EPIDEMIOLOGY OF URINARY TRACT INFECTION AMONG FEBRILE CHILDREN UNDER FIVE YEARS IN MOROGORO MUNICIPALITY, TANZANIA

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ABSTRACT

Urinary tract infection (UTI) is among the commonest causes of febrile illness in children of less than five years of age in Sub-Saharan Countries and is in most cases associated with poor hygiene. This cross sectional study was conducted between August 2014 and October, 2015. It aimed at determining the epidemiology of urinary tract infection in children less than five years of age who attended healthcare facilities in Morogoro Municipality and also to establish bacteria susceptibility to antibiotics commonly used in treatment. A questionnaire was administered to 275 mothers/children caregivers to establish their awareness and risk factors for UTI. Subsequently, urine samples from 275 children were collected for urinalysis, bacterial culture and antibiotic sensitivity test. All respondents had heard about UTI, and they knew mode of transmission, clinical signs, treatment and control of the disease. Predictors of UTI in children that were found to be statistically significant ($P<0.05$) were inappetence, frequent urination, nitrite in urine, bed wetting and washing of baby with no specific patterns after urination/ defecation. Urinalysis results detected some children with yellow urine (74.6%), turbid urine (40.4%) and some abnormalities like urobilirubin, glucose, proteins, nitrates, bilirubin, ketones, traces of red blood cells and leucocytes. The specific gravity and pH of urine above normal was 4.4% and 5.5% respectively. Up to 43.6% of the urine samples had bacterial growth. Children aged between 0 and 36 months had more bacteria growth (35.6%) and female children were more affected (23.6%). The commonest bacteria isolated were *E. coli* (18.2%), *Klebsiella* (10.2%) and *Staphylococcus* (8%). All bacteria isolated (n=120) had high resistance to clindamycin (97.5%), Cotrimoxazole (85.8%), Ampicillin (73.3%), Ciprofloxacin (70.8%), Erythromycin (72.5%) and Ampiclox (68.3%). This study shows that the awareness on UTI is high among the mothers/children care givers nevertheless, the magnitude of the disease is high and most bacteria isolated had multi-antibiotic

resistance. Therefore deliberate measures aimed at minimizing the problem need to be taken.

DECLARATION

I, Alex Fortunatus Magufwa, do hereby declare to the senate of Sokoine University of Agriculture that, this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

_____ _____

Alex Fortunatus Magufwa Date

(MSc. Candidate)

The declaration above is confirmed by;

_____ _____

Dr. Hezron E. Nonga Date

(Supervisor)

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Dr. Lucas E. Matemba Date

(Supervisor)

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DEDICATION

My humble effort I dedicate to my sweet and loving parents who have always believed in me and whose affection, love, encouragement and prayers gave me hope. Most of all, to my great creator, my Almighty GOD the author of knowledge and wisdom who made this possible

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LIST OF ABBREVIATIONS AND SYMBOLS

µg	Microgram
g	Grams
MDR	Multidrug Resistance
Ml	Millilitres
MNH	Muhimbili National Hospital
MOHSW	Ministry of Health and Social Welfare
MRCC	Medical Research Coordinating Committee
MRRH	Morogoro Regional Referral Hospital
NIMR	National Institute for Medical Research
ºC	Degree Celsius
ºF	Degree Fahrenheit
OR	Odds ratio
SUA	Sokoine University of Agriculture
TSI	Triple Sugar Iron
UTI	Urinary Tract Infection
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Urinary tract infection (UTI) refers to an infection caused by pathogenic microorganisms of urine and genitourinary tract which include urethra, urinary bladder and kidneys (Elder, 2004). UTI is defined by $> 5\times10^4$ colonies per ml in a catheterized urine specimen. Urinary tract infections (UTI) are a common cause of morbidity and complications among children globally. These infections are caused mainly by Gram negative bacteria, which constitute the normal flora of the gastrointestinal tract colonizing the perineum and ascending into the genital urinary system through the urethra.

UTI is the commonest cause of fever among children and women in Tanzania, and is caused by multidrug resistant *Escherichia coli* and *Klebsiella* species (Mshana *et al*., 2012). The initial step in diagnosis of possible urinary tract infections is laboratory examination of urine specimens (Cappuccino *et al.,* 2002) and the isolates are confirmed using cultural growth of the bacteria. Other UTI tests such as serological and molecular also play an important role in the diagnosis of UTI in children. Prevalence and incidence rates of UTI in children are reported to vary with age and sex (Elder, 2004).

The infection is known to cause severe complications such as renal scarring, hypertension and end stage renal disease. UTI is a common problem among children and pregnant women in Tanzania (Moyo *et al.,* 2010). There are many predisposing factors for UTI in children that includes children with malformed and obstructed urinary tract, prematurity, indwelling catheter, lack of circumcision, Hirschsprung's disease, constipation, trauma, diabetes (Merck Manual, 2011). Also female gender predisposes to UTI since females

have a shorter urethra than men, which reduces the distance that bacteria travel to reach a female's bladder, poor hygiene as well as weak immunity also predisposes children to UTI. Clinical findings of the patients such as fever, suprapubic pain (for the older children) etc. suggests the presence of UTI.

A study carried out at Muhimbili National Hospital (MNH) in 1992, found that among 164 children admitted with severe malnutrition, UTI was the commonest infection with females dominating over males, and the commonest pathogens isolated were *Escherichia coli* and *Klebsiella pneumoniae* (Isaac *et al*., 1992). Another study conducted in inpatient paediatric ward of Muhimbili hospital in Tanzania among febrile under-fives places prevalence of UTI at 16.8% (Fredrick *et al.,* 2013). This very same study reports *Escherichia coli, Klebsiella* species, Staphylococcus epidermidis, Staphylococcus aureus and Pseudomonas aeruginosa in that order as causes of UTIs among the under-fives. Other studies have documented varying prevalence of urinary tract infections among the under-fives. A similar study among febrile under-fives in a Nigerian hospital estimates prevalence at 11% (Ibeneme *et al.,* 2014): greater than the 9% estimate among children with primary diagnosis of malaria in Nigeria (Okunola *et al.,* 2012).

The mechanism that maintain the normal sterility of urinary tract includes urine acidity and free flow, a normal emptying mechanism, intact uretero-vesical and urethral sphincters as well as immunologic and mucosal barriers. Therefore abnormalities of any of these mechanisms predisposes to urinary tract infections (Merck Manual, 2011).

In Tanzania, UTI with its diverse clinical syndrome and affected host groups remains one of the most common but widely misunderstood and challenging infectious disease encountered in clinical practices, still UTI is practically diagnosed clinically or through

routine urinary analysis even without final laboratory confirmation using culture and sensitivity test. Irrational drug use and the presence of counterfeit drugs on the local market have in addition, been mentioned to be the main factors contributing to the emergence of multidrug resistance (MDR) bacteria (MOHSW, 2006).

1.2 Problem Statement and Study Justification

1.2.1 Problem statement

Tanzania is one of the sub- Saharan African countries most affected by bacterial infectious diseases. Communicable diseases dominate the pattern of overall morbidity and contribute to over 49% of the total burden of the disease (MOHSW, 2006). Infants and young children are at higher risk of acquiring acute renal injury as a result of UTI and they are usually presented with non-specific features as compared to older children (Lum, 2007). UTI is diagnosed based on the clinical findings, laboratory analysis results of the urine and cultural findings. However, diagnosing UTI in children is difficult because the presenting symptoms and signs are non-specific, particularly in infants and children under 3 years (Lum, 2007). Irrational drug use and the presence of counterfeit drugs on the local market have been mentioned to be the main factors contributing to the emergence of multidrug resistance (MDR) bacteria (MOHSW, 2006).

Worldwide, more than 50% of all medicines are prescribed, dispensed or sold inappropriately, and 50% of all patients fail to take them correctly. As a consequence, the prevalence of antimicrobial resistances is an emerging threat, with resistances of about 70-90% to original first line antibiotics (WHO Guideline, 2005). The same situation will probably apply to most health care facilities in Morogoro Municipality and other hospitals in Tanzania where UTI is practically diagnosed clinically or by routine urinalysis without laboratory confirmation using culture and sensitivity tests. These practices are likely to

result to development of antimicrobial resistances. Therefore this study identified the magnitude of UTI among under-fives children with febrile conditions in Morogoro Municipality and isolated the common pathogens and performed drug sensitivity test against isolated organisms.

1.2.2 Justification of the study

UTI is among the common cause of death resulting from acute renal injury in under-five children in developing countries (Adjei *et al.,* 2004). At the moment Morogoro Municipal appears to have many cases whose causes have not been established. Culture and sensitivity test to the organism causing UTI is also not routinely been carried out in most hospitals in Tanzania as in healthcare facilities within the Municipal. Therefore, understanding the cause of UTI together with their sensitivity test of the isolates would significantly help the medical practitioners to come out with appropriate treatment protocol as well as identifying the risk factors responsible for UTI transmission being important for planning disease control strategy in the study area.

1.3 Objectives of the Study

1.3.1 Overall objective

Epidemiology of urinary tract infection among febrile children under-five years and antimicrobial drugs susceptibility of the isolated bacteria in Morogoro Municipality, Tanzania.

1.3.2 Specific objectives

i. To determine the prevalence of UTI among children under five years presenting to health facilities in Morogoro Municipality with febrile conditions

ii. To establish the etiological agent of UTI among children under-five years presenting to health facilities in Morogoro Municipality with febrile conditions.

iii. To establish the risk factors for UTI in under-five febrile children

iv. To determine the antimicrobial drug susceptibility pattern of the isolated bacteria

1.4 Research Questions

i. What is the prevalence of UTI among under-fives children presenting to health facilities in Morogoro Municipality with febrile conditions.

ii. What are the common bacteria causing UTI in under-fives children with fever at Morogoro Municipality?

iii. What are the risk factors that may lead to UTI in under-fives children?

iv. Are the routinely (commonly) used antimicrobial drugs sensitive to the isolated bacteria?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definition

Urinary tract infection (UTI) refers to an infection by pathogenic microorganisms of urinary and genitourinary tract which include urethra, urinary bladder and kidneys (Elder, 2004). UTI is a common problem among children and pregnant women in Tanzania mostly causing febrile illnesses (Moyo *et al.,* 2010). Initial step in the diagnosis of a possible urinary tract infection is by laboratory examination of urine specimens (Cappuccino *et al.,* 2002), of which infections are associated with counts of 100 000(10^5) or more colon forming unit per ml of urine. Prevalence and incidence rates of UTI in children are reported to vary with age and sex (Elder, 2004). A study conducted by Shaikh *et al.,* (2008) indicated that in children and adolescents with a first UTI, the risk of scarring is doubled in those with either an abnormal renal ultrasonographic finding or with both fever of 39° C (102° F) or above and causative organism other than *Escherichia coli.*

2.2 Epidemiology of UTI

2.2.1 Prevalence/distribution

The incidence of UTIs varies based on age, sex and gender (Elder, 2004; Downs, 1999). Race has also been observed in UTI as it was found in a study conducted in febrile young children at Emergency Department of Children's Hospital of Philadelphia by Shaw *et al.* (1998), whereby an overall prevalence of UTI was 3.3% (95% CI: 2.6,4.0), with higher prevalence in girls and whites. Strikingly, white girls had a 16.1% (95% CI: 10.6, 21.6) prevalence rate of UTI and white boys had prevalence rates similar to non-white girls of 2.5%, whereas non-white boys had the lowest rates of UTI.

