

AFRICA UNIVERSITY

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Determinants of urinary tract infections in pregnant women at Victoria
Chitepo Provincial Hospital in Mutare: A one year retrospective study
(January 2023-December 2023).

BY

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Abstract

Urinary tract infections (UTIs) are a significant health concern among pregnant women, particularly in low-resource settings like Zimbabwe, where diagnostic practices are often limited. This retrospective study investigated the determinants, prevalence, etiological agents, and preventative measures associated with UTIs in pregnant women at Victoria Chitepo Provincial Hospital in Mutare over a one-year period (January–December 2023). Utilizing secondary data from the hospital's Laboratory Information System (LIS), a quantitative census method was employed to capture a comprehensive dataset of 143 confirmed UTI case. A quantitative census method was used to collect the data as it provided a true measure of the selected group, minimizing sampling errors. The findings revealed that age and immune-compromised states were key determinants of UTIs. Women aged 21–30 years accounted for the highest number of infections, while comorbid conditions such as HIV and diabetes significantly increased susceptibility. *Escherichia coli* emerged as the predominant causative organism, followed by yeast, *Staphylococcus* species, and other uropathogens. The overall prevalence of UTIs among pregnant women was 33.3%. Preventative strategies highlighted included routine antenatal care, antibiotic therapy, patient education, dietary recommendations, and screening programs, with antenatal care being the most prominent intervention. The study concluded that antenatal care should be easily accessible in communities with the incorporation of mobile health clinics to enable routine screening of diseases, encouragement by health personnel to adhere to drug prescriptions and regularly visit health care facilities. Advancement in diagnostic technology, sensitive tests and the possible reduction in terms of waiting period in organism identification and isolation in the laboratory. Antimicrobial resistance should also be educated. These findings contribute critical insights for public health planning and clinical management strategies aimed at improving maternal health outcomes in Zimbabwe and similar settings.

Key words: Urinary tract infections, antimicrobial resistance, Zimbabwe, Mutare, *Escherichia coli*,

Declaration

I Rufaro Eve Maturure, student number 210691 do hereby declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a Bachelor of Science degree.

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Dedication

I dedicate this dissertation to my parents Mr. A. and Dr. R. Maturure who continuously supported me throughout my studies.

Acronyms and Abbreviations

AUREC ----- Africa University Research and Ethics Committee

UTI-----Urinary tract infections

LIS-----Laboratory information system

AU-----Africa University

Spp-----Species

AMR-----Antimicrobial resistance

ANC----- Antenatal care

ASB----- Asymptomatic bacteriuria

DM----- Diabetes mellitus

HIV-----Human immunodeficiency virus

Definition of terms

Urinary tract infection: The presence of bacteria in urine accompanied with clinical symptoms.

Asymptomatic bacteriuria: The presence of bacteria in urine without presentation of clinical symptoms.

Bacteriuria: The presence of bacteria in urine with or without symptoms.

Pyelonephritis: The inflammation of the kidney due to a bacterial or viral infection.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

The urinary tract is responsible for micturition in mammals. It is a system that consists of the bladder, kidney, ureter and urethra. Accumulation of bacteria in the urethra and bladder results in an infection spreading throughout the system. According to Abate, Marami, & Letta (2019), women tend to be more susceptible to urinary tract infections as they have urethras that are shorter and closer to the anus, increasing the likelihood of getting UTIs. The changes that occur during pregnancy increase the risk of getting a UTIs including changes in your urine, immune system and increased pressure on the bladder reducing urine flow resulting in an infection. Pregnancy elevates susceptibility (Davis & Narayan, 2020).

They represent a potential risk to both maternal and fetal health and if left untreated may lead to complications such as pyelonephritis, preterm birth and maternal sepsis, highlighting the importance of prompt diagnosis, treatment and management (Mahamane Salissou, 2023). Pregnancy causes physiological changes that increase the susceptibility to UTIs, making it vital to understand the unique dynamics of these infections in this population (Habak, Carlson & Griggs, 2024).

