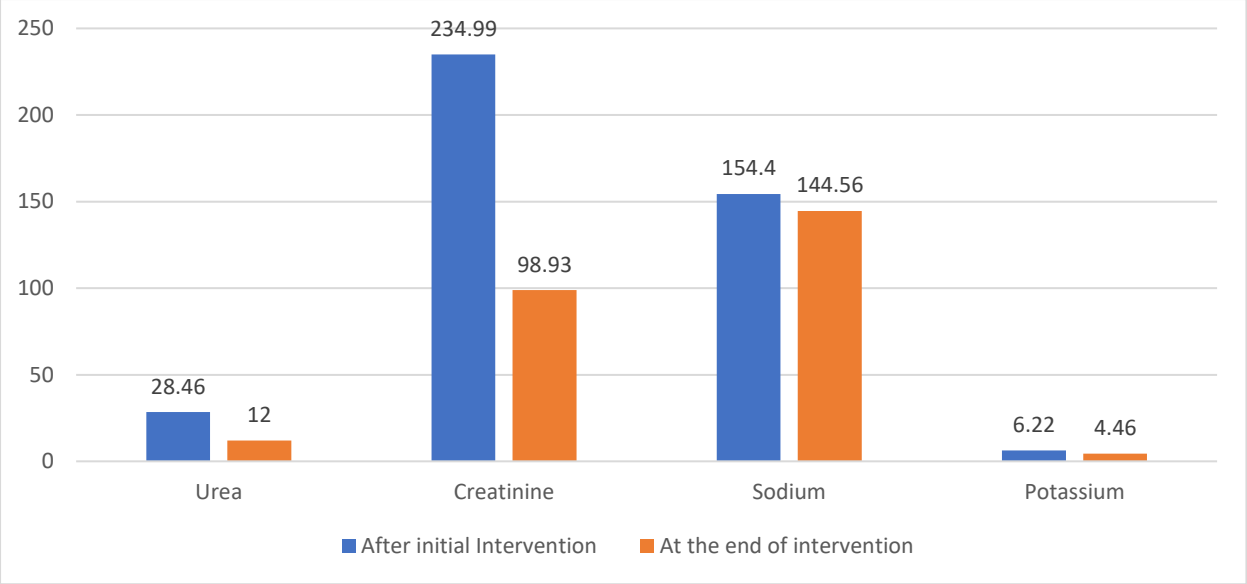
Intervention	**Frequency (%)**
Medication only (Anti-biotics)	**71(60.4)**
Peritoneal dialysis and Medication	49(39.6)
Names of medication given	
Antibiotics (flucloxacillin and gentamycin)	9(7.5)
Antibiotics and Intravenous Fluid	**111(92.5)**
Transfusion	
Yes	10 (8.3)
No	**110(84.2)**

4.6. The treatment outcome of children admitted with AKI following different interventions modalities

4.6.1. Parameters at the initial intervention and at the end of intervention

Figure 6 shows the comparison between the parameters at the initial intervention and at the end of the intervention (discharge/death). Urea decreased from average 28.46 at the initial intervention to 12 mmol/l. Creatinine levels decreased from an average of 234.99 at the initial intervention to 98.93 mmol/l at the end of intervention. The average sodium level at the initial intervention was 154.4meq/l compared to 144.56 meq/l at the end of intervention. The potassium level decreased from 6.22 at the initial intervention to 4.46 mmol/l at the end of intervention.

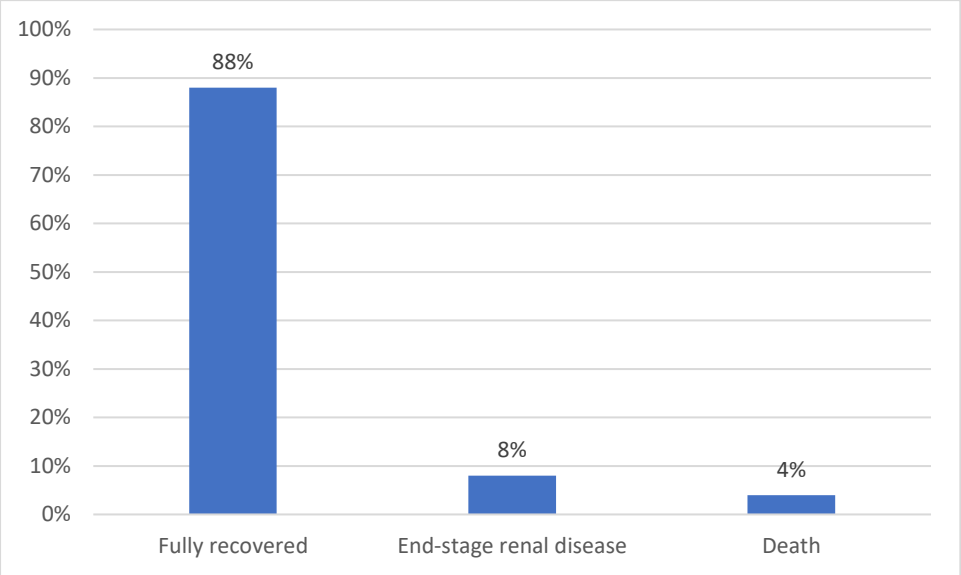
Figure 6:Parameters at the initial and at the end of intervention