Several studies have reported varying incidence and prevalence rates of UTI. In a cross-sectional study of febrile infant males less than one year of age and female less than two years of age carried out at Children's Hospital of Philadelphia in United States, reported overall prevalence of 3.3% with higher prevalence in females (Shaw *et al.,* 1998). Another study conducted by Garcia *et al.* (2002) in Los Angeles, California, reported an incidence of 7.5% among 160 infants less than eight weeks of age with jaundice indicating importance of considering UTI even during early infancy. Hoberman *et al.* (1997) also reported prevalence of 4.6% and 5.9% in febrile infants aged less than two months of age and above two months of age respectively with overall prevalence of 5.3% in a study which was conducted in Pittsburgh Children Hospital, United States.

In a similar study which was conducted in 131 children of up to five years of age presenting with fever in India, reported an incidence of 8.4% with the incidence rates of 6.1%, 12.2%,12.3% and 5.4% in boys, girls, infants and in 13-60 months age group respectively (Kaushal *et al.,* 2003).

Jeena *et al.* (1996) reported prevalence of UTI as a single major diagnosis of 14% in a retrospective study conducted among 54 paediatric patients in a tertiary hospital in Durban, South Africa, and in Nigeria, Mussa-Aiseen *et al.* (2003) reported prevalence of 9% in a study of 300 children aged one to 60 months who presented with fever in emergency room, with a significantly higher prevalence of UTI among girls.

2.2.2 Causes of the UTI in under Five Children

There are many causes of UTI which have been documented and may range from bacterial to fungal infections such as *Candida* species. The most commonly reported causes of UTI are bacteria that include *Escherichia coli* (Ahmed *et al.,* 2015) which is Gram negative,

facultative anaerobe, rod shaped bacterium of the genus *Escherichia* that is commonly found in the lower intestine of warm-blooded organisms and *Klebsiella* species particularly *K. pneumoniae* (Mshana *et al.,* 2012). Other pathogens also found to cause UTI are *Staphylococcus aureus, Enterococcus* and *Pseudomonas* (Shaw *et al.,* 1998).

2.2.3 Predisposing Factors for UTI in under five Children

Predisposing factors to UTI in children includes; children with malformed and obstructed urinary tract, prematurity, indwelling catheter, lack of circumcision, Hirschsprung's disease, constipation, trauma and diabetes (Schoen *et al*., 2000). The bowel and bladder dysfunction and alteration of the periurethral flora by antibiotic therapy has also been widely associated with increased susceptibility to UTI. Also female sex predisposes to UTI since females have a shorter urethra than men, which reduces distance that bacteria need to travel to reach a female's bladder. Poor toilet and hygiene habits as well as weak immunity system predispose children to UTI (Shaikh *et al*., 2008).

Recent advances have suggested that a deregulation of candidate genes in humans may predispose patients to recurrent UTI. The identification of a genetic component of UTI recurrences will make it possible to diagnose at-risk adults and to predict genetic recurrences in their offspring. Six out of 14 genes investigated in humans may be associated with susceptibility to recurrent UTI in humans. In particular, the HSPA1B, CXCR1 & 2, TLR2, TLR4, TGF-β1 genes seem to be associated with an alteration of the host response to UTIs at various levels (Zaffanello *et al*., 2010).

2.3 Clinical signs of UTI in under Five Children

Clinical course of UTI varies with patient's age. No specific sign or symptom can be used to identify UTI in infants and children. Children aged 0-2 months who have pyelonephritis

usually do not have symptoms related to urinary tract. UTI is discovered as part of evaluation of neonatal sepsis. Neonates with UTI may display the following symptoms: jaundice, fever, failure to thrive, poor feeding, vomiting and irritability. Infants and children aged 2 months to 2 years with UTI may display poor feeding, fever, vomiting, strong-smelling urine, abdominal pain and irritability. Children aged 2-6 years (Pre-school) with UTI can display the following symptoms: vomiting, abdominal pain, fever, strong-smelling urine, enuresis and urinary symptoms such as dysuria, urgency and frequency. The strongest clinical predictors of UTI in infants and non-toilet trained children are: fever without apparent source, ill-appearance, abdominal pain and suprapubic tenderness (Cincinnati, 2006; Shaikh, 2006).

2.4 Diagnosis of UTI

The American Academy of Pediatrics (AAP) criteria for the diagnosis of UTI in children 2-24 months are the presence of pyuria and/or bacteriuria on urinalysis and of at least 50 000 colony-forming units (CFU) per mL of a uropathogen from the quantitative culture of a properly collected urine specimen (Clinical practice guideline subcommittee on Urinary tract Infection, 2011).

Urinalysis alone is not sufficient for diagnosing UTI. However, urinalysis can help in identifying febrile children who should receive antibacterial treatment while culture results from a properly collected urine specimen are pending (Finnell *et al.,* 2011). Culture of a urine specimen from a sterile bag attached to the perineal area has a too high false-positive rate to be suitable for diagnosing UTI; however, a negative culture is strong evidence that UTI is absent (Clinical practice guideline subcommittee on Urinary tract Infection, 2011). Laboratory studies such as complete blood count and basic metabolic panel (for children with a presumptive diagnosis of pyelonephritis) also blood cultures (in patients with

suspected bacteremia or urosepsis), renal function studies (i.e. serum creatinine and blood urea nitrogen BUN levels) and electrolyte levels can be used.

Imaging studies can also be used in urinary tract infections to detect conditions that must be treated in order to avoid immediate deterioration or recurrences, and probable long-term kidney damage. In new-borns identified with hydronephrosis during pregnancy or by neonatal screening, vesicoureteral reflux and renal scarring are congenital and not caused by infection. Most of these patients are male and the vesicoureteral reflux is of a higher grade than that detected in girls having had urinary tract infection. In children with urinary tract infection, imaging studies can only be indicated to those children who are at risk for developing renal damage (Bjerklund, 2002).

2.5 Treatment of UTI in under Five Children

Seriously sick patients may be treated with oral fluids and antibiotics. Hospitalization is necessary for the following patients with UTI:

- Patients who are toxaemic or septic
- Patients with signs of urinary obstruction or significant underlying disease
- Patients who are unable to tolerate adequate oral fluids or medications
- Infants younger than 2 months with febrile UTI (presumed pyelonephritis)
- All infants younger than 1 month with suspected UTI, even if not febrile

Various antibiotics have been used for treatment of suspected UTI in children, commonly being parenteral Gentamycin, Cefotaxime, Ampicillin, Nitrofurantoin and Ceftriaxone (Rimoy *et al.,* 2006). However, the choice of antibiotics should be based on the results of sensitivity test.

2.6 Prevention of UTI in Children

Urinary tract infections may be difficult to prevent in children.

- In infants and toddlers, frequent diaper changes can help prevent the spread of bacteria that cause UTIs.
- When children begin self-care, it's important to teach them good hygiene. After every bowel movement, girls should remember to wipe from front to rear — not rear to front — to prevent germs from spreading from the rectum to the urethra.
- All children should be taught not to "hold it" when they have to go because urine that remains in the bladder gives bacteria a good place to grow.
- School-age girls should avoid bubble baths and strong soaps that might cause irritation, and they should wear cotton underwear instead of nylon because it's less likely to encourage bacterial growth.
- Children should also drink plenty of fluids and avoid caffeine, which can irritate the bladder.
- If test results show abnormalities of the urinary tract that raise the risk for repeated infections, then physicians are normally advised to prescribe a long-term prophylactic antibiotic treatment to minimize the risk of re-infections (Elder, 2011).
- Child should wear loose-fitting clothes. Tight clothes can trap moisture, which allows bacteria to grow.
- Cotton underwear is the best for a child since it lets in air to dry the area.
- If a child has constipation, proper medication therapy should be prescribed.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Description of the Study Area

This study was conducted in Morogoro Municipality, which is one of the seven Districts of Morogoro Region with a total area of 531 square kilometres. Administratively it has 1 Division, 29 Wards and 272 hamlets. The Municipal is situated at the foot of Uluguru Mountains, about 194 kilometres west of Dar es Salaam. It has a population of 315,866 according to 2012 Census. The Municipal has three Hospitals (Morogoro Regional Referral Hospital, Mzinga Hospital and Mazimbu Hospital), 13 health centres and 42 Dispensaries. The study was conducted particularly in Morogoro Regional Referral Hospital, Mafiga, Sabasaba and Uhuru Health Centres. MRRH on average attends 50-60 under five children in a day with admission ranging between 20 and 25, also both Mafiga, Sabasaba and Uhuru Health Centres attends the combined average of 50 under-fives per day according to data from respective health facilities.

