PREVALENCE AND FACTORS ASSOCIATED WITH URINARY TRACT INFECTIONS AMONG FEBRILE CHILDREN ADMITTED AT DODOMA REGIONAL REFERRAL HOSPITAL.

FADYA MOHAMED HASHIM

MASTER OF MEDICINE IN PEDIATRIC AND CHILD HEALTH

THE UNIVERSITY OF DODOMA

OCTOBER, 2019.

PREVALENCE AND FACTORS ASSOCIATED WITH URINARY TRACT INFECTION AMONG FEBRILE CHILDREN ADMITTED AT DODOMA REGIONAL REFERRAL HOSPITAL.

FADYA MOHAMED HASHIM

DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE IN PEDIATRICS AND CHILD HEALTH OF THE UNIVERSITY OF DODOMA.

THE UNIVERSITY OF DODOMA

OCTOBER, 2019.

DECLARATION

AND

COPYRIGHT

I, **Fadya Mohamed Hashim** declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature

"No part of this thesis/dissertation may be reproduced, stored in any retrieval system, or transmitted in any form or by any means without prior written permission of the author or the University of Dodoma. If transformed for publication in any other format shall be acknowledged that, this work has been submitted for degree award at the University of Dodoma.

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by the University of Dodoma thesis/dissertation entitled **prevalence, aetiology, antibiotic sensitivity and factors associated with urinary tract infection among febrile children aged 6 months to 5 years admitted at Dodoma Regional Referral Hospital** in fulfillment/partial fulfillment of the requirements for the degree of Master of Medicine in Pediatric and Child Health of the University of Dodoma.

Name of the first supervisor

Signature……F. Kimaro…………..Date…11/11/2019……….

Dr Frans¢isca Kimaro

Name of the second supervisor

Signature……………………………..Date……11/11/2019………

Dr Mkhoi Lord Mkhoi

AKNOWLEDGEMENTS

I thank God for giving me strength, courage and good health to take Master of Medicine in Pediatric and Child health. Thanks to my supervisors, Dr Franscisca Kimaro and Dr Mkhoi Lord Mkhoi for giving their time to supervise this thesis/dissertation. Special thanks go also to the Head of Pediatric Department, Dr Shakilu Jumanne to be a good organizer and implementing the course.

I acknowledge the assistance of my employer Ministry of Health Zanzibar for supporting me financially and helping me to achieve my dream of becoming a pediatrician. I sincerely thanks to the parents/caretakers for giving consent to participate in this study, the Dodoma Regional Referral Hospital (DRRH) for their support to the whole period of sample collection and to the laboratory technicians of DRRH for doing their work in a high standard.

DEDICATION

To my mother who gave me strength and support for the whole period of my studies.

To my lovely husband who gave full support and permission to fulfill my dream.

To my children who stayed without their mother's presence during my study period.

ABSTRACT

Background: Urinary Tract Infection is among the most common febrile illness affecting 150 million people worldwide. The etiology of urinary tract infection can vary from one place to another due to significant geographical variations. Paucity of information exists with regard to UTI, in terms of the prevalence, etiologies, clinical manifestation and antibiotic susceptibility in Dodoma region. The aim of this study was to determine the prevalence, aetiology, antibiotic sensitivity and factors associated with UTI among febrile children admitted at Pediatric ward in Dodoma Regional Referral Hospital (DRRH).

Method: A cross sectional analytic study was done at DRRH over a period of 5 months. A total of 190 children aged 6 months to 5 years admitted with fever were enrolled into the study. Urine samples were taken for dipstick, microscopy, culture and sensitivity. Data was collected, recorded and analyzed using statistical package SPSS version 25.

Results: Participants were 190 children aged 6 months to 5 years with prevalence of UTI 11.6%. The isolates were *Escherichia coli (E. coli) and Klebsiella Oxytoca (K.oxytoca).* Urine nitrites (AOR) 2.1 95% CI (1.7– 5.1) *p-value* = 0.022, painful micturition (AOR) 1.5 95% CI (1.04 – 2.5) *p-value* = 0.043 and Urine leucocytes esterase (AOR) 1.3 95% CI (1.06 – 3.7), $p < 0.001$ were significantly associated with the positive urine culture. *E. coli* was 100% sensitive to Tetracycline, Ceftriaxone, Gentamycin, Cotrimoxazole and Chloramphenicol; whereas Meropenem, Amoxycillin-Clavulate and Ciprofloxacin had a sensitivity rate of 93.8%, 68.7% 56.3% and respectively. .*E. Coli* was found to be resistant to Ampicillin and Amikacin but K. *Oxytoca* was 100% sensitive to both Ampicillin and Amikacin, 83.3% sensitive to Ciprofloxacin, and 50% sensitive to both Meropenem and Amoxycillin clavulate.

Conclusion: Extent of UTI in DRRH was (11.6%). Prevalent organisms isolated were *E. coli* and *K.oxytoca.* Leucocytes esterase, nitrites and painful micturition were statistically significant associated with UTI. Management of UTI ought to rely mostly on clinical and laboratory findings for appropriate treatment and follow up of patients.

TABLE OF CONTENTS

DECLARATION AND COPYRIGHT ... ii
CERTIFICATION ... iii
AKNOWLEDGEMENTS ... iii
DEDICATION ... v
ABSTRACT ... vi
TABLE OF CONTENTS ... vii
LIST OF TABLES ... x
LIST OF FIGURES ... xi
LIST OF APPENDECES ... xii
LIST OF ABREVIATIONS ... xiii
OPERATIONAL DEFINITIONS. ... xiv

CHAPTER ONE ... 1
INTRODUCTION ... 1
1.1 Background ... 1
1.2 Problem statement ... 2
1.3 Research questions ... 3
1.4 Broad objective ... 4
1. 5 Specific objectives ... 4
1.6 Rationale of the study ... 4
1.6.1 Scope of the study ... 5

CHAPTER TWO ... 6
LITERATURE REVIEW ... 6
2.1 Prevalence of UTI ... 6
2.2 Etiology and antibiotic sensitivity of UTI ... 8
2.3 Factors associated with UTI ... 9
2.4 Pathogenesis of UTI ... 10
2.5 The common uropathogens ... 10
2.6 Clinical features of UTI ... 11
2.7 Diagnosis of UTI ... 12

2.8 Management 12
2.9 Prognosis 12
2.10 Research Gap 12
CHAPTER THREE 14
RESEARCH METHODOLOGY 14
3.1 Study Design 14
3.2 Study Location 14
3.3 Study Population 15
3.4 Inclusion Criteria 15
3.5 Exclusion Criteria 15
3.6 Sample Size 16
3.7 Sampling Technique 16
3.8 Data Collection 16
3.9 Laboratory Investigations 17
3.10 Quality Control 18
3.11 Variables 18
Measure of the variable is dependent and independent. 18
3.12 Data Processing and Analysis 19
3.13 Ethical Consideration 19

CHAPTER FOUR 21
RESULTS 21
4.1 Study Enrollment Overview 21
4.2 Baseline Characteristics 23
4.3 Clinical Manifestations and Laboratory Findings 23
4.4 Prevalence of UTI 25
4.5 Aetiology of Urinary Tract Infection 25
4.6 Antibiotic Sensitivity Pattern 26
4.7 Factors Associated with UTI 27
4.8 Multivariate Analysis of Factors Associated with UTI 30

CHAPTER FIVE 32

DISCUSSION OF THE FINDINGS 32
5.1 Prevalence of Urinary Tract Infection 32
5.2 Etiology of Urinary Tract Infection 33
5.3 Antibiotic Sensitivity 35
5.4 Factors Associated with Urinary Tract Infection 35

CHAPTER SIX 38
CONCLUSION AND RECOMMENDATIONS 38
6.1 Conclusion 38
6.2 Recommendations 38
REFFERENCES 39
APPENDICES 43

LIST OF TABLES

Table 1: Social demographic data and clinical manifestation among febrile children admitted at DRRH 24

Table 2: Antibiotic sensitivity among febrile children admitted at DRRH 27

Table 3: Socio-demographic factors and clinical manifestations associated with positive urine culture among febrile children admitted at DRRH............ 29

Table 4: Logistic regression on Socio-demographic factors and clinical manifestations associated with positive urine culture among febrile children admitted at DRRH 31

LIST OF FIGURES

Figure 1: Consort diagram 22
Figure 2: Prevalence of UTI among febrile children admitted at DRRH 25
Figure 3: Etiology of UTI among febrile children admitted at DRRH 26

LIST OF APPENDECES

Appendix 1: Fomu ya Ridhaa -Kiswahili 43
Appendix 2: Consent Form –English Version 44
Appendix 3: Questionnaire 46
Appendix 4: Permission Letter from the University of Dodoma.............................. 49
Appendix 5: Data Collection.. 50

LIST OF ABREVIATIONS

AOR	Adjusted Odds Ratio.
BMC	Bugando Medical Center
C	Degrees Centigrade
CI	Confidence Interval
cfu	Colony Forming Unit
COR	Crude Odds Ratio.
DRRH	Dodoma Regional Referral Hospital
E. Coli	*Escherichia coli*
EMB	Eosin Methyline Blue
HPF	High Power Field
K. Oxytoca	*Klebsiella Oxytoca*
ml	Milliliters
MNH	Muhimbili National Hospital
MSU	Midstream Urine
RBC	Red Blood Cells
SPSS	Social Package For Social Science
UTI	Urinary Tract Infection
WBC	White Blood Cells

OPERATIONAL DEFINITIONS.