1.2 Background of the study

The prevalence of UTIs globally during pregnancy has been estimated to range between 13% to 33% (Asmat, Mumtaz & Arif Malik, 2021). The commonest agents include *Escherichia coli* (responsible for majority of the infections), *Staphylococcus* spp., *Klebsiella pneumoniae*, *Proteus* spp., *Pseudomonas aeruginosa*, *Enterococcus* spp. and *Acinetobacter* (Mahamane Salissou, 2023). In developing countries like Zimbabwe, UTIs are common among women in their reproductive ages. The prevalence of UTI among pregnant women in Africa varies among study populations,

it ranging from 11.6% to as high as 75% (Vicar et al., 2023). Pregnant women are more susceptible to UTIs due to a combination of various hormonal and physiologic changes that predispose them to bacteriuria (Davis & Narayan, 2020). Studies in Zimbabwe have shown that in many hospitals, routine urine culture is not carried out for antenatal mothers and when UTI screening is done, dipstick analysis and wet prep microscopy of urine is used, but these tests have poor positive and negative predictive values to detect bacteriuria particularly in asymptomatic persons (Ayoyi et al., 2017). This research will close this gap by providing critical data regarding diagnosis, common etiological agents and probable treatment options taking note of antimicrobial resistance. The findings of this study will inform public health interventions to reduce the risk of UTIs during pregnancy in the future and contribute to further scientific research.

1.3 Statement of the problem

Identifying the determinants and risk factors associated with UTIs is crucial for implementing effective prevention and management strategies. The study will be conducted at Victoria Chitepo Provincial Hospital in Mutare which is a leading medical laboratory in Manicaland where numerous pregnant women receive diagnostic services and antenatal care including testing for UTIs. Pregnant women are particularly susceptible due to physiological changes which facilitate bacterial growth and ascent of pathogens into the urinary tract (Abate, Marami & Letta, 2019). An observation at Victoria Chitepo Provincial Hospital in Mutare revealed that approximately 700 urine samples were received over a period of three months requiring UTI screening and half of those being that of pregnant women.

Regardless of the persistent need to eradicate urinary tract infections in pregnant women, a limited amount of focus has been placed on this study especially in Zimbabwe, making the accessibility of information pertaining to the statistics of the prevalence of UTIs inaccessible (Mukapa et al., 2022).

1.4 Research objectives

1.4.1 Broad objective

The purpose of this study is to ascertain the determinants of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023.

1.4.2 Specific objectives

1. To assess the determinants of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023.
2. To examine the prevalence of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023.
3. To determine the etiology of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023.
4. To come up with preventative measures to overcome urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023.

1.5 Research questions

1. What are the determinants associated with the development of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023?
2. What is the prevalence of UTIs among pregnant women attending Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023?
3. What is the etiology of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023?
4. What preventative measures can be used to overcome urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023?

1.6 Justification of the study

Victoria Chitepo Provincial Hospital in Mutare is a leading medical laboratory in Manicaland where numerous pregnant women receive diagnostic services and antenatal care including testing for UTIs which is a serious health concern among pregnant women, leading to significant complications for both the mother and the developing fetus if left untreated. Identifying key risk factors and determinants of UTIs in this population will not only help develop prevention strategies but also mold antenatal care to address the specific needs of pregnant women. Understanding the antimicrobial resistance profiles of the uropathogens will significantly impact the selection of appropriate antibiotic treatments, critical for improving clinical outcomes and the implementation of effective prevention and management strategies of UTIs. The research findings will contribute to the scientific community, providing valuable information about UTIs in pregnant women and will ultimately improve the

management and prevention of UTIs in pregnant women, enhancing maternal and neonatal health outcomes in the Manicaland catchment area. Considering the amount of data available at Victoria Chitepo Provincial Hospital in Mutare, this research has the potential to provide information specific to Zimbabweans.

Overall, this study will contribute to filling the existing knowledge gap and provide valuable insights on the determinants of urinary tract infections in pregnant women and the findings will contribute to existing scientific literature of urinary tract infections in pregnant women and guide future research.

1.7 Delimitation of the study

This retrospective research made use of secondary data and is limited to a specific time frame of January 2023 to December 2023. The study focused on pregnant women who sought help with regard to UTIs at Victoria Chitepo Provincial Hospital in Mutare.