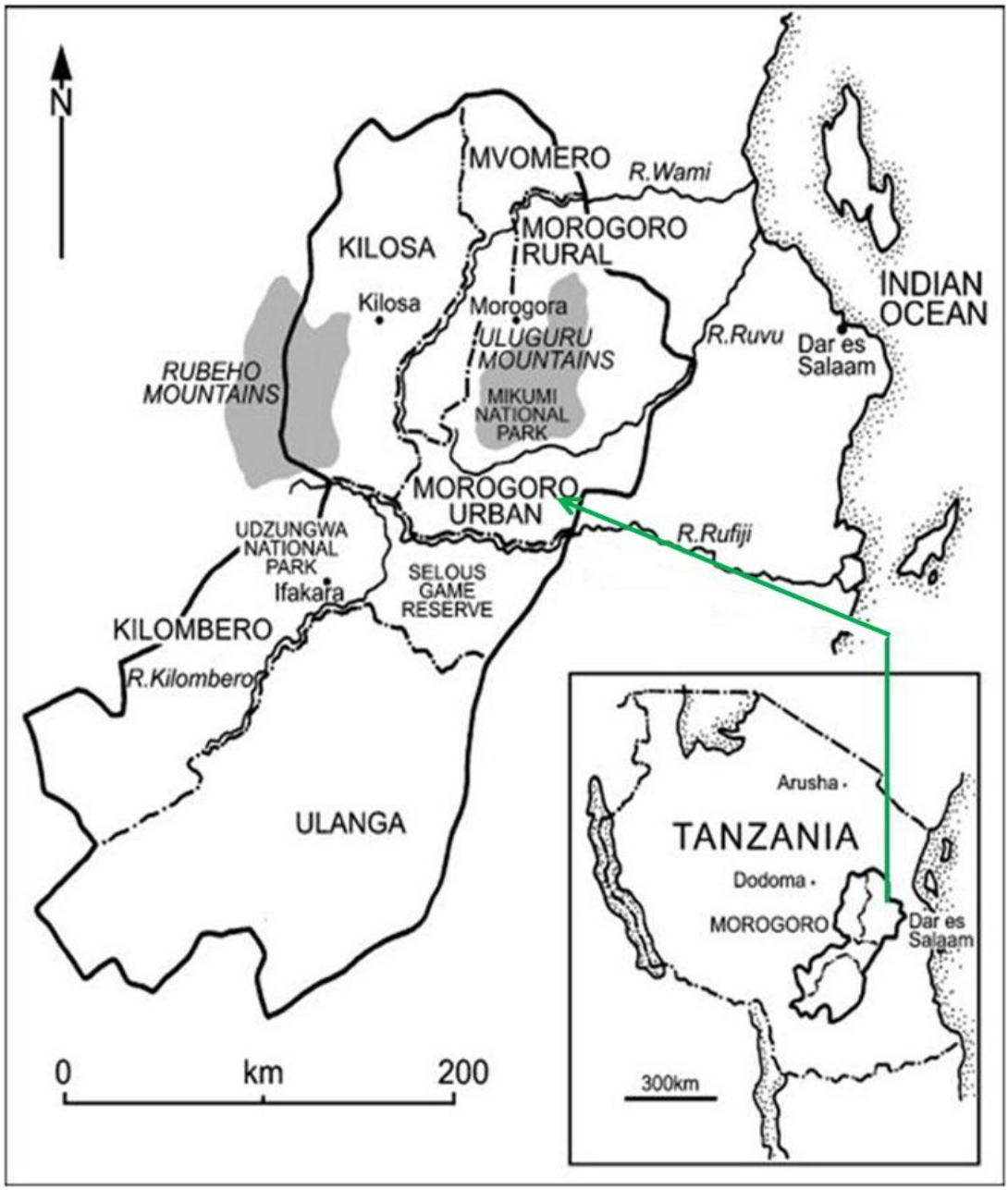

Figure 1: A map showing location of Morogoro Municipality

3.2 Study Design and Setting

The design for this study was cross-sectional panel study which was conducted from August 2014 to October, 2015. During this period, urine specimen was collected from children under five years who fulfilled the inclusion criteria and processed in the laboratory of SUA and NIMR at MRRH.

3.3 Study Population and Inclusion Criteria

All children under-five years of age presented to health facilities within the municipal with febrile illness (axillary temperature of ≥37.5˚C) from September 2014 August 2015 formed a study population. The patient's inclusion criteria were all children under-five years of age presented with febrile illnesses (≥37.5˚C), however, the study excluded children above five years and those who used antibiotics for the past seven days as well as those whose mothers or guardians refused or were not willing to participate to the study.

3.4 Sample Size Calculations

The sample size was calculated using the formula as described by Martin *et al.* (2007).

Sample size number; n-: = $\frac{Z^2 \text{ x } P\ (1\text{-}P)}{E^2}$

Where: Z is the percentage point corresponding to significance level. For a significance level of 5%, "Z" (Confidence interval) is 1.96, "P" is the prevalence of UTI among under five children attended Makongoro Health center, Mwanza Tanzania which is 20.3% (Msaki *et al.,* 2012), and "E" corresponds to the maximum likely errors, and is 0.05. Therefore the calculated sample size was:

Sample size number; n= $\frac{1.96^2 \text{x} 0.203\ (1\text{-}0.203)}{(0.05)^2}$ = 248.61, ≈249.

This resulted to the minimal sample size of 249 children for this study.

3.5 Ethical Consideration

The permission to carry out this study was sought from the authority of healthcare facilities and ethical clearance to conduct the study in Tanzania was issued by the ethics review subcommittee of the Medical Research Coordinating Committee of the Tanzania's NIMR Ref.No. NIMR/HQ/R.8a/Vol. IX/2000 (Appendix1). There was voluntary participation and free right of not participating or withdrawal at any time. Parent/Guardian was assured of anonymity and confidentiality throughout the study. Written consent

(Appendix 2) was sought from the guardian/parent prior to his/her participation in the study after thorough explanation of the aim of the study.

3.6 Data Collection

3.6.1 Prospective data collection through questionnaires

This study targeted all under-fives children with febrile conditions and not in antibiotics cover for the past seven days in Morogoro Municipality. Interviews were conducted with parents/guardians of targeted children using questionnaires. The questionnaire aimed at gathering information like bio data of patients including age, sex, place of residence as well as capturing general awareness of parents/guardians on UTI (Appendix 3). After interview, patients were carefully examined for clinical presentation and basic health parameters. This aimed at establishing any observable clinical manifestations, abnormalities and the general health status of a child.

3.6.2 Prospective data collection for bacteriological work

Urine specimens were collected aseptically where for children more than 2 years old, a clean catch method of mid-stream urine was used to obtain the sample after thorough cleaning using ®ULTRA COMPACT ANTIBACTERIAL WET WIPES, TURKEY; where, parents/guardians were provided with sterile urine collection container of approximately 15 ml (CORNING 430791, MEXICO). For children less than 2 years old, sterile urine collection bags (POLYMED PAEDIATRIC URINE COLLECTION BAG, POLY MEDICURE LTD, INDIA) were used to aseptically collect urine specimen due to their inability to control sphincter. Parents/guardians were instructed on how to tightly seal the filled specimen containers with mid-stream urine and handle them over to the research assistant, however, for samples collected using sterile urine bags, parents/guardians had to inform the researcher who aseptically collected the urine from the bags and transferred the

same into sterile urine collecting containers. Containers were then properly labeled and immediately transported to the laboratory for analysis within 24 hours. Hygienic practices like putting on gloves were considered by both, the researcher and parents/guardians throughout the exercise.

3.7 Laboratory Procedures

3.7.1 Urinalysis procedure

Before urine sample was further processed for culture and biochemical tests, part of the sample was taken for macroscopic urine analysis. Each sample was checked for turbidity and colour before a urine reagents strip (CYBOW^{TM} LOT 150318, DFI CO.LTD, KOREA) was dipped, and the results recorded in a minute. The test used provided information on urobilinogen, glucose, ketones, bilirubin, protein, nitrite, pH, blood, specific gravity as well as leukocytes status in the urine sample.

3.7.2 Media preparation and storage

Before culture was done, all the media were prepared in advance and the procedures for preparations were done according to manufacturer's instructions. After the media were prepared they were stored at 8^{o}C refrigeration until use. Different types of media were used as detailed in the subsequent sections.

3.7.2.1 Preparation of MacConkey agar

MacConkey agar composed of pancreatic digest of gelatin 17.0, lactose monohydrate 10.0, sodium chloride 5.0, peptones (meat & casein) 3.0, bile salts 1.5, neutral red 0.030, crystal violet 0.001 and bacteriological agar 13.5agar was used for the selective isolation and identification of Enterobacteriaceae from urine. The medium was prepared according to manufacturer's instruction by suspending 50 grams of the MacConkey powder (European

Pharm, Laboratorios Conda SA Madrid. Spain, ISO 21567.LOT 411121) into 1 litre of distilled water, followed by gentle boiling to dissolve completely. The medium was sterilized in the autoclave at 121ºC for 15 minutes, cooled to around 40ºC in a water bath. The medium was stored under refrigeration temperature until use.

3.7.2.2 Preparation of blood agar

Blood agar contains 10.0 g of heart infusion, 10.0g meat peptone, 5.0g sodium chloride and 15.0 g of bacteriological agar. The medium was prepared according to manufacturer's instructions by dissolving 40 g of blood agar powder (Laboratorious Conda SA Madrid. Spain. LOT 202211) in 1000 ml distilled water, mixed well and dissolved by heating with frequent agitation. Then gently boiled using thermal stable flask for one minute until complete dissolution then packed aseptically followed by autoclaving at 121ºC for 15 minutes then cooled to 50ºC. Aseptically 10% of 50 ml sterile defibrinated horse blood was added in the molten media mixed thoroughly and poured in the sterile glass petri dishes at the volume of 20 to 30 mls. The plates were left at room temperature for two hours for the media to solidify then incubated for 24 hours at 37ºC to check for sterility. Then the medium was stored under refrigeration temperature until use.

3.7.2.3 Triple Sugar Iron Agar (TSI)

Triple Sugar Iron Agar (OXOID® Ltd., Basingstoke, Hampshire, England, U.K.) is composed of 3 g `Lab-Lemco' powder, 3 g Yeast extract, 20 g Peptone, 5 g Sodium chloride, 10. g Lactose, 10. g Sucrose, 1 g Glucose, 0.3 g Ferric citrate, 0.3 g Sodium thiosulphate, 0.024 g Phenol red and 12 g Agar. (The medium was prepared by suspending 65 g of powdered medium in 1 litre of distilled water. It was boiled to dissolve completely, mixed well and distributed in to final petri dish). The medium was sterilized by

autoclaving at 121°C for 15 minutes. After sterilization procedure was completed, the medium was allowed to set in sloped form with a butt about 1 inch deep.

3.8 Laboratory Culture of the Samples

This procedure was performed to detect organisms that are the causative agents of urinary tract infections. Normally the urinary tract is sterile above the urethra. However, during non-invasive collection technique (example by using sterile paediatric urine collection bag) urine is potentially contaminated with the normal flora of the urethra and genitourinary tract. For this reason, urine cultures utilize a colon count (quantitation of growth) to aid in determining if dealing with contamination, colonization or infection. Therefore during the study, the diagnosis of urinary tract infection came after observing colon counts of more than 100 000 (10^5) or more organisms per 1 mil of urine.

Before performing urine culture, Gram staining technique was performed as described below. This was followed by inoculation of the sample on blood agar and MacConkey agar which was achieved by dipping 0.001 calibrated loops vertically, then quickly making a streak down the middle of the Blood Agar Plate with the loop containing urine. Then streak back and forth across the plate perpendicular to the original inoculum (creating a "lawn") then incubated at 37ºC under aerobic conditions and assessed for bacterial growth after 24, 48, 72 and 96 hours of incubation. Suspected bacteria colonies were purified by subculture on blood agar base and re-incubated at the same culture environment for 24 hours before bacteria identification.

3.9 Bacteria Identification

3.9.1 Morphology

Assessment of bacteria colony morphology characteristics on solid agar plates was used as first stage for identification. In most cases, the common bacteria colonies observed were

medium to small dry, flat pink reddish colonies on MacConkey plate agar characteristics for *Escherichia coli.* Other morphological features observed were large mucoid colonies with odour of fresh bread characteristic for *Klebsiella* spp, also medium green, rough colonies on blood agar plate with beta haemolytic and grape like smell characteristic for *Pseudomonas aeruginosa*. Very few samples found to have colonies which appeared small, shiny or dry with grey-white or colourless appearance on blood agar characteristic for *Streptococcus* spp also medium to large with sharp borders, round and convex in shape with creamy to golden colour, and some with zones of clear beta-haemolysis characteristics of *Staphylococcus* spp as well as white swarming colon on blood agar, non-lactose fermenting on Mac Conkey agar plate also positive hydrogen sulphide and urea characteristic for *Proteus* spp.