4.6.2. Status of the child during the end of intervention

As shown in figure 7, majority (81.7%) recovered, 13.3% had end stage renal disease and 4% of the children died.

Figure 7:Status of the child at the end of intervention



A paired samples t-test was conducted to compare the parameters(Urea, Creatinine, Sodium, and Potassium) at the initial intervention and the end of the intervention based on medication intervention. The findings determined that there was a significant difference ($p<0.05$) in scores across all the clinical parameters.

Table 7:Paired t-test in medication only group

Clinical parameter	*N*	*Mean before intervention*	*Mean after intervention*	*t*	*p-value*
Urea	72	22.69	11.88	5.75	**<0.001**
Creatinine	72	169.66	91.19	5.66	**<0.001**
Sodium	72	148.88	140.42	3.9	**<0.001**
Potassium	72	5.63	4.47	2.03	**0.046**

4.6.3.Evaluation of the difference at the initial intervention and at the end of intervention for Peritoneal dialysis and medication

A paired samples t-test was conducted to determine whether there was difference in clinical parameters at the initial intervention and after using peritoneal dialysis and medication. There was significant difference ($p<0.05$) across all the clinical parameters measured. Peritoneal dialysis and Medication were efficient in improving the level of recovery among children with acute kidney injuries.

Table 8:Paired t-test for Peritoneal dialysis and Medication group

Clinical parameter	*N*	*Mean before intervention*	*Mean after intervention*	*t*	*P-value*
Urea	48	36.008	12.761	7.97	**<0.001**
Creatinine	48	313.69	117.2	6.59	**<0.001**
Sodium	48	161.61	152.12	1.5	**0.008**
Potassium	48	7.59	4.6	1.94	**0.008**

4.6. 4. Relationship between intervention and outcome – Chi-Square test for association

A chi-square test for association was conducted aimed at determining whether there was a statistically significant association between the intervention and the outcomes, as shown in table 9. The findings showed that there was a statistically significant association between intervention given and outcome at $x^2(2) = 16.18$, $p=0.000$.

Table 9:Association between intervention and outcome

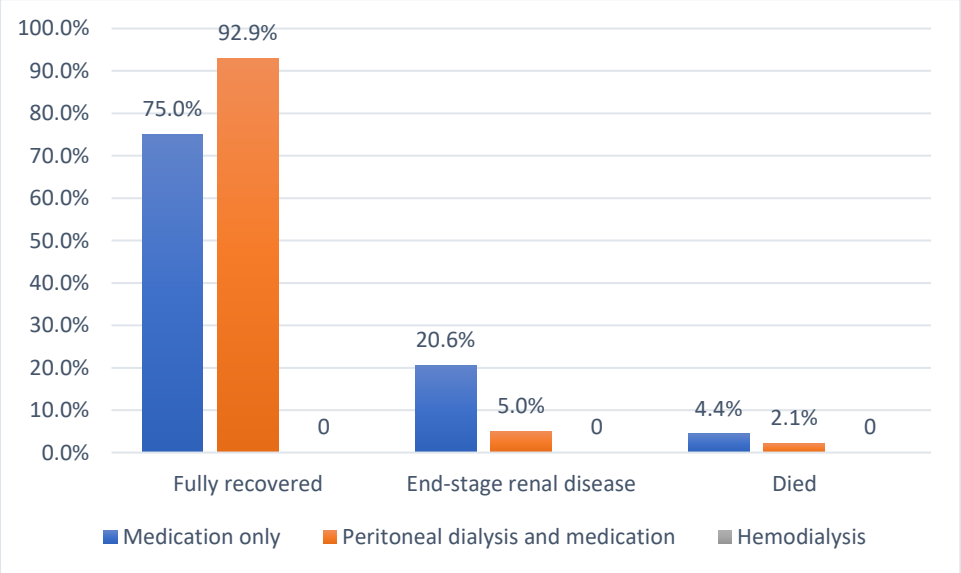
	Outcomes				**F ratio (x^2)**	**P-Value**
Intervention	*N*	*Fully recovered*	*End-stage renal disease*	*Death*		
Medication only group	**71**	**51**(75)	14(20.6)	3(4.4)	81.96	**<0.001**