Urinary tract infection: Is an infection of urinary tract system. Based on urine culture results, bacterial growth in urine obtained by midstream clean-catch technique is considered significant with bacterial growth of ≥100,000 cfu/mL; whereas by urethra catheterization considered significant if they have bacterial growth of ≥10,000 cfu/mL; and from suprapubic aspiration is even a single cfu/mL

Febrile children: Are the children with fever whereby the axillary body temperature was ≥38 degrees centigrade.

CHAPTER ONE

INTRODUCTION

1.1 Background

UTI is one among the most common febrile illness affecting 150 million people worldwide (Flores, 2016). Issues of age, sex, circumcision status and race are considered to be predisposing factors that increases the risk of acquiring UTI (Magliano et al., 2012). In term of sex, women due to their genital urinary anatomy; particularly short urethra and close proximity between the rectum and urethra are more likely to experience UTI than men (Vasudevan, 2014). On the other hand, uncircumcised men or boys are more likely to acquire UTI than their counterpart because the male genitalia foreskins harbor infections.

People of Hispanic origins and Caucasians are considered to be more likely to acquire UTI other than blacks (Roberts, 2012). Moreover, children in comparison to older people are also reported to be more likely to acquire UTI. There is limited information and data indicating the global prevalence of Urinary tract infection (UTI) which limits the causality; other than that, specific groups such as the elderly or patients with spinal cord injuries, catheters, or diabetes who are considered to be more at risk of acquiring the disease. This is mostly due to frequent urination and bladder stasis (Magliano et al., 2012).

Despite the limited data justifying the reasons why younger age groups are mostly affected by UTI, existing literatures suggest that UTI is one among the most common febrile disease affecting children (Fredrick et al, 2013). A cross sectional study done in Muhimbili National Hospital enrolled 382 children under five years of

age in which 16.8% found to have UTI (Fredrick et al, 2013). Fever is the symptom that likely creates the suspicion of UTI whereby 80% of UTI cases present with fever (Finnell & Carroll, 2011) . That is why, proper diagnostic investigation of UTI involves relevant urinalysis and urine culture tests (Magliano et al., 2012; Mhambi, 2015).

Without proper investigation, there is a high risk of UTI misdiagnosis. The impact of misdiagnosis can lead to prolonged and re-occurrence of the disease which can lead to renal scarring and failure (Uwaezuoke, 2016). furthermore, misdiagnosis can lead to improper disease management that can ultimately lead to microbial resistance (Wakim at al, 2015) due to irrational use of antibiotics. Therefore, understanding the prevalence, etiology, and antibiotic sensitivity of urinary tract infection in hospital settings is paramount especially to children aged 6 months to 5 years to help clinicians to make informed decisions regarding diagnostic testing and management of children presenting with signs and symptoms of urinary tract infection..

1.2 Problem statement

UTI has been found to be among the most common causes of febrile illness in children (Hathagoda, Gunathilaka, & Dissanayake, 2018). Poor hygiene status is linked to UTI (Singh, 2019). Various data exists in Tanzania shows the magnitude of the disease ranging from 16.8% (Fredrick et al, 2013) to 39.7% (Festo et al, 2011).

In Dodoma Regional Referral Hospital however, previous data showed an increase in magnitude of UTI over time; 1.6% in 2000 to 2.5% in 2017 (Dodoma health information system). The disease is known to lead into long-term and short term

devastation medical outcomes including renal scarring and later Acute kidney injury (Fredrick et al, 2013; Okarska-Napierała, Wasilewska, & Kuchar, 2017). Diagnosis of UTI has been a challenging task in developing countries due to difficulties in confirming the diagnosis. Clinical capability lead to diagnostic challenges, most clinicians fail to identify appropriate causative organisms leading to presumptive treatment that can result into mismanagement and later antibiotic resistance.

There is no sufficient data showing the prevalence of UTI among under five children with isolation of causative organisms since the etiology of UTI can vary from one place to another due to significant geographical variations. Due to existing gap in terms of prevalence, etiologies, clinical manifestation and antibiotic susceptibility there was a need to carry out the present study in order to understand the current situation, and provide information which can also further lead to another in depth study.

1.3 Research questions

1. What is the prevalence of UTI among febrile children aged 6 months to 5 years admitted at Dodoma Regional Referral Hospital (DRRH)?
2. What are the causative organisms for urinary tract infection (UTI) among febrile children aged 6 months to 5 years admitted at DRRH?
3. What are the patterns of antibiotic sensitivity for UTI in febrile children age 6 months to 5 years admitted at DRRH?
4. What are the factors associated with UTI among febrile children aged 6 months to 5 years admitted at DRRH?

1.4 Broad objective

To determine the prevalence, aetiology, antibiotic sensitivity and factors associated with urinary tract infection among febrile children aged 6 months to 5 years admitted at Pediatric ward in Dodoma Regional Referral hospital.

1. 5 Specific objectives

1. To determine the prevalence of UTI in febrile children aged 6 months to 5 years admitted at DRRH.
2. To determine the aetiology of UTI in febrile children aged 6 months to 5 years admitted at DRRH.
3. To determine antibiotic sensitivity in febrile children aged 6 months to 5 years admitted at DRRH.
4. To determine factors associated with UTI among febrile children aged 6 months to 5 years admitted at DRRH.

1.6 Rationale of the study

The study was conducted with the aim at enlightening health care providers in regard to UTI among children admitted at pediatric ward in DRRH. The study findings are expected to improve the management of the children with UTI by defining its magnitude and provide the current status on antimicrobial susceptibility patterns. This information is important in rational choice of antibiotic and will help in managing children presented with UTI. Additionally, it can help to provide information leading to undertaking other studies in other settings.

1.6.1 Scope of the study

UTI is the most common illness affecting people of all age, sex, and race. However, this study is limited to only children aged 6 months to 5 years with fever especially those who had not taken antibiotics in the last 48 hours. This is because this aged group they are prone to infection due to lowered immunity.

CHAPTER TWO

LITERATURE REVIEW

2.1 Prevalence of UTI

Urinary Tract Infection- Is an infection of urinary tract system. Based on urine culture results, bacterial growth in urine obtained by midstream clean-catch technique is considered significant with bacterial growth of ≥ 100,000 cfu/mL; whereas by urethra catheterization it is considered significant if they have bacterial growth of ≥ 10,000 cfu/ml. However, from suprapubic aspiration it is considered as UTI even if there is a single cfu/ml (Christopher, 2016).

Urinary tract infection is an infection which affect the genitourinary tract leading to morbidity and mortality (Fredrick et al, 2013). Prevalence of UTI varies from one study to another due to geographical location. For example in Sweden, UTI prevalence is 4.3% in children (Saheb, 2018).While in Australia is about 20%. This shows that prevalence of UTI differs from one country to another (Craig, 2009).

A good history taking, proper physical examination and correct method of urine collection in accordance with child's age are important factors in making a correct and proper diagnosis of urinary tract infection (Tsai, 2016). In India, children with febrile seizure not on antibiotic for 48 hours prior to admission were enrolled and excluded from neurological and congenital abnormality. The findings showed that there was 13% of UTI and that more investigations were needed to rule out other cause of fever (Brien, Ghjuhh, & Rwkhu, 2013) .

Furthermore, anatomical abnormality can also lead to urinary tract infection. A study done in Lebanon to determine the risk factors for UTI where renal ultrasound was

done in 153 enrolled children, showed that about 5.1% of children with UTI had vesicoureteric reflux (Jawhar, 2014). In a case control study of 52 Cerebral palsy children in Nigeria aged 2 to 15 years were found to have a high prevalence of urinary tract infection of 38.5%. Due to severe immobility emphasis was given to keep more effort on physiotherapy to reduce risk of urinary tract infection (Anigilaje, 2013).

Children with sickle cell anemia have high predisposing factors for infections, UTI being among them. This is thought to be due to compromised kidney function caused by repeated vasooclusive crises(Fatunde, 2013). This was found in a case control study done in Ibadan- Nigeria in which 100 heterozygous sickle cell children were compared to 100 children with normal hemoglobin. Children with sickle cell aged 1 to 15 years were found to have a prevalence of urinary tract infection of 21.6% compared to 2% of the normal hemoglobin children (Chukwu, 2011). Moreover, in Western Kenya where 260 children were included in a cross sectional study aged 2 months to 5 years with the median age 25 months. The findings determined the magnitude of UTI in febrile children who did not use antibiotic. The results showed that there was a urinary tract infection with prevalence of 11.9% (Masika, 2017). In addition, another cross sectional study was done in Nairobi where 264 children with fever were tested for malaria and UTI showed that they had negative malaria infection while of UTI was 16% (Okwara, 2004). In a cross sectional study done at Muhimbili National Hospital (MNH), among children with fever, despite using antibiotic for 72 hours prior to admission, the prevalence of UTI was 16.8% (Fredrick et al, 2013). Furthermore, in Kilosa- Tanzania, a cross sectional study was done in a district hospital in which febrile children aged 2- 13

years were enrolled, urinalysis only was done in diagnosing urinary tract infection in which 18.6% had UTI.

2.2 Etiology and antibiotic sensitivity of UTI

The common uropathogens of UTI isolated in a cross sectional study done in Australia which involved 576 children with fever were *E. coli, Proteus mirabilis, Klebsiella Oxytoca, Enterobacter, Citrobacter, Enterococus and Staphylococcus saprophyticus*. They were sensitive to Gentamycine, Ceftriaxone, Ciprofloxacin and Nitrofurantoin but resistant to Cotrimoxazole. Reported resistance to Cotrimoxazole might be an alarm to review the current treatment guidelines that recommend Cotrimoxazole for treatment of UTI (Kim & Koo, 2015).