3.9.2 Gram staining technique

The Gram stain of the bacterial colony was done on sterile glass slide as described by Hans Christian Gram in 1884. Briefly, a drop of normal saline was put on a glass slide and loop full of bacteria colony was added and made a smear which was dried in air and fixed on flame. The fixed smear was flooded with crystal violet stain for 30 – 60 seconds, washed with tap water and flooded again with Lugol's iodine for 30 – 60 seconds followed by second washing with tap water. Acetone-alcohol was used to decolorize the smear before the third washing was applied. The smear was then counterstained with neutral red that stayed for 2 minutes then washed off with tap water. The back of the slide was wiped clean and placed on a draining rack for the smear to air dry. A drop of oil immersion was added on the smear and examined under the light microscope first at 40X objective to check the staining and the distribution of material and then at 100X objective to visualize the morphology of the bacteria. Gram positive bacteria appeared dark purple and Gram negative bacteria appeared pale to dark red.

3.9.3 Biochemical tests

To isolate uropathogens, each collected specimen was streaked on both blood and MacConkey agar (Oxoid Ltd. Bashingstore Hampaire, UK) using calibrated loops. This was used as a semi-quantitative method for approximate enumeration of the isolates in order to decide when a particular sample was UTI positive or not. Inoculated plates were then incubated aerobically at 37^0C for 24 hours, and those cultures which became negative at the end of 24 hours were further incubated for 48 hours. A specimen was considered positive for UTI if a single organism was cultured at a concentration of $\geq 10^5$ cfu/ml of urine specimen. Bacterial identification was made using biochemical tests, namely indole, methyl red, voges proskauer and citrate (IMViC), triple sugar iron (TSI), catalase, coagulase, and urease and oxidase tests.

3.9.3.1 IMViC

Indole test

A tube Indole test method was adopted in this case where bacterial colonies were emulsified in tryptophan broth followed by incubation at 37^0C for 24 hours in ambient air. Then 0.5 ml of Kovac's reagent was added to the broth culture and the resulting mixture observed for a positive reaction (Pink colored ring).

Methyl Red and Voges Proskauer Tests

These two tests were performed consecutively where bacterial cultures were inoculated into two tubes containing methyl red (MR) and Voges Proskauer (VP) broth. The tubes were incubated at 37^0C for 24 hours, then 5 drops of methyl red indicator solution was added to the tube containing MR broth, while to the tube containing VP broth, 0.6 ml of 5% alpha naphthol, followed by 0.2 ml of 40% KOH were added. The tube for VP test was then shaken gently and exposed to atmospheric oxygen for 10 to 15 minutes and the

results read. Results for MR test was read within a few minutes following addition of the MR indicator. Positive results for MR test was presented by development of a stable red colour in the surface of the medium which meant production of sufficient acid that lowered the pH to 4.4, while for the VP test a positive reaction was presented by the development of a red color 15 minutes or more after the addition of the reagents indicating the presence of diacetyl, the oxidation product of acetoin).

Citrate Test

Simmons Citrate Agar was inoculated by touching the tip of a needle lightly on the slant of a 24 hours old culture under test, followed by incubation at 37^0C for 24 hours. Then observation was made for a positive reaction (development of blue coulouration which denoted alkalinization).

3.9.3.2 Triple Sugar Iron (TSI)

This test was used to identify bacteria that ferment any of the three sugars (1% lactose, 1% sucrose and 1% glucose) in the medium. Using a sterile inoculating needle, a 24 hours culture was picked from Trypticase soy broth (TSB). Using the needle, a stab was made into the sterile TSI slant medium up to the butt of the TSI tube and then the needle was streaked back and forth along the surface of the slant. The TSI slant tube was then incubated for 24 hours at 37^0C and observed for positive reactions.

- glucose fermentors: Alkaline slant (red) and acid butt (yellow) with or without gas production (breaks in the agar butt)
- sucrose or lactose fermentors: Acid slant (yellow) and acid butt (yellow) with or without gas production
- No carbohydrate fermentation (only peptone catabolization): Alkaline slant (red) and alkaline butt (red) or no change (orange-red) butt

- Hydrogen sulfide (H_2S) production
- CO_2 production

3.9.3.3 Catalase test

A drop of sterile normal saline was put on a sterile glass slide followed by 1 to 2 colonies of pure bacterial culture. Then a thick smear was made and a drop of 3% hydrogen peroxide was added. A positive catalase reaction was based on appearance of effervescence within few seconds.

3.9.3.4 Coagulate test

Glass microscopic slide method was adopted in this case where a clean microscopic slide was divided into two using a pencil (one side for a test and the other for a control). Then a drop of sterile distilled water was placed on either side of the slide followed by emulsification of one to two colonies of pure bacterial culture. Then the test suspension was treated with a drop of rabbit plasma and thoroughly mixed. A positive reaction was based on formation of clumping within 5 to 10 seconds.

3.9.3.5 Urease test

This test was performed to identify bacteria that have the ability to split urea in the presence of water to release ammonia and carbon dioxide due to possession of urease enzyme among the isolates. The principle being that, ammonia combines with carbon dioxide and water to form ammonium carbonate which turns the medium alkaline, and thus turning the indicator phenol red from its original orange yellow color to bright pink. Using sterile wire loops organisms were picked from Tryptic broth culture and inoculated into appropriately labeled tubes containing sterile urea broth followed by incubation at 37^0C for 24 to 48 hours. Then the tubes were examined for colour changes.

3.9.3.6 Oxidase test

This test was performed to separate oxidase positive from oxidase negative bacteria from the isolates. A drop of oxidase reagent (reagent with substrate tetramethyl-p-phenylenediamine dihydrochloride) was put on a filter paper and then a colony or two of the test organism was slowly smeared on the drop site and colour change observed within 10 to 30 seconds. A positive reaction was based on colour change to deep blue or purple.

3.9.4 Antimicrobial sensitivity testing

All identified isolates were subjected to antimicrobial susceptibility tests to the commonly used antibiotics in UTI treatment [10 µg Ampicillin (AMP), 30 µg Chloramphenicol (CHL), 10 µg Gentamycin (GEN), 15 µg Erythromycin (ERY), 10 µg Ciprofloxacin (CIP), 30 µg Cotrimoxazole (COT), 10 µg Clindamycin (CD), 30 µg Ampiclox (APX), 30 µg Ceftriaxone (CRO) and 30 µg Nalidixic acid (NAL)] by the Kirby-Bauer disk diffusion method according to the Clinical Laboratory Standards Institute (CLSI, 2012). Briefly, the isolates were sub-cultured onto nutrient agar and incubated at 37^0C for 24 hours, and then one to two colonies were picked using a sterile wire loop and introduced into 5 ml of sterile normal saline in universal bottles and mixed. The turbidity of the mixture was then compared with a 0.5 mcFar land standard. Then 200 µl of the suspension was dispensed onto Mueller-Hinton agar plates and spread by using a sterile glass spreader for confluent growth as described by Luangtongkum *et al.* (2007). The plates were then allowed to dry and the antibiotic discs dispensed using a sterile forceps. The plates were then incubated overnight at 37^0C and the zones of inhibition were measured using a ruler and compared with standard antimicrobial resistance charts. Results were recorded as resistant or sensitive based on absence or presence of zone of inhibition respectively (Lennette, 1995).

3.10 Data Management and Analysis

Collected data were verified, cleaned and entered in Microsoft excel spread sheet. Analysis was achieved by using Epi Info version 7 Statistical Software (Coulombier *et al.,* 2001). To compare the proportions (%) of UTI in children less than five years between categories, chi square was used at critical probability of $P<0.05$ at 95% confidence interval using Stat Calc function on Epi Info Version 7. The proportions considered in the comparisons of the UTI in children included the possible risk factors like sex, age, clinical features (fever, inappetance, vomiting, bed wetting) urinalysis results (urine colour, turbidity, nitrite) and cleanliness patterns of a child after urination or defecation.

CHAPTER FOUR

4.0 RESULTS

4.1 General results

A total number of 275 children under five years of age with febrile illnesses (axillary temperature of ≥ 37.5°C) were involved in the study and their mothers/care givers were administered with questionnaires in order to establish their awareness on UTI.

4.1.1 Demographic characteristics of the respondents (mothers/care givers of under-fives)

The demographic data of 275 respondents involved in the study are shown in Table 1. Majority of the respondents had the age between 26 and 35 years, were married, their ethnic group was mostly Luguru and the level of education to majority was primary school.

Table 1: Demographic characteristics of mothers/care givers of under-fives at Morogoro Municipality, Tanzania (n= 275)

Parameter	Category	Number	Percent
Age (in years)	15– 25	55	20.0
	26 – 35	171	62.2
	36 – 45	39	14.2
	Above 45	10	3.6
Marital status	Single	61	22.2
	Married	190	69.1
	Widow/Widower	17	6.2
	Divorced	7	2.5
Level of education	No formal education	22	8.0
	Primary education	160	58.2
	Secondary education	61	22.2
	College	32	11.6
Ethnicity (tribe)	Luguru	132	48.0
	Kaguru	37	13.5
	Pogoro	33	12.0
	Chagga	22	8.0
	Others*	51	18.5
Religion	Christian	156	56.7
	Muslim	119	43.3

Others*means tribe less than 15 were included in others' category

4.1.2 Awareness on UTI among mothers/baby care givers in Morogoro Municipality

Awareness on UTI among mothers/baby care givers and general other information gathered from the respondents are summarized in Table 2. All of 275 mothers/baby care givers who were interviewed confessed that they had heard about UTI especially in children. When they were asked about signs of UTI, majority (93.8%) reported pain during urination as a major signs of UTI in children and the transmission mostly is by a baby staying with a wet pant for a long time. Nevertheless, majority of respondents reported their baby to urinate up to 8 times a day. Most respondents (85.5%) reported to know the treatment of UTI being antibiotics. Sanitation of toilets, frequent change of gears used in children for urine control in children and a better choice of such gears were reported as control measures of UTI in children. Several other information on UTI were explored and the results are detailed in Table 2.