1.8 Summary

This chapter has provided the introduction, background of the study, statement of the problem, research objectives, research questions, justification of the study and the delimitations of the study. The next chapter will look at a review of related literature.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1 Introduction

A literature review is an overview of published articles on certain topics to provide a representation of the existing knowledge and give context to the reader and an understanding on the decided topic (Mauer & Venecek, 2022). When literature reviews are conducted independently they can help researchers better comprehend earlier researches on the subject of choice, making it easier to identify gaps in the body of knowledge and possible directions for future study (Kraus, Mahto & Walsh, 2023). This study explores the determinants of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023 whilst looking at different authors' perceptions associated with the determinants in urinary tract infections in pregnant women.

This chapter focused on the conceptual framework and the relevance of the conceptual framework in relation to the determinants of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023 and conclude with a summary of the entire chapter. Different perspectives by various authors were taken note of in-order to make a detailed analysis of the researches. It provided a theoretical foundation for understanding the determinants of urinary tract infections in pregnant women, taking into note various interrelated elements that contribute to these infections (Neugent et al., 2020).

2.2 Conceptual framework

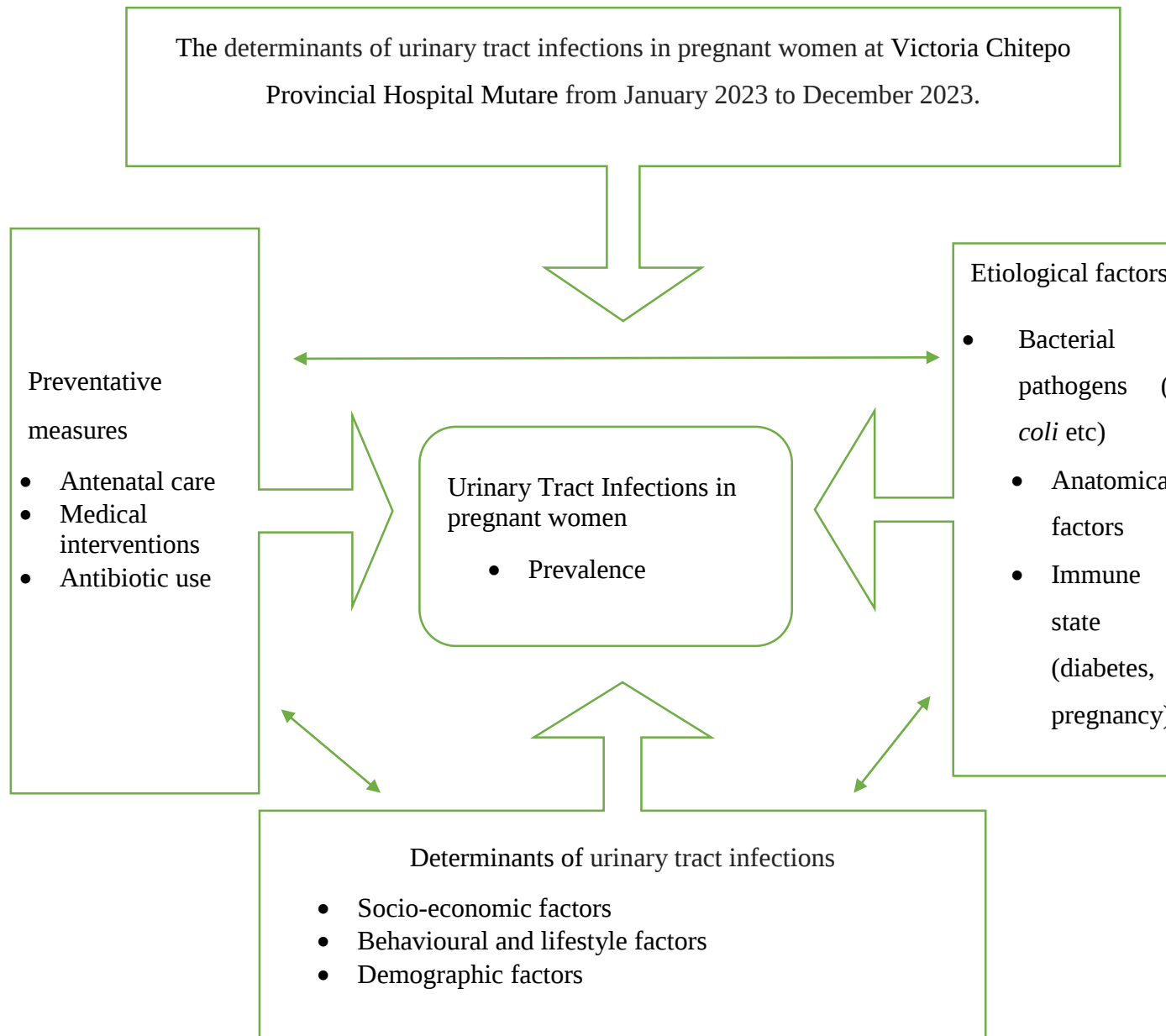


Figure 2 . 1 Conceptual framework model for the determinants of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare.

A conceptual framework is defined as “a network or a “plane” of linked concepts. Conceptual framework analysis offers a procedure of theorization for building conceptual frameworks based on grounded theory method (Jabareen, 2009). The conceptual framework model is made up of independent variables and dependent variables that explain the determinants of urinary tract infections. The independent

variables in this case are the determinants of UTIs, etiological factors and preventative measures whilst the dependent variable is the presence of urinary tract infections in pregnant women. The determinants of UTIs are a key component that includes socio-economic factors, behavioural and lifestyle factors and demographic factors that have a fundamental influence on health. The etiological factors include the main causes which are bacterial pathogens (*E. coli* etc), anatomical factors and Immune state (diabetes, pregnancy).