Peritoneal dialysis and Medication	**49**	46(92.9)	3(5.0)	1 (2.1)	121.29	**<0.001**
Hemodialysis	**0**	0(0.0)	0(0.0)	0		

4.6.5. Intervention and Outcome

The bar chart as shown in figure 7 shows that children who utilized Peritoneal dialysis and medication, 92.9% fully recovered, 5% were at the end stage renal disease and 2.1% died. Those who used medication only, 75% fully recovered, 20.6% were at end stage renal disease and 4.4% died.

Figure 8:Intervention and Outcome



CHAPTER FIVE: DISCUSSION

5.1.Parents/ caregiver socio-demographics

The study focused on establishing the Patterns of clinical presentation, treatment modalities and immediate outcomes of children admitted with AKI at Kenyatta National Hospital. Socio-demographics of parents/ caregivers were assessed. Majority of the children were accompanied by their mothers. Mothers form primary caregivers compared to guardians or their fathers. The average age of parents and caregivers was 29 years. The findings from the study determined that there was no association between monthly income and the intervention chosen for children. Majority of the parents/caregivers are self-employed and earning between $100 and $200 which is unable to sustain their lives as well as treatment of AKI. The determination that there is no association between monthly income and the intervention used can be explained by the small sample size. Some of the interventions such as peritoneal dialysis is expensive and the findings have shown that the parents and guardians earn little to sustain treatment for their children. According to findings from the World Health Organization (2017), majority of people in sub-Saharan region are poor and unable to afford quality healthcare. Collister et al. (2017), established that treating acute kidney injury is very expensive especially hemodialysis which influences the choice of alternative clinical interventions. Therefore management of acute kidney injury in children has been a major challenge for many individuals despite the efforts that are being developed by the government.

The assessment of children biographic characteristics highlighted that majority of the children with AKI were female and aged less than 12 months. This finding however was different from the findings in study conducted by Anigilaje et al.(2019) in Nigeria which showed that 51.2 % of the respondents having AKI were male over a 12 month period. The study included a sample

population of children one month old to 15 years. A higher sample population attributed to the difference considering that this study focused on children below the age of 5 years within a 3 month period.

5.2.Clinical presentation

The analysis obtained various clinical presentations among children with acute kidney injury. Common clinical presentations identified include decreased urine output, shortness of breath, seizure, fatigue as well as fever. Majority of the children had more than one clinical presentation. The presence of more than one clinical presentation highlights that the condition of these children were severe. Inability to detect these clinical presentations much earlier is attributed to inadequate knowledge about child healthcare among caregivers. Parents tend to associate clinical presentations such as fever , decrease in urine output and fatigue with common medical conditions such as flu hence fail to seek proper medical help before the condition worsens. The findings are related to the findings in study conducted by Bellomo et al. (2012). The study determined that major clinical presentations in acute kidney injury was associated with fatigue, weight loss, sleep disturbance and anorexia. Similar findings were obtained in Duzova et al. (2010) that determined that acute gastroenteritis and dehydration were common in children who were aged more than one month. Duzova et al. (2010) further evaluation of the study showed that low fluid intake was high in newborns. The causes of AKI among pediatric patients was evaluated where sepsis was leading cause of AKI across different age-groups, ischemic injury as well as urinary tract obstruction.

Rimele and Kellum (2010) showed that reduction in urine output was a major clinical presentation associated with development of acute kidney injury among children. However the development of these presentations varies based on the underlying risk factors as well as the condition of the child. The analysis from this study showed that majority of the children experienced AKI within the first 12 months. Prowler et al. (2011) assert that urine monitoring is one of the standard procedures universally developed in critically ill patients hence provide a strong basis where it is easier to enable determination of different conditions. AKI develop within a short period hence the focus on developing better intervention enables focus on specific symptoms. In a study conducted in Egypt by Tawfik et al. (2002), extreme dehydration was associated with increased renal disability. Based on the findings from analysis, dehydration was one of the factors that led to admission and determination of AKI among children.