Table 2: Awareness of UTI among mothers/baby care givers (n=275)

Item assessed	Category	Frequency	Percentage
Signs of UTI	Pain during urination	258	93.8
	Frequent urination	164	59.6
	Bed urination	116	42.2
	Coughing	59	21.5
Transmission of UTI	Delay in urination	223	81.1
	Dirty toilet	235	85.5
	Wet pant	241	87.6
How often a child urinate per day?	4 to 8 times	227	84.4
	More than 8 times	42	15.6
	Not sure	6	2.2
Do you know the treatment of UTI?	Yes	235	85.5
If yes, which medicines are used to treat UTI?	Antibiotics	201	73.1
	Drips	4	1.5
	Drinking more water	5	1.8
	Herbs	24	8.7
Prevention of UTI in children	Toilet sanitation	235	85.5
	Cloth sanitation	135	49.1
Gears used in children for urine control	Nappy	142	51.6
	Piece of khanga	39	14.2
	Underpants/shorts	81	30.9
	Pampers	9	3.3
Frequency of change of urine control gears in children	Every after urination or defacation	240	87.3
	After 6-8 hours	35	12.7
When urine control gears are used in children	Always	216	78.5
	During day time	39	14.2
	Occasionally	13	4.7
	During night	7	2.5
Toilet type at home	Flash	224	81.5
	Pit latrine	51	18.5
At what age does your baby start self washing	5 to 6 years	239	86.9
	7 to 8	29	10.6
	Above 8	7	2.5
Who takes care of a baby at home	House girl	20	7.3
	Mother	255	92.7
Can a house girl be a possible source of UTI to a baby?	Yes	106	38.5
	No	169	61.5
If yes, how can a house girl be a possible source of UTI to a baby?	Carelessness	48	45.3
	Delay to change urine control gears once wet	36	33.9
	Poor hygiene	15	14.2
	Don't know	7	6.6
Do you clean baby after urination/defacation	Yes	265	96.4
	Self cleaning	10	3.6
How do you clean a baby after urination/defaecation	From front backwards with water and soap	261	94.9
	Random with water and soap	14	5.1

4.1.3 Clinical characteristics and predictors of UTI in the study children

The clinical characteristics and predictors of UTI in the study children are summarized in Table 3. It was found that children aged between 0 and 36 months had more cases of UTI compared to those with the age of 37 to 60 months. Predictors of UTI in babies that were found to be statistically significant were inappetence, frequent urination, nitrite in urine, bed wetting and washing of baby with no specific patterns after urination /defecation.

Table 3: Clinical characteristics and predictors of UTI in the study children at Morogoro Municipality, Tanzania (n= 275)

Variable	Category	Number (%) of culture positive cases	Number (%) of culture negative cases	OR	95% CI	P value
Age (months)	0 - 36	98 (43.4)	128 (56.6)	0.9396	0.505 – 1.749	0.0014*
	37 - 60	22 (44.9)	27 (55.1)			
Sex	Female	65 (41.9)	90 (58.1)	1.1716	0.725 - 1.89	0.2744
	Male	55 (45.8)	65 (54.2)			
Fever	Yes	120 (43.6)	155 (56.4)	-	-	-
Inappetance	Yes	117 (43.5)	152 (56.5)	0.7697	0.153 - 3.883	0.0097*
Vomiting	Yes	84 (46.4)	97 (53.6)	1.3952	0.839 - 2.319	1.3415
Bed wetting	Yes	54 (43.9)	69 (56.1)	1.0198	0.632 - 1.647	0.0018*
Urine colour	Abnormal	101 (42.8)	135 (57.2)	1.2698	0.644 - 2.503	0.2667
	Normal	19 (48.7)	20 (51.3)			
Urine turbidity	Clear	66 (40.2)	98 (59.8)	1.4067	0.866 - 2.286	1.9012
	Turbid	54 (48.6)	57 (51.4)			
Nitrite	Positive	23 (82.1)	5 (17.9)	7.1134	2.616 - 19.342	0.000007
Baby caring	House girl	7 (35)	13 (65.0)	1.4779	0.571 - 3.827	0.3302
	Mother	113 (44.3)	142 (55.7)			
Baby washing style after urination/ defecation	Front backward	113 (43.3)	148 (56.7)	1.3097	0.447 -3.841	0.0468*
	Random, no specific pattern	7 (50.0)	7 (50.0)			
Type of toilet	Flash system	95 (42.4)	129 (57.6)	1.3057	0.710 -2.402	0.4935
	Pit latrine	25 (49.0)	26 (51.0)			
Irritation of urinating organs	Yes	4 (57.1)	3 (42.9)	1.7471	0.384 - 7.960	0.1183
Frequent urination	Yes	33 (78.6)	9 (21.4)	5.9004	2.694 - 12.925	0.0000*

* Statistically significant when $P<0.05$ at 95% confidence interval

4.1.4 Urinalysis results

The urinalysis results are summarized in Table 4. Most of the study children (74.6%) had their urine appearing yellow in colour and substantial number (40.4%) had turbid urine. Some urine samples had some abnormalities like having urobilirubin, glucose, proteins, nitrates, bilirubin, ketones, traces of red blood cells and leucocytes. The specific gravity of urine was above normal (1.03) in 4.4% of the examined children while 5.5% of the children had urine with pH of above normal level of 8.0.

Table 4: Urinalysis results in the study children at Morogoro Municipality, Tanzania (n= 275)

Urine parameter	Category	Frequency	Percentage
Colour	Normal (clear transparent)	40	14.5
	Pale to deep yellow	205	74.6
	Cloudy milky	19	6.9
	Cloudy yellow	11	4.0
Turbidity	Turbid	111	40.4
Glucose	Positive	2	0.7
Bilirubin	Positive	3	1.1
Ketones	Positive	1	0.4
Specific gravity	Normal (1.0 to 1.03)	260	94.5
	Above 1.03	15	5.5
Blood in urine	Positive	1	0.4
pH	Normal (4.5 - 8.0)	263	95.6
	Above normal	12	4.4
Protein	Traces	25	9.4
Nitrate	Positive	10	3.6
	Traces	35	12.7
Leucocytes	Positive	44	16.0

4.1.5 Bacteria isolation in relation to age and sex of children

A total of 120 (43.6%) of the urine samples had bacterial growth as shown in Table 6 which was used as confirmatory test for UTI in children. The results show that children with the age between 0 to 36 months had more bacteria growth (35.6%) and female children (23.6%). Female children were more affected (23.6%) compared to males (20%). Among the isolated bacteria, Gram negative bacteria were the most predominant

uropathogens. *E. coli* was the mostly isolated bacteria (18.2%) with highest isolation frequency in children of the age between 0 and 36 months. Female children were also mostly affected (11.3%) by *E. coli. Streprococcus, Enterobacter* and *Citrobacter* were the least isolated bacteria in children urine at Morogoro referral regional hospital.

Table 5: Bacteria isolation in relation to age (months) and sex of children at Morogoro Municipality, Tanzania

Bacteria species isolated	Age category: Number (per cent) affected			Sex: Number (per cent) affected		
	0 to 36 months	37 to 60 months	Total	Female	Male	Total
E. coli	43 (15.6)	7 (2.5)	50 (18.2)	31 (11.3)	19 (6.9)	50 (18.2)
Klebsiella	20 (7.3)	8 (2.9)	28 (10.2)	16 (5.8)	12 (4.4)	28 (10.2)
Staphylococcus	17 (6.2)	5 (1.8)	22 (8.0)	10 (3.6)	12 (4.4)	22 (8.0)
Proteus	7 (2.5)	2 (0.7)	9 (3.3)	4 (1.5)	5 (1.8)	9 (3.3)
P. aeruginosa	3 (1.1)	0 (0.0)	3 (1.1)	1 (0.4)	2 (0.7)	3 (1.1)
Micrococcus	2 (0.7)	1 (0.4)	3 (1.1)	0 (0.0)	3 (1.1)	3 (1.1)
Streprococcus	2 (0.7)	0 (0.0)	2 (0.7)	1 (0.4)	1 (0.4)	2 (0.7)
Enterobacter	2 (0.7)	0 (0.0)	2 (0.7)	2 (0.7)	0 (0.0)	2 (0.7)
Citrobacter	1 (0.4)	0 (0.0)	1 (0.4)	0 (0.0)	1 (0.4)	1 (0.4)
Total	98 (35.6)	22 (8.0)	120 (43.6)	65 (23.6)	55 (20.0)	120 (43.6)

4.1.6 Antimicrobial sensitivity patterns of isolated bacteria from urine

Antimicrobial sensitivity test of isolated bacterial from urine samples was performed against different antibiotics (Table 6). It was observed that of all the bacteria isolated (n=120), high resistance was observed with clindamycin (97.5%), Cotrimoxazole (85.8%), Ampicillin (73.3%), Ciprofloxacin (70.8%), Erythromycin (72.5%) and Ampiclox (68.3%). *E. coli* was sensitive to Chloramphenicol only and resistant to the rest of the other 9 tested antibiotics. All the 50 isolates of *E. coli* were resistant to Ampicillin. *Klebsiella* was resistant to Erythromycin, Ampicillin, Ciprofloxacin and Clindamycin at the variable rates while *Staphylococcus* was resistant to clindamycin and ampicillin. *Proteus* was resistant to Cotrimoxazole and Clindamycin while *Pseudomonous* was resistant to seven of the antibiotic tested. Chloramphenicol was the only antibiotic which was active against almost all bacteria isolates except *Pseudomonous* spp.

Table 6: Antibiotic sensitivity patterns of isolated bacteria (numbers and percentages) from children below 5 at Morogoro Municipality, Tanzania

Bacteria isolates	Number (%) of isolates sensitive to different antimicrobial agents									
	Chlora	**Erythro**	**Ampi**	**Cipro**	**Cotri**	**NA**	**Clinda**	**Ampcl**	**Ceftria**	**Genta**
E. coli (n=50)	45 (90.0)	16 (32.0)	0 (0.0)	14 (28.0)	22 (44.0)	16 (32.0)	19 (38.0)	9 (18.0)	18 (36.0)	19 (38.0)
Klebsiella (n=28)	22 (78.5)	11 (39.2)	12 (42.8)	9 (32.1)	11 (39.3)	27 (96.4)	9 (32.1)	27 (96.4)	25 (89.3)	24 (85.7)
S. aureus (n=22)	22 (100.0)	19 (86.4)	20 (90.9)	19 (86.4)	17 (77.3)	18 (81.8)	9 (40.9)	6 (27.3)	17 (77.3)	21 (95.5)
Proteus (n=9)	7 (77.7)	8 (88.8)	9 (100)	9 (100.0)	3 (33.3)	8 (88.9)	4 (44.4)	8 (88.9)	8 (89.9)	9 (100.0)
Pseudomonous (n=3)	0 (0.0)	3 (100.0)	3 (100)	2 (66.7)	1 (33.3)	1 (33.3)	0 (0.0)	1 (33.3)	3 (100.0)	1 (33.3)
Micrococcus (n=3)	3 (100)	3 (100.0)	1 (33.3)	3 (100)	1 (33.3)	2 (66.7)	3 (100)	3 (100)	2 (66.7)	3 (100.0)
Streprococcus (n=2)	2 (100)	0 (0.0)	1 (50.0)	2 (100)	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	2 (100.0)	2 (100.0)
Total	101 (84.2)	33 (27.5)	32 (26.7)	35 (29.2)	17 (14.2)	57 (47.5)	3 (2.5)	38 (31.7)	57 (47.5)	59 (49.2)

Chlora = Chloramphenicol, Erythro = Erythromycin, Ampi = Ampicillin, Cipro = Ciprofloxacin, Cotri = Cotrimoxazole, NA = Nalidixic acid, Clinda = Clindamycin, Ampcl = Ampiclox, Ceftria = Ceftriaxone, Genta = Gentamycin

CHAPTER FIVE

5.0 DISCUSSION

UTI is among the common cause of febrile illness in children less than 5 years of age in Sub-Saharan Africa (Jeena *et al.,* 1996; Adjei *et al.,* 2004). The occurrences of UTI in children are variable and differ from place to place, because it depends on various factors like sex of children, nutritional status and hygienic care. Other factors that may cause variations in prevalence may be sampling techniques (Clean midstream catch, transurethral catheterization, suprapubic aspiration and urinary bags) and laboratory methodologies employed in diagnosis (Fredrick, 2010).