In India, several studies done on urinary tract infection in under five children isolated different gram negative bacteria, whereby, the predominant cause was *E. coli*, in which the same *E. coli* could not be isolated in Kashmir (Ashraf, 2016), Bareilly (Kaushik, 2017), Bangalore (Wang et al., 2015). In Delhi, they were sensitive to different antibiotic, this revealed that UTI varies in terms of geographical locations (Shweta, 2016). In Western Kenya, a cross sectional study was done among 260 children with fever. The isolated uropathogens were *E. coli* and *Staphylococcus aureus.* E. coli and S. Aureus were sensitive to Ciprofloxacin, Cefuroxime, Ceftriaxone, Gentamycine and Nitrofurantoin, but resistant to Cotrimoxazole and Amoxycillin. The resistant antibiotics found in this study are the ones recommended by WHO for the treatment of urinary tract infection (Masika, 2017).

In Tanzania, two cross sectional studies were done at Muhimbili National Hospital

and Bugando Medical center among febrile under five children whereby *E. coli* and *K.oxytoca* were isolated. The result was that uropathogens were resistance to Cotrimoxazole and Ampicillin. This could be due to improper daily prescription of these antibiotics at primary health facilities or from local pharmacies before referral to these referral hospitals(Festo et al, 2011; Fredrick et al, 2013).

2.3 Factors associated with UTI

Urinary tract infection varies according to age, sex, race/ ethnicity, circumcision status, genetic factors and urinary anatomical/ physiological factors. Based on sex, by the age of one year females have high prevalence of UTI than males due to anatomical nature of urethra. While based on circumcision status, males who were uncircumcised have high prevalence of UTI than circumcised males. Anatomical and physiological factors such as vesico ureteric reflux (VUR) can occur. The occurrence of such factors can cause pyelonephritis and other complications which lead to end stage renal failure (Ocheke, 2016).

Based on age, a retrospective study was done in Lebanon which involved 675 children with the median age 16 months. It was observed that age, sex and genitourinary abnormality were the most likely predisposing factors for UTI. In case of genitourinary abnormality they did a radiological imaging and vesicoureteric reflux detected (Wakim at al, 2015). In a cross sectional study of 724 children under 18 years done in India explained that all genders were susceptible to infection. However women were mostly affected due to anatomy and reproductive physiology whereas the younger the age the higher the risk of getting UTI (Vasudevan, 2014) .

In a prospective case control study done in tertiary care centers in India involved 214 children in which children under five with signs and symptoms of UTI were included. The risk factors were recent hospitalization, recent catheterization, uncircumcised male, common toilet usage, cleaning perineum from back to front, constipation, usage of tight underclothing, diaper usage, voluntary with holding of urine and minimum water intake (Kavitha, 2018). In a study done in Bugando hospital which enrolled 370 under five children with fever, positive urine White Blood Cells (WBC) microscopy, positive nitrites test and diarrhea were clinically significantly associated with the diagnosis of urinary tract infection (Festo et al, 2011). In Muhimbili 382 febrile children observed whereby leucocytes esterase and urine nitrite were found significantly associated with UTI (Fredrick et al, 2013).

2.4 Pathogenesis of UTI

Urinary tract infection occurs by two routes which are ascending infection and hematogenous route. When uropathogens colonises the periurethra and ascends to the urinary bladder, in the upper part of urethra and bladder are sterile but when uropathogens colonises the bladder they cause lower urinary tract infection called cyctitis. After urinary bladder is colonized by uropathogens, they ascend to the ureters and kidneys which cause upper urinary tract infection called pyelonephritis. If pyelonephritis is not treated earlier, it can cause renal damage to renal failure and spread of infection to the blood stream. (Batabyal, 2018).

2.5 The common uropathogens

The common uropathogens were the gram negative bacteria such as *E. coli, Klebsiella Oxytoca*, *Pseudomonous aeroginosa* and *Proteus mirabilis*. The gram

positives are such as *Enterococus* and *Staphylococcus aureus*. Some fungi such as *Candida albican* which are not common had been isolated in diabetic patient urine and cause urinary tract (Flores, 2016). According to study done in Sweden out of 105 under five children studied, the common uropathogens isolated were the *E. coli* which was 96.1% (Zareba, 2014).

However in another study, isolated gram negative organisms such as *E.coli, K.pneumoniae*, *Pseudomonous* and gram positive *Staphylococcus saprophyticus*, *Proteus mirabilis* and *Enterobactereceae* were isolated (Christopher, 2016). Another study was done in India which involved 100 children with febrile seizure where the predominant isolates were *E.coli*, *K.oxytoca, Proteus mirabilis, Pseudomonous* and some gram positive such as *Enterobactereceae* (Srinivas, 2017). According to the prospective study done in Ibadan Nigeria in 171 children with sickle cell anemia aged 1 to 15 years isolated pathogens were only *E.coli* and *Klebsiella Oxytoca* (Fatunde, 2013).

2.6 Clinical features of UTI

Clinical features of UTI are nonspecific and vary with age. From 0-2 months child may present with jaundice, fever, failure to thrive, poor feeding, vomiting and irritability. From 2 months to 2 years children may present with poor feeding, fever, vomiting, abdominal pain, irritability and strong smelling urine. And from 2 years to 6 years children may present with vomiting, abdominal pain, fever, strong smelling urine, enuresis and urinary symptoms such as dysuria, urgency and frequency (Ibeneme, 2014).

2.7 Diagnosis of UTI

Urinary tract infection can be diagnosed by clinical features and laboratory investigations. Laboratory investigations include urine analysis which comprise of urine for dipstick and microscopy in which, the presence of pyuria and bacteriuria is expected as well as urine culture for isolation of uropathogens; more so, imaging is used to rule out urogenital anomalies which are among the cause of UTI (Okarska-Napierała et al., 2017).

2.8 Management

According to WHO (2013) treatment guideline of UTI at the first line is oral Trimethoprim 10mg/kg and sulfamethoxazole 40mg/kg 12 hourly for 7-10 days. If the first line fails, the second line is proposed which includes injection intravenous or intramuscular Gentamycine 7.5 mg/kg once daily plus injection Ampicillin intravenous or intramuscular 50mg/kg 6 hourly or injection Ceftriaxone 100mg/kg once a day for 7-10 days.

2.9 Prognosis

Early diagnosis and treatment of UTI results into good prognosis. If a child with cystitis a is treated early, prognosis will be good, however if treatment is delayed it can lead to pyelonephritis which could complicate into end stage renal failure if not timely and properly managed resulting into poor prognosis (Fisher, 2017).

2.10 Research Gap

There is no sufficient data showing the prevalence of UTI among under five children with isolation of causative organisms since the etiology of UTI can vary from one place to another due to significant geographical variations. Due to existing gap in

terms of prevalence, etiologies, clinical manifestation and antibiotic susceptibility there was a need to carry out the present study in order to understand the current situation, and provide information which can also further lead to another in depth study.

.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Design

A cross sectional analytical method was employed which involved analyzing the associated of laboratory investigations with UTI occurrence among febrile children aged 6 months to 5 years. This study design was convenient due to the fact that, it gives the likelihood of observing the occurrence of dependent variable UTI (effect/outcome) and associated independent variables/factors (cause), it also strictly used subjects obtained from those who were admitted in the ward having a fever $\geq$ 38°C and who were not on antibiotic for the past 48 hours.

3.2 Study Location

The research was carried out at the Pediatric ward of Dodoma Regional Referral Hospital, located in Dodoma municipal at Dodoma region. Dodoma is the capital city of Tanzania. It is in the central zone. It is bounded by Iringa, Singida, Morogoro and Manyara. According to 2012 national census the region had a population of 2,083,558 which has 50 people per square kilometer. Dodoma has 7 districts, namely Chamwino, Bahi, Kongwa, Dodoma municipal, Mpwapwa, Kondoa and Chemba. The common tribes found in Dodoma region are Gogo, Warangi and Wasandawi. Dodoma Regional Referral Hospital receives referral cases from different parts, such as Kongwa, Bahi, Chamwino and other areas around nearby Dodoma region.

According to the hospital vital statistics of the year 2013, the regional vital indicators showed that the under-five mortality rate was 39 per 1000 live birth. The

hospital has 21 wards with 434 beds which can accommodate 434 patients at one time, and has a total number of 540 staff. Among the departments it has is a Pediatric department which has 63 beds and 26 staff. The staffs available in the department were 1 Pediatrician, 2 Medical Officers, 13 Registered Nurses, 6 Medical Attendants and 4 Cleaners. Also there were 9 Pediatric residents and 6 intern doctors. There is a follow up clinic of care and treatment on Tuesday and Friday; preterm baby's clinic on Wednesday and general pediatric clinic on Thursday every week. There were averages of 208 patients admitted in DRRH per month.

UTI is common in pediatric ward of DRRH in which in 2000 was 1.6% and 2017 was 2.5% of cases diagnosed by using clinical features and urinalysis.

3.3 Study Population

Children aged 6 months to 5 years admitted at Pediatric Ward with fever.

3.4 Inclusion Criteria

- Children with fever admitted at Dodoma Regional Referral Hospital, not on antibiotic for the past 48 hours.
- Parents/guardian agreed to participate in the study.

3.5 Exclusion Criteria

- Children aged six months to five years old and who were in coma.
- Children who were unable to produce urine.