5.3.Clinical treatment modality and outcomes

Treatment of AKI in children follows different patterns that can help in determining outcomes. The findings showed that majority of the children with AKI were given intervention immediately. However, there was no significant association between time taken before intervention was given to the outcomes. Starting intervention immediately was mainly determined by the condition of a child as well as the financial constraint required to purchase equipment such as Catheter. Those who were given intervention directly required medication only because it is more affordable. However those who required medication and peritoneal dialysis took longer to start intervention mainly because of the cost of treatment considering that majority of parents and caregivers were low income earners. Most of the children who received intervention immediately fully recovered. The findings are related to conducted by Shamel (2014) which showed that the average recovery period for AKI is estimated between 7 days and 3 months based on different factors such as the intervention considered. This means that there is likelihood of quick recovery based on the intervention given. However most advanced interventions are extremely expensive and not available in local healthcare facilities which makes it difficult to achieve quick recovery. According to Walters et al.(2009) patients who took medication as the main intervention in treating AKI too much longer period to recover compared to dialysis techniques. Intermittent hemodialysis , peritoneal dialysis, and continuous renal replacement therapies such as continuous venovenous hemodialysis, continuous venovenous hemofiltration or continuous venovenous hemodiafiltration may be employed to provide enhanced solute clearance and ultrafiltration. Walters et al.(2009) also asserted that peritoneal dialysis has long been preferred and utilized as a form of continuous therapy in the setting of AKI in pediatrics.

The study established that majority of the children were subjected to medication only intervention while peritoneal dialysis and medication as a single clinical intervention was also considered. The increasing cost of alternative care among children with AKI has limited the available option which increase the focus on medication and primary clinical intervention for all the cases reported. The choice of a combined intervention was observed as effective especially when handling critical conditions among children. These findings are similar to Ciccia et al. (2017) who found that medication was common clinical intervention that was considered in treating Children with AKI. Ciccia et al. (2017) also determined that novel non-invasive diagnostic and predictive biomarkers have been launched globally to improve our ability to diagnose and predict AKI and its adverse outcomes as well as recovery.

Combined intervention of peritoneal dialysis and medication was considered as more efficient with a high percentage of patient who fully recovered compared to medication only. Kilonzo et al. (2012) found that the reduced rate of dialysis among children is mainly attributed to early detection which make it possible to focus on medication to improve patient outcomes. Callegari et al. (2013) also found similar outcomes while explaining the reluctancy in adopting dialysis among children despite being more efficient. The study also highlighted that the cost of care might be a factor considering that dialysis is expensive compared to medication only. Susantitaphong et al (2016), stressed that one of the major factors associated with low rate of dialysis is anatomical structure of children blood vessels making medication only as a viable option. The success of medication only is based on level of detection.

Cullis et al. (2014), explains why peritoneal dialysis has not been effectively utilized as well as being considered as a treatment modality in children with AKI.Peritoneal dialysis for AKI has, however, more recently become sidelined by newer, more technologically advanced treatments such as hemofiltration and haemodialysis (HD). Despite the sidelining of peritoneal dialysis, developing countries still rely on it to improve health outcomes among children with AKI.

The results highlighted that Peritoneal dialysis and medication have been widely utilized as the main treatment modality in KNH. In evaluating the effectiveness of peritoneal dialysis in Europe and North America, Gaiao et al. (2012) found that in three major dialysis congresses, 36% felt Peritoneal dialysis was suitable for AKI in the Intensive care Unit from which only 15% practiced peritoneal dialysis. When it came to treating AKI in the wards, more than 50% felt it was suitable. In the same study, acute peritoneal dialysis was far more likely to be practiced by physicians from Asia compared to those from Europe and North America.

Assessing the cost of dialysis, peritoneal dialysis is slightly affordable compared to other interventions such as hemodialysis which explains its use in the hospital. There was no consideration of hemodialysis as a clinical intervention modality in all children who were evaluated. According to Kilonzo et al.(2012), peritoneal dialysis is adopted because it offers significant cost and infrastructural benefits over hemodialysis because it does not require electricity nor does it use expensive machinery or consumables. Kilonzo et al.(2012) further showed that it costs approximately $370 to save the life of one patient with AKI with peritoneal dialysis which is approximately half the cost of hemodialysis.