Lastly, the preventative measures to mitigate UTIs include antenatal care, medical interventions and antibiotic use. All these factors are linked together at the core by UTIs in pregnant women. Multiple links exist between these independent factors as they are intertwined (Suárez, Casarrubia, & Lafont, 2023). According to Bräuchler, Knodel & Röschenhalter (2021), a conceptual framework is at the center of every research as it serves as an intentional guideline that provides a reflection of how various factors interact in a study and emphasizes the importance of understanding as it is vital for the success of one's research.

2.3 Relevance of conceptual framework

2.3.1 Determinants of UTIs in pregnant women

Urinary tract infections represent one of the most common changes that occur during pregnancy, which if not taken note of could result in complications. Analyzing the determinants of UTIs is essential to find solutions that reduce their prevalence and possible complications. The risk factors associated with UTIs in Africa remain poorly investigated

A quantitative, cross-sectional study was conducted in Monteria Colombia to establish the social risk factors related to urinary tract infections in 37 pregnant women and it revealed that socio-demographic aspects, gynecological-obstetric factors, personal care and hygienic habits were responsible for the occurrence of UTIs. The study further revealed that the social situation of the individual interferes in the acquisition of behaviors that expose them to the development of diseases that precede risk factors such as physical inactivity, tobacco use, alcohol consumption, inadequate diet and obesity (Suárez, Casarrubia, & Lafont, 2023).

Similar observations were obtained in a cross sectional study carried out on 210 pregnant women attending an antenatal clinic at Pumwani Maternity hospital, Kenya which disclosed that UTIs affected women in their reproductive ages as pregnant women were more susceptible to UTIs due to hormonal and physiologic changes that predisposed them to bacteriuria. Determinants such as history of recurrent urinary tract infection, diabetes, low socio-economic status, increasing maternal age and anatomical abnormalities were associated with an increase in bacteriuria during pregnancy (Onyango et al., 2018).

According to a study done by Laari et al., (2022) on 158 study pregnant women, the majority were within the age group of 36-45 years with 35.4%, those within 26-35 years accounted for 32.9% and those within the 15-25 age group constituted 31.6%. In terms of the trimester stage of pregnancy, 38.6% were within their first trimester, 31.0% of them were within their second trimester and the remaining 30.4% of them were in their third trimester of pregnancy.