3.6 Sample Size

The sample size was calculated by Leslie and Kish formula by using prevalence of UTI in Muhimbili (Fredrick et al, 2013) whereby:

N = Small sample size.

Z = Normal standard deviation, set at 1.96, corresponding to 95% confidence interval.

P = Prevalence of UTI in Muhimbili 16.8% (Fredrick et al, 2013)

E = margin of error of 5%.

N= $Z^2 P(1 - P)/E^2$

= 1.962× 0.168(1- 0.168)/0.052

= 190 sample size was obtained.

3.7 Sampling Technique

The sampling technique was convenient sampling method in which the patients admitted with fever ≥38C aged 6 months to 5 years and who were not using antibiotic for the past 48 hours serially enrolled until the desired sample size was attained.

3.8 Data Collection

After getting consent from the parent/guardian, data were collected using structured questionnaires and laboratory investigations such as, urinalysis and urine for culture and sensitivity.

Data from Urinalysis comprised of urine for sedimentation and dipstick. Urine sample was obtained by suprapubic aspiration under aseptic sterile condition in children aged six to eighteen months, by urethra catheterization under sterile condition in eighteen to twenty three months and for children aged two to five years by voiding midstream clean catch urine (MSU).

3.9 Laboratory Investigations

After collection of urine specimens done, they were transported in sterile containers, and sent to the laboratory within 1 hour of collection, where it was kept in refrigerator at 4 centigrade and analyzed for not more than 18 hours from the collection time. Urine dipstick for leucocytes esterase and urine nitrites were analyzed by using a CYBOW TM test strips for urinalysis.

Within 1hour specimen collection of 1 microlitre standard quantitative loop was used to inoculate all urine samples on Eosin Methyline blue, Mackonkey agar and blood agar plates. Plated media were incubated for 24 hours at 37 centigrade. Few drops of centrifuged urine were examined by laboratory technician using 40x objective of light microscope. A minimum of 10x objective high power field were scanned for WBCs. Results were reported in terms of number of cells per high power field by the use of the criterion of ≥5WBC/hpf to indicate positive microscopy.

UTI defined by urine collected by suprapubic aspiration is even single CFU/ml colon growth on culture media while by urethral catheterization specimen ≥10,000 CFU/ml and by midstream clean catch urine ≥ 100,000CFU/ml. Antimicrobial sensitivity testing performed routinely included Nitrofurantoin (300ug),

Amoxyclavulanic acid (30ug), Ampicillin (10ug), Ciprofloxacin (5ug), Meropenem (5ug), Amikacin (30ug), Tetracycline (30ug), Ceftriaxone (30ug), Gentamycine (10ug), Cotrimoxazole (25ug) and Chloramphenicol (30ug). Sensitivity testing was performed by Kirby Bauer diffusion method using Muller Hinton agar with incubation of 24 hours at 37 degrees centigrade. Antimicrobial sensitivity was reported as resistant, intermediate and sensitive.

3.10 Quality Control

Aseptic techniques were observed in all steps of urine sample collection and inoculation onto culture media to minimize contamination. KOVA-Trol line of lyophilized, human, urine-based controls provided complete quality control for the physical, chemical and microscopic examination of urine specimens and culture media were prepared according to the direction of the manufacturer. Three plates of each batch were incubated at 37C for 48 hours to check for sterility and the ability to support growth of the common organisms causing urinary tract infection were determined by inoculating the media with a typical stock culture. Negative and positive controls were included to validate the biochemical reagents or test kits.

3.11 Variables

Measure of the variable is dependent and independent.

1. Dependent (effect/outcome) variables were urine culture status positive or negative.
2. Independent (predictors/risk factors) variables were age, sex, race, religion, circumcision status, dysuria, vomiting, blood in urine, frequency, urgency,

low urine output, urine leucocytes esterase, urine nitrites and socioeconomic status.

3.12 Data Processing and Analysis

The data collection was done using a coded, pre-tested questionnaire which was filled by principal investigator before entered into computer software. The data were analyzed by using statistical package for social science (SPSS) version 23. Prevalence was determined by a number of positive urine cultures in a population aged six months to five years over total number of the study participants. Descriptive statistics was done in which frequency and percentage shown, inferential statistics was done in which socio demographic and clinical features were run into univariate logistic regression. Then those features which became statistical significance were run into multivariate analysis, chi square and adjusted odds ratio were reported, p –value set as at < 0.05 in a 95% confidence interval.

3.13 Ethical Consideration

Informed consent was sought from parents or guardians of participants and those who agreed to participate signed in the oral written informed consent form. Confidentiality was observed in which patient identification number was uniquely recorded, no individual name appeared and used. This study was approved by University of Dodoma Ethics and Research Board Committee. Permission to conduct the study was sought from hospital administration of Dodoma Regional Referral Hospital.

Risk subjected to the participant was minimum; however, the benefit was maximum in which patients whose uropathogens were isolated were treated according to drug sensitivity results revealed.

CHAPTER FOUR

RESULTS

4.1 Study Enrollment Overview

Data were collected for a period of five months from October 2018 to February 2019. A total number of 1042 patients with fever admitted at Dodoma Regional Referral Hospital from whom 706 were children aged 6 months to 5 years. Out of 706 children, 486 were children with fever but were already on antibiotic for the past 48 hours so they did not meet the inclusion criteria, 220 children whose mothers consented to participate in the study, had fever and not on antibiotics for the past 48 hours but 30 children could not get urine; in the long run about 190 children were included into the study in which urinalysis and urine culture were done whereby 22 (11.6%) had positive urine culture results.

Sampling Scheme

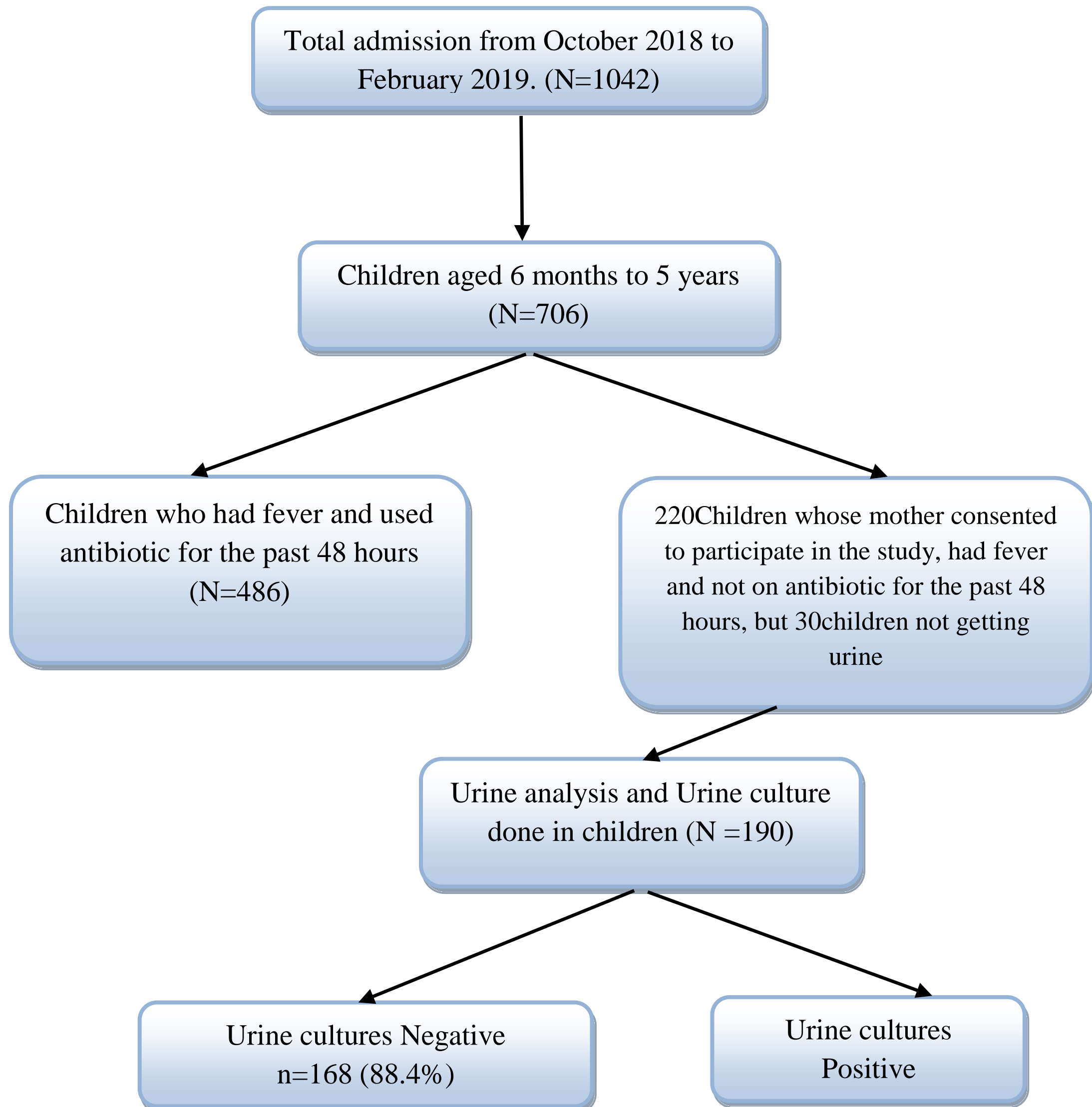

Figure 1: Consort diagram{ TC "Figure 1: Consort diagram" \f A \l "1" }

4.2 Baseline Characteristics

A total number of patients enrolled into the study were 190, whereby children aged 6 to 18 months predominant were 88(46.3%). Boys were 115 (60.5%) predominantly. Among 115 boys 86 (53.3%) of boys were 86 (53.8%). Income assessment of the household member/guardians revealed to be more than half of parents/guardians 132 (69.5%) had low household earn per month (Less than 500,000/- Tanzania Shilling). Table 1.