CHAPTER SIX: CONCLUSION AND RECOMMENDATION

6.1. Conclusion

Acute Kidney Injury is a serious healthcare condition in children leading to death of 6.5% of the children who were recruited in the study. The common clinical presentations that were identified included decreased urine output, fever, fatigue, seizure ad weight loss. These are serious condition especially among children and can be fatal if not successfully countered with best interventions. The findings also showed that majority of the children who were evaluated under the age of five years and having AKI were less than 12 months. The occurrence of AKI in children less than 12 months has been associated with high mortality rate. Medical only and peritoneal dialysis together with medication were found to be important when dealing with AKI although medication has higher recovery when the AKI condition is detected earlier and intervention given. Peritoneal dialysis with medication was more efficient although it is slightly expensive compared to medication only hence explaining the reason why medication has been the preferred clinical intervention. Since Peritoneal dialysis for AKI is predominantly practiced in developing countries where the infrastructure for quality research is often lacking, the result has been limited evidence on which to base clinical decisions in areas such as dosing, volumes.

6.2.Recommendations

- Improve early detection of AKI among children to ensure less complex intervention such as medication only can be used to attain desired outcomes where patients can fully recover.
- Emphasize on the adoption of Peritoneal dialysis together with medication for children with AKI who are critically ill because it is more efficient compared to medication only.

- To determine why hemodialysis is not being considered as a clinical intervention in treating critical ill children with AKI. Hemodialysis is one of the advanced clinical intervention in managing AKI.
- Encourage parents/caregivers to seek medical care as soon as possible to ensure that survival rate of AKI children improve significantly since the recovery of a AKI child is based on early detection. Late detection is associated with increased development of end stage renal disease as well as death.

6.3. Limitations

- The study was done within a limited time frame which could have influenced the outcome regarding the adoption of the clinical interventions.
- The major clinical parameters were only evaluated at the initial and at the end of intervention without taking into consideration other underlying factors that could have influenced the clinical outcome.

6.4. Areas for further Research

The area for further research in this case should focus on understanding the reasons that explain the current uptake of Medication, Peritoneal dialysis and Hemodialysis and why the Hospital has been unable to adopt more advanced clinical treatment modalities for AKI in children.

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APPENDIX I: INFORMED CONSENT FORM FOR PARENTS / GUARDIANS

Study Title:

Determination of the Patterns of Clinical Presentation, Treatment Modalities and Their Outcome in Children with Acute Kidney Injury at Kenyatta National Hospital

Dear Participant,

My name is Dennis Mwenda, a Master's of Science Nursing student at University of Nairobi. The purpose of this consent form is to give you the information you need to know in order to decide whether or not you would like to take part in this study I'm carrying out in this facility. Please read/ listen carefully and be free to ask me to explain anything that you do not understand.

Purpose and benefits of the study

I'm carrying out a study to assess the Patterns of Presentation, Treatment Modalities and Their Outcome in Children with Acute Kidney Injury at Kenyatta National Hospital. The study findings will provide evidence based ways and strategies of ensuring best management modalities and protocols for patients presenting with Acute Kidney Injury

Procedure

If you are willing to participate in the study, you will meet with the researcher or research assistant who will interview you based on the questionnaire which has already been prepared. You are free not to answer any question that you may feel uncomfortable with. Please do not hesitate to contact me (The researcher) or my supervisor on the telephone numbers provided below for further clarification. No invasive procedure will be employed. You will only be required to answer the questions as shall be posed to you by the researcher or the research assistant.

Use of patients' medical records

The information on the patients' records will also be used to obtain some data. However, confidentiality and privacy will be ensured while collecting such information.

Benefits of taking part in the study

There may be no direct benefit to you for taking part in the study. The information we will gather from this exercise will help us in understanding the Patterns of Presentation, Treatment Modalities and Their Outcome in Children with Acute Kidney Injury at Kenyatta National Hospital. This will go a long way in developing best strategies in management of AKI

Confidentiality

All questionnaires are to be completed anonymously. No personal identification information will be collected on the questionnaire. Furthermore, results of this study will be presented in aggregate manner, so no individual responses will be traced back to an individual.

Risk, stress and discomfort

The questionnaire used to interview you will not have your name or personal number, which can identify you. You will receive no money for participating in this exercise. The only discomfort is when you will be taking about 10 minutes to complete the questionnaire.

Dissemination of findings

The results of the study will be presented to the University of Nairobi, School of Nursing faculty members and to Kenyatta National Hospital. The results of the study will also be published in scientific peer reviewed nursing journals for public access. The abstract will be presented in scientific conferences

Consent Certificate

I confirm that I have understood the information provided for the above study and have had the opportunity to ask questions. I also understand that my participation is voluntary and that I am free to withdraw at any time, without giving reasons. I agree to take part in the above study.