A study by Geerlings, (2008) revealed that patients with DM had a higher prevalence of asymptomatic bacteriuria (ASB) and incidence of UTIs as compared to patients

without DM. A prevalence of ASB of 26% in women with DM compared with 6% in those without. Compared with patients without DM, the relative risk ranged between 1.39 (99% confidence interval (CI) 1.36–1.43) and 1.43 (99% CI 1.39–1.46) for all diabetic patients in a large retrospective Canadian study.

A study conducted at the Women and Newborn Teaching Hospital of the University Teaching Hospitals in Lusaka urban, Zambia on urinary tract infections and associated factors in HIV infected pregnant women concluded that among the 380 HIV positive study participants, 63 had UTIs, translating to a prevalence of 16.5% (Mukosha et al., 2020).

2.3.2 The prevalence of UTIs in pregnant women

There is a descriptive cross sectional study which was carried out to determine the risk factors of urinary tract infection among pregnant women in Derna city Libya. The study was conducted on 140 pregnant women during 2017 and 2018. The women were between 17 to 49 years and the prevalence of urine tract infection was 49.3% (69 of 140), 66 (47.1 %) of them had urine tract infection symptoms and more than half of them were in second trimester (53.6%), 70% were multi-gravid and 55% had previous history of urine tract infection (Younis et al., 2019).

The prevalence of urinary tract infections was observed among 145 pregnant women aged 26 to 30, who were obtaining antenatal care in Kano, Northern Nigeria. The results showed that out of the 145 subjects, 23 were diagnosed with urinary tract infection which indicated a prevalence of 15.8 % of the pregnant women. Subjects in their third trimester showed a higher incidence of UTIs (Ali & Abdallah, 2019).

A hospital based cross sectional study conducted at Levy Mwanawasa University Teaching Hospital Lusaka, Zambia during 2018 to 2019 revealed that the prevalence of UTIs was 60% as this selected hospital serves as a referral center with a catchment population of roughly 800,000 in- and outpatients (Yeta et al., 2021).

The prevalence of UTIs was higher in the studies conducted in Zambia and Libya as compared to the study conducted in Nigeria.

2.3.3 The etiology of urinary tract infections in pregnant women

A study was conducted at Murtala Muhammad Specialist Hospital Kano, Nigeria by Ali and Abdallah, (2019) to determine the organisms associated with UTIs among pregnant women. It was conducted on 145 women attending antenatal clinic from March to August 2017 whose findings revealed *Escherichia coli* (25.9%) , was the most prevalent organism associated with UTI followed by *Staphylococcus aureus* (20.9%), *Klebsiella* (14.8%), *Pseudomonas aeruginosa* (14.8%), *Proteus sp.* (13.7%) while the least prevalent organisms was *Staphylococcus epidermidis* (9.9%) in the 23 urine samples that were cultured. It concluded that UTIs were common medical complications of pregnancy.

In a observational study conducted at the Department of Obstetrics and Gynecology, Holy Family Red Crescent Medical College Hospital Dhaka, Bangladesh from 2021 to 2022 done on a total of 120 pregnant women with UTIs concluded that the primary etiological agents identified were *Escherichia coli* (60.00%), *Klebsiella pneumoniae* (16.67%), *Staphylococcus aureus* (12.50%), *Enterococcus spp.* (6.67%), and other (4.17%) agents (Begum, Barua, & Nur, 2023).

These findings of the research done in Bangladesh and those in Nigeria are consistent with each, indicating similar causative agents with the most popular being *Escherichia coli*, *Klebsiella pneumoniae* and *Staphylococcus aureus*.

2.3.4 Preventative measures to overcome urinary tract infections in pregnant women

Corrales, Corrales-Acosta, & Corrales-Riveros, (2022) in a study done revealed that the antibiotics of choice for urinary tract infections in pregnant women included nitrofurantoin, trimethoprim/sulfamethoxazole, fosfomycin, multiple penicillins such as amoxicillin, ampicillin, pivmecillinam, ampicillin/sulbactam, amoxicillin/clavulanate, first-generation cephalosporine (1stGC) such as cephalexin and second-generation cephalosporine (2ndGC) such as cefuroxime.