4.3 Clinical Manifestations and Laboratory Findings

The clinical manifestations of study participants are shown on Table1. The commonest presentation was vomiting 44 (23.2%), followed by Leucocytes esterase 26 (13.7%) and frequent urination 19 (10%). The findings also revealed that 10 (5.3%) presented with painful micturition.

Table 1: Social demographic data and clinical manifestation among febrile children admitted at DRRH (n=190)

Variable	Categories	Frequency (n)	Percentage (%)
Age (months)			
	6 to 18	88	46.3
	19 to 23	15	7.9
	24 to 60	87	45.8
Sex			
	boys	115	60.5
	Girls	75	39.5
Circumcision status, Male child (n=115)			
	Yes	29	25.2
	No	86	74.8
Household monthly average income (shilling)			
	<500,000	132	69.5
	500,000-1,000,000	56	29.4
	>1,000,000	2	1.1
Frequent urination			
	Yes	19	10
	No	171	90
Vomiting			
	Yes	44	23.2
	No	146	76.8
Blood in urine			
	Yes	4	2.1
	No	186	97.9
Painful micturition			
	Yes	10	5.3
	No	180	94.7
Leucocytes esterase			
	Yes	26	13.7
	No	164	86.3
Urine nitrites			
	Yes	13	6.8
	No	177	93.2
Urine sediments			
	Yes	6	3.2
	No	184	96.8

4.4 Prevalence of UTI

The prevalence of urinary tract infection in febrile children admitted at DRRH was found to be 11.6%, while urine culture results revealed positive microbial growth in 22 children. (Figure 2).

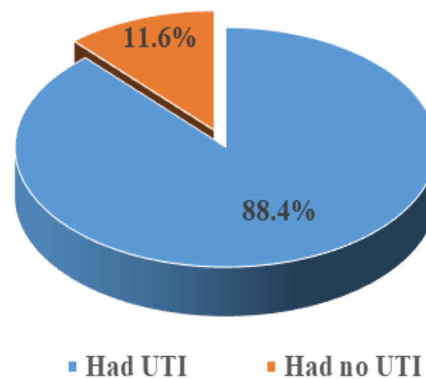

Figure 1: Prevalence of UTI among febrile children admitted at DRRH (N=190)

4.5 Aetiology of Urinary Tract Infection

Two microorganisms were isolated from culture of 22 febrile children. The gram negative *E. coli* was the most isolated microbes found in 16 (72.7%) children compared to *K. Oxytoca* seen in 6 (27.3%) children.

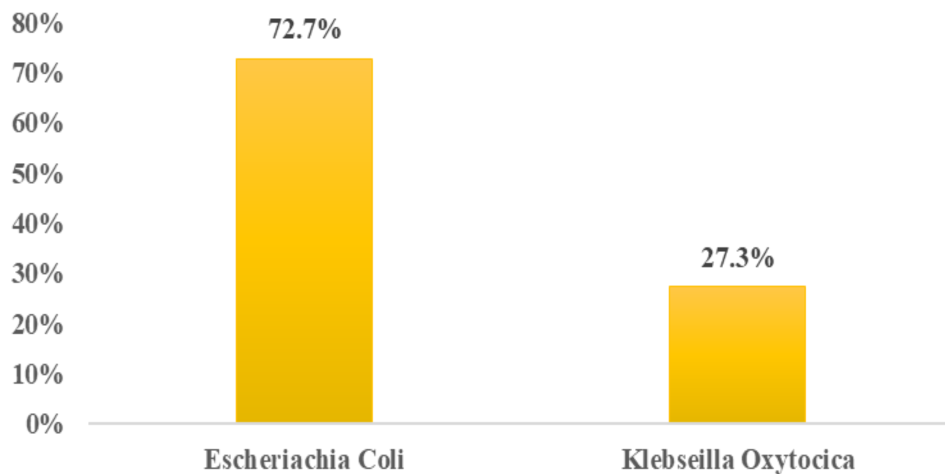

Figure 2: Etiology of UTI among febrile children admitted at DRRH (N=22)

4.6 Antibiotic Sensitivity Pattern

The results from culture and sensitivity revealed the sensitivity pattern of two antimicrobials studies. *E. coli* was highly sensitive to Tetracycline, Ceftriaxone, Gentamycin, Cotrimoxazole, Chloramphenicol, Amoxycillin clavulanic acid, Ciprofloxacin and Meropenem. Other results revealed that *E. coli* was resistant to Ampicillin and Amikacin. On the other hand, *K.oxytoca* was sensitive to Ampicillin, Amikacin, Amoxycillin clavulanic acid, Ciprofloxacin and Meropenem.

Table 2: Antibiotic sensitivity among febrile children admitted at DRRH (N=22)

Antibiotics	*E. Coli* n (%)	*K. Oxytoca* n (%)
Nitrofurantoin	4 (25)	1 (16.7)
Amoxicillin clavunilic acid	11 (68.7)	3 (50)
Ampicillin	0(0)	6 (100)
Ciprofloxacin	9 (56.3)	5 (83.3)
Meropenem	15 (93.8)	3 (50)
Amikacin	0(0)	6 (100)
Tetracycline	16 (100)	0(0)
Ceftriaxone	16 (100)	0(0)
Gentamycin	16 (100)	0(0)
Cotrimoxazole	16 (100)	0(0)
Chloramphenicol	16 (100)	0(0)

4.7 Factors Associated with UTI

Higher proportion of positive urine culture was seen in elder children aged 24-60 months 12 (13.8%). It was prominent in male 13 (11.3%) admitted children. Higher proportion of positive urine culture was found in uncircumcised children 11 (12.8%). Moreover, Culture positive results were mostly seen in children who experienced blood in urine of 21 (11.3%) children compared to children with no similar history. Positive culture results were mostly observed 19 (10.6%) in children not presenting with painful micturition compared to their counterpart. Highest proportion of positive urine culture was observed in febrile children 20 (15.9%) who

had urine leucocytes esterase, urine nitrites 12 (92.3%) and no urine sediments 19 (10.3%).

Age, sex, circumcision status, frequent urination and blood in urine were not statistically significantly associated with positive urine culture. However, the probability of having positive urine culture was more likely to be noted in children who had painful micturation, positive urine leucocytes esterase, urine nitrites and urine sediments (Table 3).

Table 3: Socio-demographic factors and clinical manifestations associated with positive urine culture among febrile children admitted at DRRH

Factor	Culture positive (n=22)	Culture negative (n=168)	*p*-value
Age (years)			
6 to 18	9 (10.2%)	79 (89.8%)	
19 to 23	1 (6.7%)	14 (93.3%)	
24 to 60	12 (13.8%)	75 (86.2%)	*0.629*
Sex			
Boys	13 (11.3%)	102 (88.7%)	
Girls	9 (12%)	66 (88%)	*0.674*
Undergone circumcision(N=115)			
Yes	2 (6.9%)	27 (93.1%)	
No	11 (12.8%)	75 (87.2%)	*0.751*
Increased urine frequency			
Yes	4 (21.1%)	15 (78.9%)	
No	18 (10.5%)	153 (89.5%)	*0.174*
Blood in urine			
Yes	21 (11.3%)	165 (88.7%)	
No	1 (25%)	3 (75%)	*0.397*
Painful micturition			
Yes	3 (30%)	7 (70%)	
No	19 (10.6%)	161 (89.4%)	*0.041*
Urine leucocytes Esterase			
Yes	20 (15.9%)	106 (84.1%)	
No	2 (3.1%)	62 (96.9%)	*<0.001*
Urine nitrites			
Yes	12 (92.3%)	1 (7.7%)	
No	10 (5.6%)	167 (94.4%)	*<0.001*
Urine sediments			
Yes	3 (50%)	3 (50%)	
No	19 (10.3%)	165 (89.7%)	*<0.001*

4.8 Multivariate Analysis of Factors Associated with UTI

Independent Predictors for Positive urine culture were obtained after doing logistic regression by running two models; binary logistic regression in bivariate and multivariate analysis. All factors which were significant at 5% ($p< 0.05$) in bivariate analysis were entered into the multiple logistic regression for adjustment. Multivariate analysis model showed that urine nitrites (AOR) 2.1 95% CI (1.7– 5.1) $p = 0.022$, painful micturition (AOR) 1.5 95% CI (1.04 – 2.5) $p = 0.043$ and urine leucocytes esterase (AOR) 1.3 95% CI (1.06 – 3.7) $p< 0.001$ were more likely to significantly associated with the positive urine culture.