My signature below means that I have voluntarily agreed to participate in this research study

Name of Research assistant	Date	Signature
……	……	……

In case of any concerns, please contact the following;

Dennis Mwenda (Principal Investigator), School of Nursing Sciences, University of Nairobi. Tel. 0721 276091 Nairobi.

Dr. Samuel Kimani (Supervisor) , School of Nursing Sciences, University of Nairobi, Tel. 0722 384 917, Nairobi

Dr. Kivuti-Bitok (Supervisor) School of Nursing Sciences, University of Nairobi, Tel. 0710 499 700, Nairobi

The Secretary, KNH/UoN ERC, P.O BOX 20723-00202, Tel. 726300-9, NAIROBI

SOMO YA I: FOMU YA KUTUMA

HABARI RIDHAA

Uamuzi wa Sampuli za Uwasilishaji wa Kliniki, Matibabu ya Matibabu na Matokeo Yake Kwa Watoto walio na Madhara ya Pigo Ya Pumu Kliniki ya Taifa ya Kenyatta

Mshiriki Mshirika,

Jina langu ni Dennis Mwenda, Mwanafunzi wa Sayansi ya Uuguzi wa Sayansi katika Chuo Kikuu cha Nairobi. Madhumuni ya fomu hii ya idhini ni kukupa maelezo unayohitaji kujua ili uamuzi kama ungependa kushiriki katika utafiti huu ninaofanya katika kituo hiki. Tafadhali soma / kusikiliza kwa uangalifu na uwe huru kuuliza mimi kueleza chochote ambacho hujui.

Kusudi na faida za utafiti

Ninafanya utafiti ili kuchunguza Sampuli za Uwasilishaji, Matibabu ya Matibabu na Matokeo Yake Kwa Watoto walio na Madhara ya Pigo ya pumu katika hospitali Kuu ya Kenyatta. Matokeo ya utafiti yatatoa njia za msingi za ushahidi na mikakati ya kuhakikisha njia bora za usimamizi na itifaki kwa wagonjwa wanaowasilisha kwa Madhara ya Pumu ya Pigo.

Utaratibu

Ikiwa una nia ya kushiriki katika utafiti, utakutana na mtafiti au msaidizi wa utafiti ambaye atawahoji wewe kulingana na dodoso ambayo tayari imeandaliwa. Wewe ni huru bila kujibu swali lolote ambalo huenda usijisikie. Tafadhali usisite kuwasiliana na mimi (Mtafiti) au msimamizi wangu kwenye nambari za simu zinazotolewa hapa chini kwa ufafanuzi zaidi. Hakuna utaratibu wa uvamizi ambao utaajiriwa. Utastahili tu kujibu maswali ambayo utafuatiwa na mtafiti au msaidizi wa utafiti

Taarifa juu ya kumbukumbu za wagonjwa pia zitatumiwa kupata data fulani. Hata hivyo, siri na faragha vitahakikisha wakati wa kukusanya habari hizo

Faida ya kushiriki katika utafiti

Kunaweza kuwa hakuna faida moja kwa moja kwako kwa kushiriki katika utafiti. Taarifa tunayokusanya kutokana na zoezi hili itatusaidia kuelewa Sampuli za Uwasilisho, Matibabu ya Matibabu na Matokeo Yao kwa Watoto walio na Madhara ya Pumu ya pigo katika Kliniki ya Taifa ya Kenyatta.

Usiri

Maswali yote yanapaswa kukamilika bila kujulikana. Hakuna habari ya kitambulisho cha kibinafsi itakusanywa kwenye dodoso. Zaidi ya hayo, matokeo ya utafiti huu yatawasilishwa kwa namna ya jumla, hivyo hakuna majibu ya mtu binafsi yatafuatiwa na mtu binafsi

Hatari, shida na wasiwasi

Jaribio la kutumia mahojiano hautakuwa na jina lako au namba yako binafsi, ambayo inaweza kukutaja. Hutapokea pesa kwa kushiriki katika zoezi hili. Usumbufu tu ni wakati unachukua muda wa dakika 10 kukamilisha hoja.