A literature search conducted by Wawrysiuk et al., (2019) which was performed for the last 20 years revealed that the prevalence of bacterial etiology results in a large consumption of broad-spectrum antibiotics, which lead to higher rates of resistant uropathogens thus non-antibiotic prevention and treatment options are now of great importance. The study reviewed non-antibiotic options for UTI management, including use of cranberry products, the phytodrug Canephron N, probiotics, nonsteroidal anti-inflammatory drugs (NSAID), d-mannose, estrogens, vitamins, and immunotherapy. The study however concluded antibiotics remain a “gold standard” for UTI treatment and prevention, but changing the therapeutic strategy by including non-antibiotic measures could minimize antimicrobial resistance (Wawrysiuk et al., 2019).

Another literature search was conducted to identify published studies between January 2005 and November 2016 to demonstrate how uropathogenic bacteria showed resistance to antimicrobial drugs that were regularly used in developing countries, showing the need to incorporate culture and drug susceptibility tests into the routine antenatal care for pregnant women and monitoring of drug resistance (Belete & Saravanan, 2020). The studies highlighted the magnitude of resistance to antimicrobial drugs used to treat UTIs in pregnant women whilst the other emphasized their usage as the gold standard.

2.4 Summary

This chapter offered a review of related literature, taking into note various opinions by different authors and concluded that the determinants of urinary tract infections included bacterial pathogens, immune state, socio-economic factors, antenatal care received and medical interventions. It also gave a clear indication on how little is known when it comes to urinary tract infections in pregnant women in Zimbabwe and this is a gap that needs to be filled.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction

This chapter offered a detailed description of the methodology used in the research and outlined the research design, study site, study population, sampling, data collection instruments, data collection procedures, analysis and organization of data, ethical considerations and the chapter summary. It provided a comprehensive overview of the research methodology and worked towards the establishment of the foundation for the analysis of the obtained data, which was used to present and discuss the findings, interpretations and implications of the research whilst ensuring validity in examining the determinants of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023. This was a retrospective study meaning it was an observational review or reassessment of database records with the aim of analyzing previous events of interest (De Sanctis et al., 2022).

3.2 The research design

The research was a retrospective study that made use of secondary data that was obtained from the laboratory information system (LIS) at Victoria Chitepo Provincial Hospital in Mutare. Details that were collected were from pregnant women who would have had urinary tract infections. Statistical methods were used to compare the cases to see if there are any factors that are common. These factors were identified as determinants of UTIs in pregnant women. As it is a retrospective study, it made use of stored patient medical records thus making it quick and inexpensive.

3.3 Study population

The study population included pregnant women with urinary tract infections at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023.

3.4 Inclusion Criteria

The study was conducted among all pregnant women with urinary tract infections at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023.

3.5 Exclusion Criteria

Cases of urinary tract infections in women who are not recorded as pregnant at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023 were excluded from this study.

3.6 Sample size

A quantitative census method was used to collect the data from a Laboratory Information System, focusing on all pregnant women with urinary tract infections at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023 that made the total number of participants to 143.

3.7 Sampling procedure

A quantitative census method was used to collect the data as it provided a true measure of the selected group, minimizing sampling errors. This approach enabled an in-depth exploration of the determinants of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023.

3.8 Pilot study

A pilot study is a small scale study conducted to evaluate the feasibility and practicality of a research design to identify any ambiguous or challenges that could potentially arise during the main study (In, 2017). Pre-testing was done on ten samples belonging to pregnant women with urinary tract infections at Victoria Chitepo Provincial Hospital. The participants who were involved in the pre-test were not be used in the

actual study. This helped refine the research methods before pursuing a full-scale study.

3.9 Study setting

The setting of the study was at Victoria Chitepo Provincial Hospital in Mutare.

3.10 Data collection procedure

A quantitative census approach was used in this study. The collected information was obtained from Victoria Chitepo Provincial Hospital in Mutare from past records that fall into the specified time frame as it was a retrospective study. To do this, permission was sought from the respective authorities and the collected data was arranged and presented in tables and charts.

3.11 Data analysis

The collected data was presented in graphs and tables to enable neat representation of the collected information. The numerical information was presented as percentages and calculated to give clear results of the collected information as graphical representation of data is the cornerstone of medical research (Vickers et al., 2020).