Table 4: Logistic regression on Socio-demographic factors and clinical manifestations associated with positive urine culture among febrile children admitted at DRRH

VARIABLES	URINE CULTURE		UNIVARIATE			MULTIVARIATE		
	POSITIVE 22 (11.6%)	**NEGATIVE 168 (88.4%)**	**COR**	**CI**	***P-value***	**AOR**	**CI**	***P-value***
Painful micturation								
Yes	3 (13.6%)	7 (4.2%)	1.3	1.06-1.1	0.04	1.5	1.04-2.5	0.043
No	19 (86.4%)			1				
Urine leucocytes esterase								
Yes	20 (90.9%)	106 (63.1%)	1.2	1.05-2.4	<0.001	1.3	1.06-3.7	<0.001
No	2 (9.1%)			1				
Urine nitrites								
Yes	12 (54.5%)	1 (0.6%)	2.8	1.16-4.9	0.031	2.1	1.7-5.1	0.022
No	10 (45.5%)			1				
Urine sediments								
Yes	3 (13.6%)	3 (1.8%)	1.28	1.06-2.9	0.031	1.3	0.99-2.8	0.057
No	19 (86.4%)			1				

CHAPTER FIVE

DISCUSSION OF THE FINDINGS

5.1 Prevalence of Urinary Tract Infection

This study enrolled 190 children; the prevalence of urinary tract infection was 11.6% (22/190). The observation confirmed the increase in trend of UTI among children at DRRH. The findings showed that the current prevalence is much higher compared to 2017 extracted from pediatric ward data which was of only 1.6% in 2000 to 2.5% in 2017 (Dodoma health information system). The difference in proportion might also be due to different in methodology for diagnosis of UTI. In previous diagnosis was not made based on urine culture results (Dodoma health information system). This observation from current study done in DRRH was nearly similar documented from a study done at MNH which showed prevalence of UTI 16.8% in children (Fredrick et al, 2013).

The results were also similar to observation made in Nairobi among febrile children with prevalence of 13.3% (Okwara, 2004); in Western- Kenya with the prevalence of 11.9% (Masika, 2017), with prevalence of 11% in Nigeria in children with severe acute malnutrition (Uwaezuoke, 2016). And prevalence of 13% in Lebanon (Saheb, 2018) As well as that of from Kilosa - Tanzania which was 18.6% (Chipwaza, 2015). The similarity can further be validated due to deployment of similar method of urine culture for diagnosis of UTI.

However, the current prevalence is much lower compared to 39.7% observed in Mwanza in a study done at BMC may be due to power of the study - large sample size of 370 children with fever; BMC is a tertiary hospital it usually receives patients

who were put to treatment for sometimes without good prognosis, so referred children are more likely to take irrational antibiotic without a confirmatory diagnostic investigation and the enrolled children were from the aged 2 months in which the risk of getting UTI in the first year of life is higher. Furthermore, higher prevalence was also observed in a study done in Nairobi where malaria was endemic in children presented with fever and treated presumptively. Through urine culture, it was found that UTI was 38.3% prevalent due to previously treated patient with fever having malaria. When malaria test became negative, they were given antibiotic for the treatment of urinary tract infection without doing definitive diagnostic investigations of UTI (Wang et al., 2015). This indicates the significance of evaluating the cause of fever rather than assuming all fevers are due to malaria. In fact, the current prevalence is higher compared to that of Sweden which was 1.6% in a multicenter study of 2309 under two years children because of suprapubic urine sample collected which minimized contamination, good quality health care service, good hygiene and not using antibiotic irrationally (Hansson, 2015).

5.2 Etiology of Urinary Tract Infection

E. coli and *K. Oxytoca* were noted to be the most commonly isolated uropathogens in age group 24-60months. Our findings mimic the observations made in Australia, and Muhimbili (Fredrick et al, 2013; kim, 2015). On contrary, a different observation *Staphylococcus aureus*, was isolated in Kenya (Masika, 2017). Similar finding of the gram negative uropathogens were isolated although geographical location differed (Saheb, 2018). *E. coli* were found to be predominant in a one District hospital in Uganda which is similar to the current study in which of the isolated *E.coli* was 41.9% (Ordoki, 2018). Moreover, out of 171 febrile children

with sickle cell anemia in a prospective study in Ibadan, Nigeria who had urine culture done revealed that *E. coli* and *Klebsiella Oxytoca* were predominant (Fatunde, 2013). Similar to the study done in DRRH *E.coli* and *Klebsiella Oxytoca* were isolated in retrospective study in Lebanon in 584 febrile children under five (Wakim at al, 2015).

Similar study was done in Hyderabad India in which 100 children aged 6 months to 5 years with febrile seizure were observed through cross sectional study. The results revealed that *E.coli* was predominant (50%). This concludes that *E.coli* is the most common aetiology of urinary tract infection (Srinivas, 2017). In another cross sectional observation study in department of microbiology was conducted in tertiary care centre in New Delhi India different serotype of *E.coli* observed with the common serogroup 06 (33.2%) ,01 (15.1%) and 015 (15.1%) although it did not indicate the sample size used (Shweta, 2016).

It was different from the study done in Barley in children under five years old with fever in a prospective study in which apart from being isolated E.coli they had also isolated *Acenatobacter*, *Serratia* and *Proteus* (Kaushik, 2017). In a cross sectional study done in 260 children in Western Kenya where *Staphylococcus aureus* was isolated (Masika, 2017). In another cross sectional study in 382 children under five done in Muhimbili National Hospital apart from isolated *E.coli* and *Klebsiella* other species isolated were *Staphylococcus epidermidis, Staphylococcus aureus* and *Pseudomonous aeroginosa* (Fredrick et al, 2013).

5.3 Antibiotic Sensitivity

The antibiotic sensitivity depends upon the isolated uropathogens for the case of DRRH *E. coli* was most sensitive to Tetracycline, Ceftriaxone, Gentamycin, Cotrimoxazole, Chloramphenicol, Amoxycillin clavulanic acid, Ciprofloxacin and Meropenem, while it was resistant to Ampicillin and Amikacin. This case differed from Western Kenya where both uropathogens were resistant to Cotrimoxazole and Ampicillin due to irrational use and availability in health center (Masika, 2017). Similar observations were found in Australia (kim, 2015). It also differed from the current study done in Lebanon which showed that there was high resistance of uropathogens by all generations of Cephalosporin and Fluoroquinolones due to prolonged use of those medications. Urine culture and sensitivity were done in diagnosing UTI, genitourinary imaging in ruling out renal malformation was also done (Wakim at al, 2015). Likewise, it showed high resistance to third generation Cephalosporin (Christopher, 2016). In case of Bangladesh the resistance to Cephalosporin was also observed (Nazme, 2017). High antimicrobial resistance was observed due to improper prescription of unnecessary antibiotic which is similar to current study. A prospective cross sectional study done in Nepal showed that, *E. coli* was resistant to Ampicillin (Bahadur, 2019). The prevailing antimicrobial resistance would have been precipitated by irrational antimicrobial prescription this is due to common practice of using antibiotic from local pharmacies for self medication without laboratory evaluation and doctor’s prescription.

5.4 Factors Associated with Urinary Tract Infection

Painful micturition, urine leucocytes esterase and urine nitrites were found to be the independent predictors for positive urine culture. Painful micturation in UTI results

from the inflammation of the urethra and urinary bladder due to other sensory nerve which were located just beneath the uroepithelium, chemical irritation and inflammatory conditions can alter the mucosal barrier and stimulate the nerves and causing pain. Similar results of painful micturation had been shown in other studies like in Nepal in 1962 febrile children aged 0-14 years(Bahadur, 2019), in Iran in a cross sectional study of 2145 first grade primary school(Cheraghi, 2017), in Kashmir India in a cross sectional study of 660 febrile children underfive(Singh, 2019), in a 99 underfive febrile children in South Wales United Kingdom in a cross sectional study(Christopher, 2016) and Similar observations from Lebanon(Wakim at al, 2015).

Urine leucocytes esterase were statistical significant associated with UTI because it indicate inflammation or infection along the urinary tract often in the bladder or kidney. Leucocytes esterase are a central part of the immune system help to protect the body against foreign substances, microbes and infectious disease. Similar studies showed leucocytes esterase like in Muhimbili National Hospital in a cross sectional study of 382 febrile children below five years(Fredrick et al, 2013), in a cross sectional study done in Kilosa in Morogoro region Tanzania in a 370 febrile children aged 2-13 years(Mhambi, 2015), in a study done in Bugando Medical Center a cross sectional study of 370 febrile children with median age 18 months(Festo et al, 2011), children with severe acute malnutrition in Ibadan Nigeria with positive urine leucocytes esterase due to lowered immunity. Therefore these children had high risk of getting other co morbid condition (Uwaezuoke, 2016). It was found that all clinical features associated with urinary tract infection were not statistically

significance in diagnosing UTI. Therefore urine culture will remain to be the golden standard for diagnosis of UTI (Ibeneme, 2014).

Urine nitrites were statistical significant associated with UTI because it detects the product of nitrate reductase in a urease splitting organisms such as *Proteus species* and occasionally *E.coli* which was one of the isolated organisms in our study. Similar results had been shown in a study done in Muhimbili National Hospital(Fredrick et al, 2013), in Bugando Medical Center(Festo et al, 2011), in a cross sectional study of 56 febrile children with spinal cord injury(Hoffman, 2016), in a study done in India in 104 children aged 3months to 15years(Fernandes, Jaidev, & Castelino, 2018) and in Nigeria (Uwaezuoke, 2016).

Circumcised males had low prevalence of UTI (6.9%) compared to uncircumcised (12.8%) however this was not statistically significant probably due to small proportion of participants that were circumcised. Similar results like in other studies done in Lebanon a cross sectional study in under five children(Wakim at al, 2015), in a randomized controlled trial, a multicenter of 12 centers of 402,908 children showed circumcised male had low risk of UTI(Craig, 2009) and in a cross sectional study done in children aged under 1 year old showed circumcised children had low urinary tract infection(Alper & Curry, 2005).