Usambazaji wa matokeo

Matokeo ya utafiti utawasilishwa kwa wanachama wa Chuo Kikuu cha Nairobi, Chuo Kikuu cha Uuguzi na Kliniki ya Taifa ya Kenyatta. Matokeo ya utafiti huo pia yatachapishwa katika majarida ya uuguzi wa kitaalam ya uuguzi kwa ajili ya upatikanaji wa umma. Kielelezo kitawasilishwa katika mikutano ya kisayansi

Hati ya Ruhusa

Ninathibitisha kuwa nimeelewa taarifa iliyotolewa kwa utafiti ulio juu na kuwa na fursa ya kuuliza maswali. Pia ninaelewa kwamba ushiriki wangu ni wa hiari na kwamba mimi ni huru kujiondoa wakati wowote, bila kutoa sababu. Nakubali kushiriki katika utafiti ulio juu. Saini yangu chini ina maana kwamba nimekubali kushiriki kwa utafiti huu wa utafiti

Tarehe_____ Sahihi_____

APPENDIX II: QUESTIONNAIRE

Patterns of Clinical Presentation, Treatment Modalities and Outcomes in Children under Five with Acute Kidney Injury at Kenyatta National Hospital

Questionnaire Code……. Date of Data Collection…….

Directions for completing the questionnaire

i. Please do not write your name in any of the pages of the questionnaire.
ii. Please read carefully the instructions at the beginning of each section of the questionnaire before answering the questions in that section.
iii. Please answer all the questions in each section if possible.

Section A: Socio-Demographic characteristics of the parents/ caregivers

1. What is your age in complete years…….?
2. What is your gender?

   Male [ ]

   Female [ ]

3. What is your relationship to the child?

   Mother [ ]

   Father [ ]

   Grandparent [ ]

   Others please specify…….

4. What is your highest level of education?

   Never attended [ ]

   Primary [ ]

   Secondary [ ]

   Tertiary/ University [ ]

5. What is your occupation?

   Salaried employee [ ]

   Self-employed [ ]

   Unemployed [ ]

   Others specify……..

6. What is your marital status?

   Single [ ]

   Married [ ]

Divorced/separated [ ]

Widow [ ]

7. What is your average monthly income?

Below 10, 000 Shillings

10,001-20,000 Shillings

20,001-30,000 Shillings

Above-30,000 Shillings

Section B: Biographic Data of the children (*Choose One Response Only*)

1. Age of the child at the next birthday……..

2. Gender of the child.

Male [ ] Female [ ]

3. Where does the child live? ……

4. Who does the child stay with?

Single parent [ ]

Both parents [ ]

Guardian [ ]

Others (Please specify)……

5. What is the Birth order of the child?

First [ ]

Second [ ]

Third [ ]

Others specify…….

6. Do you have other children? Yes [ ] No [ ]

7. If yes, how many……

8. Is there another child that had similar problem? Yes [ ] No [ ]

Section C: Patterns of Clinical Presentations

1. Which admission is this to the hospital?

First [ ] Second [ ] Third [ ] Fourth [ ] Fifth [ ]

2. At which admission was the child diagnosed with acute kidney injury?

First [ ] Second [ ] Third [ ] Fourth [ ] Fifth [ ]

3. Was the patient a referral? Yes [ ] No [ ]

4. What were the chief complaints (presentation) at the time of admission *(Select all that apply) Refer to medical records*

a) Decreased urine output [ ]

b) Fluid retention, causing swelling in your legs, ankles or feet[ ]
c) Shortness of breath [ ]
d) Fatigue [ ]
e) Confusion [ ]
f) Nausea [ ]
g) Weakness [ ]
h) Irregular heartbeat [ ]
i) Chest pain or pressure [ ]
j) Seizures or coma [ ]
k) Others specify……

What were the levels of the following parameters at the time of admission? *(Refer to the patient's medical records*)

Urea……..

Creatinine…….

Electrolytes……...

Section C: Intervention Modalities

5. How many days did the child take from admission before an intervention was made?

Immediately [ ]

1-2 days [ ]

3-4 days [ ]

More than 5 days [ ]

6. Which treatment/Intervention was the child given?

(If treatment was combining, tick the combination)

Medication only [ ]

Hemodialysis only [ ]

Hemodialysis and Medication [ ]

Peritoneal dialysis only [ ]

Peritoneal dialysis and Medication [ ]

7. If medication was used in the above, state the names

……

……

8. Was the patient transfused?

Yes [ ] No [ ]

9. For how long (Sessions) did the child receive the treatment?

……

…

Section D: Outcome Assessment

10. How are the clinical makers in relation to prior and post intervention?

Clinical markers	Before intervention	After intervention
Weight		
Input/output		
Presence of edema		
SPO2		
AVPU		

6. Has your child been admitted before in the last 1 month? Yes [ ] No [ ]

7. Has your child been screened for renal diseases such as AKI before? Yes [ ] No [ ]

8. Has the child been admitted elsewhere Yes [ ] No [ ]

9. What were the levels of the following parameters immediately after the initial intervention?

Urea…….