This study determined the epidemiology of UTI among under-fives children with febrile conditions in Morogoro Municipal and established bacterial susceptibility profiles to commonly used antibiotics in treatment. All the 275 children of less than 5 years of age that were involved in the study had fever and UTI significantly contributed to the observed febrile illness

During the current study, the prevalence of urinary tract infection by culture was 43.6%. Several other studies in Tanzania have reported various levels of UTI in children. The prevalence observed in the current study is comparable to previously reported by Festo *et al*. (2011) who reported children UTI prevalence of 39.7% at Bugando Medical Centre, Tanzania. Elsewhere in Pakistan, almost similar UTI prevalence of 37.5% has been reported in febrile children (Anisur *et al.,* 2008). Other studies in Tanzania have reported low prevalence of UTI in children less than 5 years of age which ranged between 3.3% and 20.3% (Msaki *et al.,* 2012; Fredrick *et al.,* 2013; D'Acremont *et al.,* 2014; Ntukula, 2014; Chipwaza *et al.,* 2015; Hildenwall *et al.,* 2016).

In this study, positive nitrate, frequency in urination, bed wetting and washing of baby with no specific patterns after urination/ defecation were the predictors of UTI and were statistically significant compared to the study done by Fredrick *et al.* (2013) which showed insignificance. Most of the predictors were also reported in the region by (Musa-Aisien *et al.,* 2003; Festo *et al.,* 2011; Fredrick *et al.,* 2013).

All mothers/baby care had heard on UTI especially in children and were able to mention the signs, treatment and control measures. With the findings of this study, urinary tract infection is a serious problem to children of less than 5 years of age and deliberate measures need to be taken to minimize the magnitude of the problem. The results of this study indicated a high magnitude of urinary tract infection in Morogoro Municipality, which may reflect a number of predisposing factors including the children with malformed and obstructed urinary tract, prematurity, lack of circumcision in males, Hirschsprung's disease, constipation, trauma, diabetes, malnutrition, poor hygiene and weak immunity as reported by (Jeena *et al.,* 1996; Adjei and Opoku, 2004; Vasudevan, 2014).

During the current survey, majority of the respondents had the age between 26 and 35 years suggesting that this is the reproductive age for most of African women. The good observation among respondent mothers was that most of them were married meaning that the study children had two parents who otherwise help each other in taking care of the children in a household. In Morogoro region, the dominant ethnic groups are Luguru, Kaguru and Pogoro as was signified by having high number of respondent mothers/care givers during the current study (Table 1). Majority of the respondents had a primary school. Such low level of education can have many implications when it comes to public health education including the child care educations normally given when babies are sent for postnatal clinic.

The current study observed that the level of awareness on UTI among mothers/baby care givers was high signifying that they understood that UTI is among the common diseases of children (Table 2). The mothers were able to list the common signs of UTI, its transmission and control measures. Regardless of such high level of awareness to mothers/baby care givers, UTI is still a disease with high prevalence in children and significant contribute to high morbidity and mortality rates. Good hygiene to children that include clean toilets, proper choose and use of gears for urine control in children, frequent change of gears used in children for urine control, immediate and proper washing and or cleaning of a baby after urination/defecation were all mentioned by the respondents as measures for control of UTI. If such measures would be practiced by the respondents, it is anticipated that the magnitude of UTI among children could be minimized.

It is reported in other studies that UTI is among the common causes of long term febrile illnesses in children below five years of age (Jeena *et al.,* 1996; Adjei and Opoku, 2004; Msaki *et al.,* 2012; Fredrick *et al.,* 2013; D'Acremont *et al.,* 2014; Festo *et al*., 2011). During the current study, all the 120 UTI cases had high fever summing to 40°C. Such feverish cases also were associated with lack of appetite. Frequent urination which normally may be associated with bed wetting is due to irritation imposed by the bacteria infecting the urinary system (Shaikh *et al.,* 2008). Nitrite in urine when detected suggests that there is reduction of nitrate which is normally done by Gram positive bacteria like *Staphylococcus* and it is an indication of UTI (Fredrick *et al.,* 2013). During the current study, 82.1% of the children who had nitrite in the urine were culture positive and the mostly identified bacteria were *Staphylococcus*. Therefore predictors of UTI observed can be used by the clinicians as aiding factors in diagnosis of the disease in children.

It is known that normal urine colour in healthy babies is supposed to be straw yellow or water-colored urine suggestive of adequate hydration (Hoberman *et al*., 1993; Gorelick and Shaw, 1999; Bachur and Harper, 2001). When a child is dehydrated the urine may appear yellow in colour. There are many other problems which may cause abnormal colour of urine like liver or bile duct problem making the urine to appear orange, reddish/brown or dark appearance (haemoglobinuria & myoglobinuria) and purple implies porphyria (Hoberman *et al*., 1993; Gorelick and Shaw, 1999; Bachur and Harper, 2001). Other urine colour change like green or blue, cloudy or murky, it may be a sign of a urinary tract infection or kidney stones. Cloudy or milky urine is also a sign of a urinary tract infection, which may also cause a bad smell (Jeena *et al.,* 1996). Milky urine may also be caused by bacteria, crystals, fat, white or red blood cells, or mucus in the urine. Some of the medicines, supplements and food may also change the colour of urine. Indeed, all the turbid cloudy, milky urine and those with traces of blood cells (red blood cells & leucocytes) that were observed during this study were positive cases of UTI (Hoberman *et al*., 1993; Gorelick and Shaw, 1999; Bachur and Harper, 2001). Therefore, such urinalysis findings can also be used as predictors of UTI in children.

Other urine impurities were also detected in the urinalysis which also suggests some problems of different kinds. Presence of bilirubins may show evidences of jaundice. Appearances of glucose and ketones in the urine may imply diabetic case. High levels of proteins (proteinuria) indicate problems with kidneys like infections (Hoberman *et al*., 1993; Gorelick and Shaw, 1999; Bachur and Harper, 2001).

It was further found that children aged less than three years were more affected especially female children (23.6%). This was also observed in other studies done by Festo *et al.* (2011); Fredrick *et al.* (2013); Ibeneme *et al.* (2014) and Christine *et al.* (2014).

This age group is vulnerable to infectious diseases and forms a large group of children that suffers from febrile illness in the developing countries (Hori *et al.,* 1993). This may be due to factors related to body immunity. Also this age category is still dependant on their mothers/care givers for almost everything. Poor hygiene and carelessness especially after urination or defecations predisposes the children to urinary tract infection. In addition, female children were more affected (23.6%) compared to males (20%) although the statistically, the difference was not significant. Predisposition of females could be due to differences in anatomical structure i.e. the shortness of the urethra in women with its close proximity to the anus makes it easier for bacteria to ascend in the urinary tract (Minardi *et al.,* 2011).

In the 120 UTI-positive cases by culture, nine bacteria species were found being dominated by *E. coli* (Table 5) which showed multi-antibiotic resistance to most of the used antibiotics. This was also observed by Mshana *et al.* (2012) and Festo *et al.* (2011). The predominance of *E. coli* as a cause of UTI has been reported also from other studies (Biyickli *et al.*, 2004; Festo *et al*., 2011; Fredrick *et al.,* 2013; Msaki *et al.,* 2012) though a study by Osegbe *et al.* (1991) reported *Staphylococcus aureus* as the common cause of UTI in children while Christine *et al.* (2014) reported Proteus species as the commonest cause in under-fives children. *E. coli* is the member of gastrointestinal tract and normally infection is derived from the patient's own faecal flora. For the children up to approximately age 5 years are predisposed to UTIs, partly because of periurethral colonization by faecal bacteria like *E. coli, Klebsiella* and *Proteus* species as was the case during the current study (Ronald, 2002).

This study has also established that most of bacteria identified showed multi-antibiotic resistance especially to Clindamycin (Table 6). This is a serious problem and an emerging

worldwide problem being worse in developing countries. The tested antibiotics are among the commonly used in Tanzania for treatment of UTI in children; the high resistance rate observed in this study poses great challenges in the treatment options. *E. coli* was sensitive to chloramphenicol only and resistant to the rest of the other 9 tested antibiotics. Similar findings have been reported in other studies (Fredrick *et al.,* 2013; Msaki *et al.,* 2012; Festo *et al*., 2011). The observed resistance with *E. coli* and other bacteria may be contributed by irrational use of antibiotics in the community, i.e. wrong prescription or poor adherence. Other factors which cause development of resistance could be the easy availability and rampant use of broad-spectrum antibiotics in the presumptive treatment of infections even in health centres. Lack of enforcement of regulations on antibiotic use as a part of infection control programmes could have influenced the pattern of resistance results to a considerable degree.

The results of the current study generally showed that the problem of UTI in children attended at healthcare facilities in Morogoro Municipal is big and requires immediate intervention.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

From the findings of this study it is concluded that:

(a) The level of awareness on UTI was high among the mothers/children care givers.

(b) There is high prevalence of urinary tract infection at Morogoro Municipality as confirmed through culture, and this is more than the previous studies reported by (Fredrick *et al.,* 2013; Msaki *et al.,* 2012; Festo *et al.,* 2011; Christine *et al.,* 2014 and Ibeneme *et al.,* 2014).

(c) Predictors of UTI in children that were found to be statistically significant ($P<0.05$) were inappetance, frequent urination, nitrite in urine, bed wetting and washing of baby with no specific patterns after urination/ defecation.

(d) The urinalysis results showed that most children had yellow and turbid urine and some abnormalities like urobilirubin, glucose, proteins, nitrates, bilirubin, ketones, traces of red blood cells and leucocytes

(e) Young children below 36 months more affected than older counterpart

(f) Female children were found to be more affected by UTI

(g) Nine bacteria were isolated in urine being dominated by *E. coli*, *Klebsiella* and *Staphylococcus*

(h) All the bacteria isolated were resistant to most of the commonly used antibiotics

6.2 Recommendations

Based on the conclusions above, it is therefore recommended that:

(a) More studies should be carried out to explore the exact reason for UTI transmission in Morogoro Municipality since the prevalence of UTI was found to be high together

with the awareness of respondents to UTI. This could suggest possible presence of malpractices when it comes to handling children, and therefore if such measures would be practiced properly by the respondents, it is anticipated that the magnitude of UTI among children could be minimized.