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Urinary Tract Infection had a high magnitude in DRRH with the prevalence of 11.6%. The common Uropathogens isolated were *E. coli* and *Klebsiella Oxytoca*. Sensitivity results had shown that the microbes were sensitive to different antimicrobials in case of *E. coli* mostly sensitive Tetracyclin (100%), Ceftriaxone (100%), Gentamycine (100%), Cotrimoxazole (100%), Chloramphenicol (100%), Meropenem (93.8%), Amoxycillin clavulanic acid (68.7%) and Ciprofloxacin (56.3) while resistance to Ampicillin (100%) and Amikacin (100%). In *Klebsiella Oxytoca* were sensitive to Ampicillin (100%), Amikacin (100%), Ciprofloxacin (83.3%), Meropenem (50.0%) and Amoxycillin clavulanic acid (50.0%). Painful micturition, Urine leucocytes esterase and Urine nitrites were independent predictors for positive urine culture.

6.2 Recommendations

Based on the findings and in line to what was previously documented, the following are recommended;

i. UTI should be highly suspected in children presenting with urine nitrites, painful micturation and urine leucocytes esterase.
ii. If child present with symptoms of UTI, drug recommended are Ceftriaxone, Gentamycine, Cotrimoxazole, Meropenem, Ciprofloxacin and Amoxycillin clavulanic acid.
iii. Multicenter study should be considered.

REFFERENCES

Alper, B. S., & Curry, S. H. (2005). Urinary tract infection in children. *American Family Physician*.

Anigilaje. (2013). Prevalence and Predictors of Urinary Tract Infections among Children with Cerebral Palsy in Makurdi, Nigeria.

Ashraf. (2016). Spectrum of Renal and Urinary Tract Diseases in Kashmiri Children.

Bahadur. (2019). Clinical, etiological and antimicrobial susceptibility profile of pediatric urinary tract infections in a tertiary care hospital of Nepal _ BMC Pediatrics _ Full Text.

Batabyal, B. (2018). Prevalence of Urinary Tract Pathogens and Antimicrobial Resistance Patterns in Children Aged 1 to 12 Years, *5*(2).

Brien, K. O., Ghjuhh, D. Q., & Rwkhu, R. U. (2013). The prevalence of urinary tract infection (UTI) in children under five years old presenting with an acute illness in UK general practice, (February).

Cheraghi, Zar, Vakili, A., Hafezi, A., & Nikyar, A. (2017). Original Research Article Prevalence of Urinary Tract Infections among First Grade Primary School Children in Gorgan , Northeast of Iran, 22–26.

Chipwaza. (2015). prevalence of bacterial febrile illness, *13*(2), 118–122.

Christopher. (2016). Diagnosis of Urinary Tract Infections in Children _ Journal of Clinical Microbiology.

Chukwu. (2011). Asymptomatic bacteriuria in children with sickle cell anemia at The University of Nigeria teaching hospital, Enugu, South East, Nigeria.

Craig, J. (2009). antibiotic prophylaxis and recurrent urinary tract in children_NEJM, (January).

Fatunde. (2013). Urinary tract infection in febrile children with sickle cell anaemia in Ibadan, Nigeria Annals of Tropical Paediatrics Vol 23, No 2.

Fernandes, D. J., Jaidev, M. D., & Castelino, D. N. (2018). Utility of dipstick test (nitrite and leukocyte esterase) and microscopic analysis of urine when compared to culture in the diagnosis of urinary tract infection in children, *5*(1), 156–160.

Festo et al. (2011). Predictors of Urinary tract infection among febrile children attending at Bugando Medical Centre Northwestern, Tanzania _ Insight Medical Publishing.

Finnell, S. M. E., & Carroll, A. E. (2011). Diagnosis and Management of an Initial UTI in Febrile Infants and Young Children. *Pediatrics*, *128*(3), e749–e770. https://doi.org/10.1542/peds.2011-1332

Fisher. (2017). Urinary tract infections in children Epidemiology and risk factors - UpToDate.

Flores. (2016). Urinary tract infections_ epidemiology, mechanisms of infection and treatment options.

Fredrick et al. (2013). aetiology,antimicrobialsusceptibility and predictors of urinary tract infection among febrile under- five at Muhimbili National Hospital, Dar es Salaam- Tanzania, *7*(12), 1029–1034. https://doi.org/10.5897/AJMR12.1866

Gondim. (2018). Risk factors for urinary tract infection in children with urinary urgency.

Hansson. (2015). Urinary tract infections in children below two years of age_ a quality assurance project in Sweden.

Hathagoda, K. L. W., Gunathilaka, S. S., & Dissanayake, B. (2018). Bacterial pathogens causing urinary tract infections in children and their antimicrobial susceptibility patterns in a tertiary care hospital in Sri Lanka, (July), 93–99.

Hoffman. (2016). Nitrite and Leukocyte Dipstick Testing For Urinary Tract Infection in Individuals With Spinal Cord Injury_ The Journal of Spinal Cord Medicine_ Vol 27, No 2.

Ibeneme. (2014). Urinary tract infection in febrile under five children in Enugu, South Eastern Nigeria Ibeneme C A, Oguonu T, Okafor H U, Ikefuna A N, Ozumba U C - Niger J Clin Pract.

Jawhar, C. (2014). Challenges in Pediatric Urinary Tract Infection _ Jawhar _ International Journal of Sciences_ Basic and Applied Research (IJSBAR).

Kaushik. (2017). Study For Prevalence of Urinary Tract Infection (UTI) in Febrile Children and to Assess the Validity of Microscopic Urine Analysis in the Diagnosis of UTI, *4*(4), 826–829.

Kavitha. (2018). Risk factors for urinary tract infection in pediatric patients _ J.

kim. (2015). RACGP - Paediatric urinary tract infections Diagnosis and treatment.

Kim, G. A., & Koo, J. W. (2015). Validity of bag urine culture for predicting urinary tract infections in febrile infants: A paired comparison of urine collection methods. *Korean Journal of Pediatrics*, *58*(5). https://doi.org/10.3345/kjp.2015.58.5.183

Magliano, E., Grazioli, V., Deflorio, L., Leuci, A. I., Mattina, R., Romano, P., & Cocuzza, C. E. (2012). The cientific WorldJOURNAL Gender and Age-Dependent Etiology of Community-Acquired Urinary Tract Infections, *2012*. https://doi.org/10.1100/2012/349597

Masika. (2017). Contribution of urinary tract infection to the burden of febrile illnesses in young children in rural Kenya.

Mhambi, C. B. (2015). Prevalence of Bacterial Febrile Illnesses in Children in Kilosa District, Tanzania.

Nazme. (2017). Original Articles Bacteriological Profile of Urinary Tract Infection in Children of a Tertiary Care Hospital, *41*(2), 77–83.

Ocheke. (2016). The febrile child : how frequent should we investigate for urinary tract infection, *43*(1), 30–33.

Okarska-Napierała, M., Wasilewska, A., & Kuchar, E. (2017). Urinary tract infection in children: Diagnosis, treatment, imaging – Comparison of current guidelines. *Journal of Pediatric Urology*. https://doi.org/10.1016/j.jpurol.2017.07.018

Okwara, F. (2004). BACTERAEMIA, URINARY TRACT INFECTION AND MALARIA IN HOSPITALISED FEBRILE CHILDREN IN NAIROBI: IS THERE AN ASSOCIATION ? F. N. OKWARA, E. M. OBIMBO, E. M. WAFULA and F. V. MURILA.

Ordoki. (2018). Prevalence of Bacterial Urinary Tract Infections and Associated Factors among Patients Attending Hospitals in Bushenyi District, Uganda.

Pancheva, C. (2018). PROTECTIVE EFFECT OF BREAST MILK ON URINARY TRACT INFECTION IN CHILDREN AGED 0-3 YEARS ABSTRACT :, *24*(June 2014), 1918–1922.

Roberts, K. B. (2012). Revised AAP guideline on UTI in febrile infants and young children. *American Family Physician*, *86*(10), 940–946. https://doi.org/d10596 [pii]

Saheb. (2018). Prevalence of urinary tract infections in febrile children less than five years of age : a chart review, *5*(2), 359–362.

Shweta. (2016). Serotyping and Antimicrobial Susceptibility Pattern of Escherichia coli Isolates from Urinary Tract Infections in Pediatric Population in a Tertiary Care Hospital.

Singh. (2019). Prevalence of urinary tract infection in febrile preschool children, *6*(2), 320–324.

Srinivas. (2017). [PDF] A Study of Prevalence of Urinary Tract Infection among Children with Febrile Seizures in a Tertiary Care Hospital - Semantic Scholar.

Tsai. (2016). Diagnosis of paediatric urinary tract infection -science direct.

Uwaezuoke. (2016). [Full text] The prevalence of urinary tract infection in children with severe acut _ PHMT.

Vasudevan. (2014). Urinary Tract Infection_ An Overview of the Infection and the Associated Risk Factors.

Wakim at al. (2015). Frontiers _ Epidemiology and characteristics of urinary tract infections in children and adolescents _ Frontiers in Cellular and Infection Microbiology.

Wang, H. H. S., Gbadegesin, R. A., Foreman, J. W., Nagaraj, S. K., Wigfall, D. R., Wiener, J. S., & Routh, J. C. (2015). Efficacy of antibiotic prophylaxis in children with vesicoureteral reflux: Systematic review and meta-analysis. *Journal of Urology*, *193*(3). https://doi.org/10.1016/j.juro.2014.08.112

Zareba. (2014). Risk factors for febrile urinary tract infection in infants with prenatal hydronephrosis: Comprehensive single center analysis. *Journal of Urology*, *191*(5 SUPPL). https://doi.org/10.1016/j.juro.2013.10.035

APPENDICES

Appendix 1: Fomu ya Ridhaa -Kiswahili

Ridhaa ya kushiriki katika utafiti wa magonjwa ya mfumo wa mkojo kwa watoto.