Creatinine…….

Electrolytes ……

Others……..

10. What were the final levels of the following parameters after the end of the intervention?

Urea…….

Creatinine…….

Electrolytes ……

1. What was the status of the child during the last intervention?

   Fully recovered [ ]

   End stage renal disease [ ]

   Death [ ]

2. Any follow up in the renal clinic?

   Yes [ ] No [ ]

14. Do you have any other comment about this study……

……..

APPENDIX III: AUTHORIZATION LETTER TO ETHICS

Dennis Mwenda,

University of Nairobi.

School of Nursing Sciences,

P.O Box 19676-00202.

Nairobi.

Tel: 0721276091

The Chairperson,

UON/KNH Ethics and Research Committee,

P.O. Box 20723-00202, Nairobi.

Dear Sir/Madam

RE: ETHICAL REVIEW AND APPROVAL

I am a second year post graduate nursing student, pursuing Master of Science in Nursing (Nephrology). I am writing to request for permission to carry out research on **establishment of the patterns of presentation, treatment modalities and their outcome in children with acute renal injury at Kenyatta National hospital**

The research findings will be in establishing the appropriate modality to treat children with acute kidney injury.

Looking forward to your comment and suggestion for improvement of the proposed study

Yours faithfully,

Dennis Mwenda (H56/7811/2017)

APPENDIX IV: AUTHORIZATION LETTER TO KENYATTA

Dennis Mwenda

University of Nairobi

School of Nursing Sciences

P.O Box 19676-00202,

Nairobi

Tel: 0740869986

The Chief Executive Officer

Kenyatta National Hospital

Nairobi.

Through

In charge Health Record Department

Dear Sir / Madam

RE: PERMISSION TO UNDERTAKE STUDY

I am a second year post graduate nursing student, pursuing Master of Science in Nursing (Nephrology). I am writing to request permission to carry out research on "establishment of the characteristics, treatment modalities and their outcome in children with acute renal injury at Kenyatta National Hospital". A retrospective study for children who were treated in the year 2018.

Your kind consideration to allow me carry out this research in KNH will be highly appreciated. It will go a long way in facilitating completion of my study.

Please find the attached approval letter from KNH/UON ERC

Thanks for your incredible support

Yours sincerely,

Dennis Mwenda (H56/7811/2017)

APPENDIX V: TIME FRAME

	Time in months (Year 2018/19)						
ACTIVITY	**SEP 2018**	**OCT 2018**	**NOV-FEB 2018/19**	**MAR 2019**	**APR 2019**	**MAY-JUL 2019**	**AUG 2019.**
Identification of research topic							
Development of research concept paper							
Proposal development							
Presentation of the proposal and ethical approval							
Pre-testing of research instruments							
Permission to collect data							
Data collection.							
Organization, analysis and interpretation of data.							
Report writing and presentations.							

APPENDIX VI: BUDGET

Activity	**Resource Materials**	**Units**	**Quantity**	**Unit Cost (Kshs)**	**Sub-Total Kshs**
Literature search	Airtime and Internet	-	-	12,000	12000
	Sub-Total				**12,000**
Proposal preparation and correction	1 Flash Disc	Item	1	2000	2000
	Drafts of proposal Printing	Pages	60	10	600
	Binding	Copies	1	300	300
	Final proposal printing	Pages	60x 2	10	1,200
	Sub-Total				**4,100**
Preliminary preparation and Pre-testing of Instrument	Questionnaire printing	Pages	200	10	2,000
	Fare	No.	15	200	3,000
	Research assistants allowances	No.	2	2,000	4,000
	Sub-Total				**25,000**
Preliminary preparation and Data Collection	Questionnaires printing	Pages	2000	10	20,000
	Pencils /Erasers	No.	100/100	30	600
	Research assistants' fare	No.	2	6,000	12,000
	Research assistants' allowances	No.	2	10,000	20,000
	Subtotal				**52,600**
Thesis writing presentation and defense	Typing and printing	Pages	250	50	12,500
	Sub-Total				**12,500**
Thesis correction and submission	Printing	Copies	4	1,200	4,800
	Binding	Copies	4	300	1,200
Thesis publishing		unit	1	5,000	5,000
	Sub-Total				**11,000**
Contingencies	**10% of Grand Total**				**11,660**
Grand Total					**128,260**