(b) The observed resistance patterns associated with the commonly prescribed antibiotics in the Municipal are in line with the current changing patterns of microbial antibiotics resistance threatening not only the developing countries but the entire world. Therefore enforcement of law regards to antibacterial usage for these isolated microbes needs to be instituted.

(c) While the golden standard in confirming diagnosis of UTI remains bacteriological identification by culture of the specimen, the leucocyte esterase as well as nitrite tests used together in combination is useful in making the diagnosis of UTI highly probable, hence help in presumptive treatment with close follow up.

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APPENDICES

Appendix 1: NIMR ethical clearance certificate

THE UNITED REPUBLIC OF TANZANIA

National Institute for Medical Research
3 Barack Obama Drive
P.O. Box 9653
11101 Dar es Salaam
Tel: 255 22 2121400
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NIMR/HQ/R.8a/Vol. IX/2000

Ministry of Health and Social Welfare
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12th August 2015

Alex F Magufwa
Sokoine University of Agriculture,
C/O Dr. Lucas Matemba,
NIMR Head Quarters,
P.O.Box 9653 , DAR ES SALAAM

CLEARANCE CERTIFICATE FOR CONDUCTING MEDICAL RESEARCH IN TANZANIA

This is to certify that the research entitled: Epidemiology of Urinary Tract Infection among Children under Five Years Presenting to the Health Facilities with Febrile Conditions in Morogoro Municipality, Morogoro, Tanzania, (Magufwa A *et al*), whose supervisor is Dr. Lucas Matemba of NIMR Head Quarters, Dar Es Salaam has been granted ethical clearance to be conducted in Tanzania.

The Principal Investigator of the study must ensure that the following conditions are fulfilled:

1. Progress report is submitted to the Ministry of Health and the National Institute for Medical Research, Regional and District Medical Officers after every six months.
2. Permission to publish the results is obtained from National Institute for Medical Research.
3. Copies of final publications are made available to the Ministry of Health & Social Welfare and the National Institute for Medical Research.
4. Any researcher, who contravenes or fails to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine. NIMR Act No. 23 of 1979, PART III Section 10(2).
5. Sites: Health Facilities in Morogoro Municipality, Morogoro, Tanzania.

Approval is for one year: 12th August 2015 to 11th August 2016.

Name: Dr Julius J Massaga

Signature
Ag CHAIRPERSON
MEDICAL RESEARCH
COORDINATING COMMITTEE

Name: Dr Margaret E Mhando

Signature
Ag CHIEF MEDICAL OFFICER
MINISTRY OF HEALTH, SOCIAL WELFARE

CC: **RMO**
DED
DMO

Appendix 2: Questionnaire for mothers/caregivers

TEST FOR KNOWLEDGE OF THE FACTORS ASSOCIATED WITH UTI IN FEBRILE UNDER FIVE CHILDREN

This questionnaire aims to find out participant's knowledge on the possible factors that are associated with urinary tract infections in children under five presenting to health facilities in Morogoro Municipality. It will take less than thirty minutes to complete this questionnaire. Please note that your answer is completely confidential and your individual answer will not be shared with anyone.

PART A: PATIENT'S PARTICULARS

1. Age (months)……. Sex……..
2. File number……..Ward Number……
3. Date of admission (if admitted): ……/……/201_ Date of interview ……./……./201
4. Address/residence……

PART B: PARENT/ CARE GIVER'S PARTICULARS

Address: Hamlet: …… Village/Street:……Ward……
District: ……..Region……

1. Sex: (a) Male…….. (b) Female……
2. Marital status
   a) Single…… b) Married……. c) widow/widower……. d) Divorced……
3. Age range:
   (a) 15-20……. (b) 21-30…… (c) 31-40 …….. (d) 41 and above ……
4. Level of education:
   a) No formal education…. b) Primary education ……. c) Secondary…….
   d) College…… e) Vocational training…….. (f) Others (specify)……
5 What is your ethnicity (tribe)? ……
6 What is your religion: (a) Muslim… (b) Christian …c) Others (specify) …
9. What is your marital status?
   a) Married……. (b) Single……. (c) Cohabitating ……. (d) Separated/Divorced……., (f) Widowed…….

PART C: GENERAL QUESTIONS

	YES	NO
1. Have you ever heard of urinary tract infection?	( )	( )
2. Which of the following symptoms could be associated with UTI?		
a) Pain during micturition	( )	( )
b) Frequency in micturition	( )	( )
c) Bed wetting	( )	( )
d) Coughing	( )	( )

3. How often does your child urinate? (for older children)
   a) 1-4 times
   b) 5-8 times ( )
   c) More than 8 times
4. For those younger children, how often are you changing pampers/diapers?
5. Was your child diagnosed/treated for UTI in the past 10 days? ( ) ( )
6. Which medication(s) did he/she take?
   Specify (if knows)……..……
7. Does your child had/have any of the following findings/behavior during this illness? (some applies to elder children)
   a) Blood in urine ( ) ( )
   b) Sudden need to urinate ( ) ( )
   c) Pain during micturition ( ) ( )
   d) Awakening during sleep to urinate ( ) ( )
   e) Loss of bladder control ( ) ( )
   f) Fever ( ) ( )
   g) Back pain ( ) ( )
   h) Offensive smell of urine ( ) ( )
   i) Vomiting ( ) ( )
   j) Failure to thrive ( ) ( )
   k) Irritability ( ) ( )
   l) Poor feeding ( ) ( )
8. Does your child ever had an infection associated with urine or kidney?-(according to previous medical tests) ( ) ( )
   If yes can you mention what the child was suffering from?
   .....

9. Does your child ever been treated with some metal (foreign materials) inserted into his/her genitalia? ( ) ( )
10. Do you know how UTI is transmitted? ( ) ( )
    If yes, how……...
11. What material do you use for your child?
    a) Nappy ( ), together with what? .....
    b) Pampers ( ), c) Others ( ) (Specify).....
12. A. If your answer is b) above, when are you deciding to change pampers/diapers?
    a) After urinating or defecation ( )
    b) After 8 hours no matter what ( )
    c) When it is full ( )

    B. When do you cover your child with pampers?
    a) Only at night ( )
    b) All the time ( )
    c) When he/she wants to sleep ( )

    C. Which criteria are you using in choosing/selecting pampers?

    _____

13. How often do you change nappies, dippers/pumpers? .....and which part of a day is this more common? Morning ( ). Afternoon ( ), evening ( ), night ( )

14. Where do you get water for bathing your child? ……
15. How do you wipe/clean your child after urinating? .....

16. What kind of material do you use to clean your child? .....

17. What type of toilet you are using at home? .....

18. Who is responsible to clean a child (under five) while visiting toilet?
    a) Himself
    b) Another person/care taker
19. What do you think, is there any possibility for elder children to contract UTI in school?
    a) Yes ( ), and how……
    b) No ( ), and how……
20. When does a child start to clean himself/herself? .....
21. Who is taking care of the child for a long time?
    a) Yourself ( )
    b) Others ( ), specify……..

    If your answer is b) from above, what do you think, how could the person also help in contributing to the spread of UTI to your child?

    .....
    ……
22. When do you clean your child and how?

    .....
    .....

THANK YOU VERY MUCH

Date: ……/……/ ….. Signature……

Appendix 3: Informed Consent, English Version

Introduction:
My name is_____, I'm working on this research project which tries to establish the factors associated with UTI in febrile children under five years presenting to health facilities within Morogoro Municipality. The interview will take a maximum of 20 minutes.

Purpose of the study
The purpose of the study is to collect information from the study participants i.e. parents/guardians of children under five year presenting to health facilities within Morogoro Municipality. Factors associated with UTI in children will be targeted as well as the prevalence of UTI among under-fives. The findings of this study will help the principal investigator to write a dissertation which is a partial fulfilment of Masters of Public Health and Food Safety at Sokoine University of Agriculture for the academic year 2014/2015.

What participation Involves
If you agree to participate in this study the following will occur:

1. You will be requested to answer questions on various issues related to fever and UTI among children under the age of five years.

The interview will last for approximately 20-30 minutes in a private setting and your participation is absolutely voluntary and you will not receive any payment or compensation for your participation in this study.

Confidentiality and consent:
All information we receive from you during discussions will be documented. Your answers are completely confidential. Your name will not be written in this form, and will never be used in connection with any of the information you tell me. You do not have to answer any questions that you do not want to, and you may opt to end this interview at any time you want. And in case you decide to do so your decision will not in any way affect the type or quality of treatment your child receive. However, your honest answers to these questions will help in better understanding of the factors associated with UTI in under five children at Morogoro Municipality. I would greatly appreciate your help in responding to this interview. The interview will take about 20-30 minutes.

Rights to withdraw and alternatives
Taking part in this assessment is completely your choice. If you choose not to respond to any question asked, this should be fine. You can stop participating in this discussion any time even if you have already given your consent. Refusal to participate or withdraw from the assessment will not involve penalty.

Benefits
Your participation in this study will make you aware of issues affecting UTI among febrile children under five years of age thus contributing to promoting health for your children and members of community in general. We hope that the information we collect from you will provide lessons and recommendations that will eventually benefit you and others directly and indirectly through influencing policy and programmatic changes geared at improving both diagnosis and management of under-five with UTI.

Potential Risks
There is no any potential risk associated with your participation in this study.

Who to contact
If you ever have questions about this study, you should contact MR.ALEX MAGUFWA (+255 719 887 810). You can also contact PROF/DR. HEZRON EMMANUEL NONGA (+255 767 23 81 74) or DR. LUCAS MATEMBA (+255 713 313 626)

Agreement of the Participant
Do you agree?

☐ Yes

☐ No

I, _____have read and understood the contents in this form or the contents have been read to me and I have understood. All my questions have been answered to my satisfaction. I agree to participate in this study.

Signature of participants ……..
Signature of research assistant……..
Date of signed consent …….

Appendix 4: Informed Consent, Swahili Version

RIDHAA YA KUSHIRIKI KATIKA UTAFITI

Utangulizi
Jina langu ni _____ninashughulika katika utafiti huu ambao una lengo la kutambua visababishi vinavyohusiana na ugonjwa wa maambukizi katika njia ya haja ndogo kwa watoto wenye homa walio na umri chini ya miaka mitano wanaohudhuria vituo vya afya katika Manispaa ya Morogoro. Mahojiano haya yatachukua muda wa takribani dakika thelathini (nusu saa).

Dhumuni la utafiti
Dhumuni la utafiti huu ni kukusanya taarifa za uelewa wa washiriki wa utafiti juu ya ugonjwa wa maambukizi katika njia ya haja ndogo pamoja na visababishi vihusianavyo na maambukizi hayo.