3.12 Ethical considerations

Ethical considerations refer to the principles that guide researchers as they conduct their studies to respect the participants' rights and confidentiality whilst handling their medical data (Brittain et al., 2020). Ethical clearance to conduct the study was sought from the Africa University Research Ethics Committee. Permission to review clinical records from Victoria Chitepo Provincial Hospital in Mutare was requested from the chief executive laboratory scientist. After collection of the data, the results were confidentially maintained and kept in a computer with a password (encryption) for

security. Names of the participants were not be required and information was collected in accordance to the requirements of the ethics committee (AUREC).

3.13 Summary

This chapter gave a comprehensive overview of the research methodology used in the study. It explains the selected research design and its suitability for examining the determinants of urinary tract infections in pregnant women. It discusses the quantitative data analysis techniques used and highlights how appropriate they were for addressing the research objectives. In summary, this chapter presents the findings, interpretations, and implications of the research and ensures validity in examining the determinants of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the findings of the study on the determinants of Urinary Tract Infections in Pregnant Women at Victoria Chitepo Provincial Hospital during January 2023 to December 2023. The results are analysed and interpreted in relation to the study objectives and research questions. The research results are presented in the form of absolute values or percentages presented on bar graphs, pie charts and tables.

4.2 Determinants of urinary tract infections in pregnant women

4.2.1 Age as a determinant of urinary tract infections in pregnant women

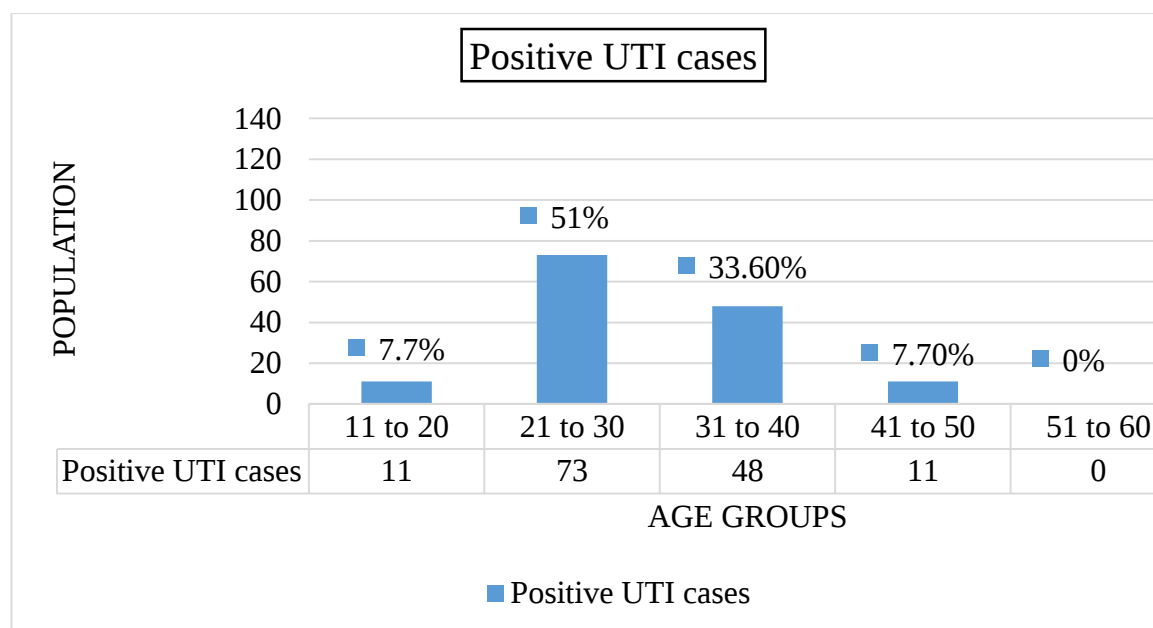


Figure 4. 1: Age as a determinant of urinary tract infections in pregnant women

Among the 143 positive UTI cases in pregnant women ranging from 13 to 49 years, the age group that had the highest occurrence was 21 to 30 years with 73 participants being within this age group making up 51% of the cases followed by the 31 to 40 age group with 48 cases which made up 33.6%. The least occurrence was within the 11 to

20 age group, followed by 41 to 50 age group and the 51 to 69 age group. The 11 to 20 and 41 to 50 age group had 7.7% of the cases each whilst 51 to 60 age group had 0%, with no number cases. The results indicate that age demographics significantly influence the occurrences of UTIs in pregnant women.