Habari za asubuhi/ jioni , mzazi/ mlezi wa mtoto , mimi jina langu Fadya Mohamed Hashim. Ninasomea udaktari bingwa wa magonjwa ya watoto, katika chuo kikuu cha Dodoma.

Ninafanya utafiti kuhusu magonjwa ya mfumo wa mkojo kwa watoto kuanzia miezi sita mpaka miaka mitano ambao wana homa. Hii itaweza kutusaidia kuweza kujua ni mdudu gani ambaye amesababisha magonjwa ya mfumo mkojo na dawa itakayoweza kutibu.

Vilevile itatusaidia kuboresha huduma kwa watoto wenye magonjwa ya mfumo wa mkojo na kupunguza kuumwa na vifo.

Kama umekubali, naomba nitumie muda mfupi ili niweze kukuuliza maswali . Maelezo yote utakayonipa itakua ni siri na sitatumia jina la mshiriki na sitafanya kitu chochote cha kumdhuru mshiriki kuanzia mwanzo hadi mwisho wa utafiti.

Mshiriki anayo haki ya kukataa kutokuendelea katika utafiti wakati wowote ule na hakuna gharama yoyote ya kujitoa katika utafiti. Naye mshiriki atapata faida ya kuchunguzwa afya yake na mku wa utafiti na hakutakuwa na malipo yeyote endapo mshiriki atapata madhara ya kiafya.

Kama una maswali unaweza kuwasiliana na mkuu wa utafiti Fadya Mohamed Hashim, Chuo Cha Sayansi ya Tiba, S.L.P 395, Chuo Kikuu cha Dodoma.

Mawasiliano 0715- 900151

Umekubali kushiriki?

Mimi………………………………………………. Nimesoma/nimesikia maelezo yote katika karatasi hii na maswali yangu yameshajibiwa nimekubali /nimekataa kushiriki katika utafiti huu.

Sahihi ya mshiriki ……………………………..

Sahihi ya mtafiti………………………………….

Appendix 2: Consent Form –English Version

Consent to participate in Research Study.

Good morning/ Good evening Parent/Guardian, I Fadya Mohamed Hashim, undertaking Masters of Medicine in Pediatric and Child Health, at University of Dodoma.

I am working on research on UTI among children aged six months to five years with fever admitted at DRRH "prevalence, aetiology and antibiotic sensitivity". This study will help us to know the infective organisms and their antibiotic sensitivity. The result of this study will help to have rational use of antibiotic, hence reduce antibiotic resistance, improve the care of children with UTI and reduce morbidity and mortality.

I would like to spend some minutes for interview if you agree to participate in this study.

All information recorded will be confidential and will be entered in the computer with only study identification number. I will not use the name of the participants. No harm will be inflicted to the participants from the beginning to the end of the study.

The participants have the right to participate or withdraw from the study at any time while the study is in progress. No penalty will be charged to the participants who will withdraw from the study.

During this study research the participants will benefit by being tested their urine and get their result. We do not expect to get any harm or injury from this study. In case it occurs compensation will not be given to the participants.

If you have questions about this study, do not hesitate to contact the principal researcher, Dr. Fadya Mohamed Hashim at Pediatric Department, School of Medicine and Dentistry, P .O. Box 395, College of Health Sciences, University of Dodoma.

Cell phone: 0715-900151.

Signature………………………..

Do you agree to participate?

I……………………………………. have read the content in this form. My question has been answered, I agree/disagree to participant in this study.

Signature of the participants ………………………………………………..

Signature of Researcher…………………………………………………………………

Appendix 3: Questionnaire

QN	Questions and Filters	Coding Categories		Code
1.	Interviewer's Initials	Interviewer initials |__|__|__|		II
2.	Date of interview	|__|__| |__|__|__| |__|__|__|__| Day Month Year		DATE
3.	Enrolment ID number	|__|__|__|		IDNO
4.	Hospital registration number	|__|__|__|__|__|__|__|__|		REGN
5.	Sex	Male	1	SEX
		Female	2	
6.	Date of Birth	|__|__| |__|__|__| |__|__|__|__| Day Month Year		DOB
7.	Age |__|__| |__|__|__| Years Months	Change to months for Excel|__|__|__| Months		AGE
8.	What is the child ethnic background?	African	1	ETHN
		Asian	2	
		others	3	
9.	On average how much does your household earn each month?	0-500,000	1	AVWI
		500,001 to 1,000,000	2	
		> 1,000,000	3	

10.	Religion	CHRISTIAN	1	REL
		MUSLIM	2	
		OTHERS	3	
11.	Circumcision status	Yes	1	CIRC
		No	0	
12.	Is the child having increased urine frequency?	Yes	1	
		No	0	
				UFR
13.	Body temperature (Centigrade)	|__|__|__|		TEMP
14.	Is the child vomiting	Yes	1	VOM
		No	0	
15.	Is the child having blood in urine	Yes	1	HEM
		No	0	
16.	Is the child having pain/discomfort in urination	Yes	1	DSYU
		No	0	
		YES	1	
	Has the child ever been diagnosed with	NO	0	UTI
17.	UTI?	|__|__|__|		UTIF
18.	If yes, answer question 18, if no go to 19 How many times has the child been diagnosed with UTI			
19.	Time of specimen collection	|__|__|__|		
20.	Time specimen sent to lab	|__|__|__|		
	Time interval between specimen collection and sending to lab	Excel|__|__|__minute		TIME

21.	Urine Leukocyte esterase	Positive	1	
		Negative	0	LEU
	Urine nitrite	Positive	1	
22.			0	NITR
	Urine sediment	Negative		
23.	WBC1			
	RBC			
	2			
	EPITHELIAL CELLS			
	3			
	OTHERS			
	4			

Appendix 4: Permission Letter from the University of Dodoma

THE UNIVERSITY OF DODOMA

DEPUTY VICE CHANCELLOR ACADEMIC, RESEARCH & CONSULTANCY
OFFICE OF GRADUATE STUDIES AND CONTINUING EDUCATION
P.o. BOX 259, DODOMA, TANZANIA.
Tel: +255 26 23 10173; Fax: +255 26 23 10005; Email: graduate@udom.ac.tz; website: www.udom.ac.tz

REF: UDOM/GRF/13 Vol. VI/87 .Tuesday, 16th October 2018

Medical Officer In charge,
Dodoma Referral Hospital
P. O. Box 904,
DODOMA, TANZANIA.

RE: INTRODUCING DR. FADYA MOHAMED HASHIM

The above named candidate is enrolled at the University of Dodoma for the degree of Master of Medicine in Paediatrics and Child Health with registration number HD/UDOM/284/T.2016.

As an essential requirement of the study programme, each candidate is required to submit a dissertation report on a research undertaken within an industry and supervised by a member of the University's academic staff. Where possible the research should relate to a practical situation in an organisation or firm selected by the candidate. Candidates are expected to use their own initiative to identify a possible research and negotiate access with a local firm or organization.

The above named candidate has developed the proposal titled **"URINARY TRACT INFECTION AMONG CHILDREN AGED 6 MONTHS TO 5 YEARS WITH FEVER ADMITTED AT PAEDIATRIC WARD IN DODOMA REGIONAL REFERRAL HOSPITAL PREVALENCE AETIOLOGY AND ANTIBIOTIC SENSITIVITY** which has been approved for data collection. The work may take the form of a survey, ethnography, case studies, etc. Where the research may contain confidential information and its publication could be harmful to the organization, confidentiality is assured by the University. Such reports will be seen only by the Supervisor and Examiner for examination purposes.

I would be grateful if you would provide the candidate with this opportunity to facilitate her Studies while at the same time gaining some useful inputs for your own organization through the results of the research report.

Sincerely,

R. Ollomy
For: Director, Graduate Studies and Continuing Education

C. c: Director, GS&CE

Appendix 5: Data Collection

THE UNITED REPUBLIC OF TANZANIA

Ministry of Health, Community Development, Gender, Elderly and Children

Telegram: "Afya" DODOMA
Tel. No:: +255 026 23223267
(All letter should be written to Permanent Secretary)

Dodoma Regional Referral Hospital,
P. O. BOX 904
DODOMA.

In reply please quote

Ref. No. PA. 90/264/06/186

2/11/2018

SCHOOL OF NURSING AND PUBLIC HEALTH,
THE UNIVERSITY OF DODOMA,
S.L.P. 395,
DODOMA.

Dear Sir/Madam,

REF; DATA COLLECTION PERMIT FOR FADYA MOHAMED HASHIM

The heading above is concerned,

This is to introduce to you the named above who is a student at Universty of Dodoma for the degree of master of medicine in paediatrics and child health with registration number HD/UDOM/284/T.2016, Has been permited to collect data for the research tittle,

URINARY TRACT INFECTION AMONG CHILDEN AGED 6 MONTHS TO 5 YEARS WITH FEVER ADIMITTED AT PAEDITRIC WARD IN DODOMA REGIONAL REFERRAL HOSPITAL PREVALENCE AETIOLOGY AND ANTIBIOTIC SENSITIVITY,

Dodoma Regional Referral Hospital grants her permission to carry out her research as requested from **30,October,2018** to **Februar,2019**.

Thank you.

For REGIONAL MEDICAL OFFICER
DODOMA

....

Dr. Rajab Kisonga
FOR;MEDICAL OFFICER INCHARGE
DODOMA REGIONAL REFERRAL HOSPITAL