Majibu yapatikanayo katika utafiti huu utamsaidia mtafiti mkuu wa kazi hii katika masomo yake ikiwa ni sehemu ya shahada yake ya uzamili katika masuala ya afya ya jamii pamoja na usalama wa chakula kutoka katika chuo kikuu cha kilimo Sokoine.

Kuhusu ushiriki
Ikiwa utakubali kushiriki katika utafiti huu, utahitajika kujibu maswali mbalimbali yanayohusu maambukizi ya ugonjwa katika njia ya haja ndogo pamoja na homa hususani kwa watoto walio chini ya umri wa miaka mitano, pia mahojiano yatafanywa katika sehemu yenye staha. Sambamba na hilo ushiriki katika utafiti huu hautakuwa na malipo yoyote zaidi ya kujitolea. Hakuna madhara yoyote utakayoyapata katika kushiriki kwako kwenye mahojiano haya.

Usiri na ridhaa
Taarifa zote zitakazopatikana kutoka kwako zitaandikwa na majibu yako yatakuwa ni siri. Jina lako halitaandikwa katika fomu hii pia halitatumika kwa namna yoyote. Hulazimishwi kujibu swali lolote ambalo hupendi/hutaki kulijibu na pia unaweza kuacha kuendelea na mahojiano wakati wowote upendapo na hii haitaathiri ubora na aina ya matibabu ambayo motto wako anahitaji. Hata hivyo, majibu yako ya uaminifu katika maswali utakayoulizwa yatasaidia sana katika kuelewa vyema sababu zinazohusiana na maambukizi kwenye njia ya haja ndogo kwa watoto wanaokuja kupata tiba katika vituo vya afya kwa Manispaa ya Morogoro. Ningeshukuru sana endapo ungeamua kushiriki katika utafiti huu.

Faida ya ushiriki
Kushiriki kwako katika utafiti huu kutakusaidia kuelewa mambo kadhawakadha yanayoweza kuchangia kuenea kwa maambukizi katika njia ya haja ndogo kwa watoto walio na umri chini ya miaka mitano na hivyo kuchangia uboreshwaji wa afya ya mgonjwa/motto wako najamii yote kwa ujumla. Ni imani yetu kwamba, taarifa tutakazozipata kutoka kwako zitasaidia kupata elimu na mapendekezo ambayo yataweza

kwanza kukuneemesha wewe mwenyewe lakini pia na wengine kwa njia moja ama nyingine kupitia uhamasishwaji wa maboreshoya sera nataratibumbalimbalikwalengo la kuboresha utambuzi na matibabu ya maambukizi kwenye njia ya haja ndogo kwa watoto walio na umri chini ya miaka mitano.

Kwa mawasiliano zaidi

Ikiwa utakuwa na swali lolote kuhusu utafiti huu kwa wakati wowote ule, tafadhari uwe huru kuwasiliana na ALEX FORTUNATUS MAGUFWA kupitia namba yake ya simu ya kiganjani 0719887810. Lakini pia waweza kuwasiliana na PROF/DR. HEZRON EMMANUEL NONGA simu nambari +255 767 23 81 74 pia DR. LUCAS MATEMBA simu nambari +255 713 313 626.

Ukubali wa mshiriki

Je, unakubali kushiriki katika mahojiano haya?

☐ Ndiyo

☐ Hapana

Mimi…… nimesoma/nimesomewa na kuelewa vyema yote yaliyoainishwa katiku fomu hii. Maswali yangu yote yamejibiwa vyema na ninakubali kuendelea na mahojiano ya utafiti huu.

Sahihi ya mshiriki……
Sahihi ya mtafiti mkuu ama msaidizi……..
Tarehe iliyosainiwa fomu ya idhini…….

Appendix 5: Dodoso lililotumika, Swahili Version

UPIMAJI WA UELEWA WA AKINA MAMA/WALEZI JUU YA MAAMBUKIZI KATIKA NJIA YA MKOJO PAMOJA NA VISABABISHI VYAKE KWA WATOTO WALIO NA UMRI CHINI YA MIAKA MITANO

Dodoso hili limelenga kupima uelewa wa atakayehusika katika utafiti huu juu ya maambukizi katika njia ya mkojo pamoja na visababishi vyake kwa watoto walio na umri chini ya miaka mitano miongoni mwa walio na homa wanaotafuta huduma ya afya katika vituo vya afya vya Manisapaa ya Morogoro. Itachukua muda chini ya nusu saa kukamilisha dodoso hili. Tafadhari tambua ya kwamba majibu yako yatakuwa ni siri na hayatashirikishwa kwa mtu mwingine yeyote.

SEHEMU YA KWANZA: TAARIFA ZA MTOTO

Umri wa mtoto (miezi) _____ Jinsia_____Namba ya faili_____
Tarehe ya kulazwa (Endapo amelazwa) _____ Namba ya wodi _____
Tarehe ya dodoso_____ Anwani_____

SEHEMU YA PILI: TAARIFA ZA MZAZI/MLEZI

1. Anwani:
   Kijiji/Mtaa……Kata/Kitongoji……..……
   Tarafa……Wilaya……Mkoa……
2. Jinsi: (a) Mwanaume…….. (b) Mwanamke……
3. Hali ya ndoa:
   a) Hajaoa/kuolewa…… b) Ameoa/kuolewa……. c) Mjane/Mgane…….
   d) Mtaraka……
4. Wastani wa umri (miaka):
   (a) 15-20……. (b) 21-30…… (c) 31-40 …….. (d) 41 na zaidi ……
5. Kiwango cha elimu:
   a) Hajasoma kabisa…… b)Elimu ya msingi/awali..……c) Elimu ya sekondari/pili……d) Chuo…… e) Elimu ya ufundi……
   (f) Nyingine(fafanua)……
6. Kabila lako ni lipi? ……
7. Dini yako: (a) Muislam….(b) Mkristo …c) Nyingine (fafanua) …

SEHEMU YA TATU: MASWALI

	Ndiyo	Hapana
1. Umekwishawahi kusikia juu ya maambukizi ya njia ya mkojo?	( )	( )
2. Ipi kati ya dalili zifuatazo uhusika katika maambukizi ya njia ya mkojo?		
a) Kuhisi maumivu wakati wa kukojoa	( )	( )
b) Kukojoa kwa mara kwa mara	( )	( )
c) Kujikojolea(kitandani)	( )	( )
d) Kukohoa	( )	( )

3. Mara ngapi mwanao hukojoa ? (kwa watoto wenye uwezo wa kujizuia katika haja ndogo)

a) Mara 1 hadi mara 4
b) Mara 4 hadi mara 8 ( )
c) Zaidi ya mara 8

4. Je, mwanao alitambulika ama kutibiwa maambukizi ya njia ya mkojo katika siku 10 zilizopita ? ( ) ( )
5. Ikiwa jibu lako ni ndiyo katika swali la 4 hapo juu., Je ni dawa gani alitumia ?
_____
6. Je, mwanao amekuwa na dalili zifuatazo katika ugonjwa huu? (baadhi ni kwa watoto wakubwa)
   a) Kukojoa damu ( ) ( )
   b) Uhitaji wa ghafla wa kokojoa ( ) ( )
   c) Maumivu wakati wa kukojoa ( ) ( )
   d) Kuamka usingizini kudai kukojoa ( ) ( )
   e) Kujikojolea ( ) ( )
   f) Homa ( ) ( )
   g) Kuumwa na mgongo ( ) ( )
   h) Harufu mbaya(isiyo ya kawaid) ya mkojo ( ) ( )
   i) Kutapika ( ) ( )
   j) Ukuaji mbovu(wa duni) ( ) ( )
   k) Kukoswa na hamu ya kula ( ) ( )
   l) Kuwa mkali na mwenye tabia ngeni ( ) ( )

7. Je, mwanao amekwishawahi kupata maambukizi yahusianayo na mkojo ama figo?(hii ni kutokana na vipimo vilivyopita) ( ) ( )
   Ikiwa jibu lako ni ndiyo, Je, waweza kumbuka mtoto wako alikuwa anaumwa nini?
_____
8. Je, mwanao amekwishawahi kupatiwa tiba inayohusisha kuingiziwa vyuma/mipira kwenye njia ya haja ndogo? ( ) ( )
9. Je, wajua namna maambukizi ya njia ya mkojo yanavyotibiwa? ( ) ( )
10. Ikiwa jibu lako ni ndiyo hapo juu, eleza ni kwa vipi_____
11. Ni vitu gani hutumia kumvalishia mwanao kwa lengo la kuzuia mkojo?
    a) Nepi ( ) pamoja na_____
    b) Pempas ( )
    c) Nyingine ( ), taja_____
12. A. Ikiwa jibu lako ni b) hapo juu, Je ni wakati gani unambadilisha mwanao ?
    a) Baada ya haja ndogo au kubwa
    b) Baada ya masaa nane(8)
    c) Au itakapojaa
    B. Ni wakati gani unamvalisha mwanao pempasi ?
    a) Usiku tu ( )
    b) Wakati wowote ( )
    c) Mara anapotaka kulala ( )
    C. Unatumia vigezo gani kuchagua aina ya pempasi unayomvalisha mtoto wako ?
_____
13. Mnatumia choo cha aina gani nyumbani ?
    a) Choo cha maji cha kukaa ( )
    b) Choo cha maji cha kuchuchumaa ( )
    c) Choo cha shimo ( )
    d) Aina nyingine ( ) taja_____
14. Nani humsafisha mtoto aliye chini ya miaka mitano aendapo msalani.
    a) Anajisafisha mwenyewe ( )

b) Anasafishwa na mtu mwingine ( )

15. Ni mara ngapi hubadilisha vitu tajwa hapo juu ?_____, pia ni wakati gani wa siku hotekea mara kwa mara ? Asubuhi ( ), mchana ( ), Jioni ( ) na Usiku( )
16. Ni wakati gani unaamua kumbadilisha mtoto nguo/vitu tajwa hapo juu _____
17. Unapata/chota wapi maji ya kumwogeshea mwanao ?_____
18. Unafikiri kwa mtoto aliye chini ya umri wa miaka mitano anaweza kupata maambukizi ya njia ya haja ndogo akiwa shuleni ?
    a) Ndiyo ( ), kwa nini ?_____
    b) Hapana ( ), kwa nini ?_____
19. Mtoto anapaswa kuanza kujisafisha mwenyewe akiwa na umri gani ?, taja_____

20. Nani ni mwangalizi wa mtoto kwa muda mwingi ?
    a) Mama/mlezi ( )
    b) Msaidizi ( )
21. Ikiwa b) ni sahihi, unafikiri ni kwa kiwango gani msaidizi anaweza kuchangia kuenea kwa mchafuko wa mkojo kwa mtoto? _____
22. Unamsafisha mwanao wakati gani? ( ) ( )
    Ikiwa jibu lako ni ndiyo, Je unamsafishaje _____

NASHUKURU SANA KWA USHIRIKIANO WAKO

Tarehe……. Sahihi……