4.2.2 Immune-compromised states as determinants of urinary tract infections in pregnant women

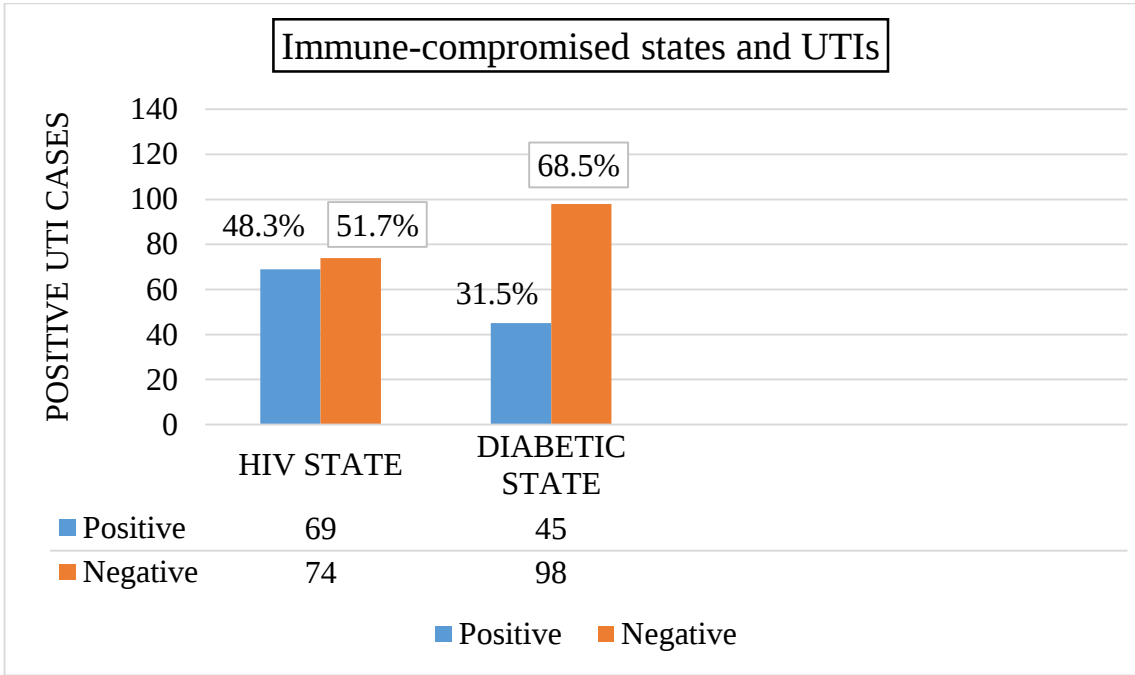


Figure 4. 2: Immune-compromised states as determinants of urinary tract infections in pregnant women

The results showed that of the 143 participants, 69 were positive for HIV contributing to 48.3% of the cases of UTI cases whilst the rest were negative. Of the 143 participants, 45 were diabetic making up 31.5% of the UTI cases. It is evident that HIV and diabetes make pregnant women more susceptible to UTI occurrences, highlighting the heightened risk of immune compromised states. Pregnancy itself is also a contributing factor to a compromised immune state. Immune-compromised states of focus included diabetes, HIV and pregnancy itself which bring about a weakened immune state.

4.3 Prevalence of urinary tract infections in pregnant women

UTI	FREQUENCY	PERCENTAGE
POSITIVE	143	33.33
NEGATIVE	286	66.67
TOTAL	429	100

Table 4. 1: Prevalence of urinary tract infections in pregnant women

The total study population of the study was 429 pregnant participants. One hundred and forty-three (143) were diagnosed with UTIs with in the 429 participants. The prevalence of UTIs in pregnant women was 33.33%. 286 participates were negative (66.67%) of UTIs despite being pregnant.

4.3.1 Prevalence of urinary tract infections in pregnant women by age

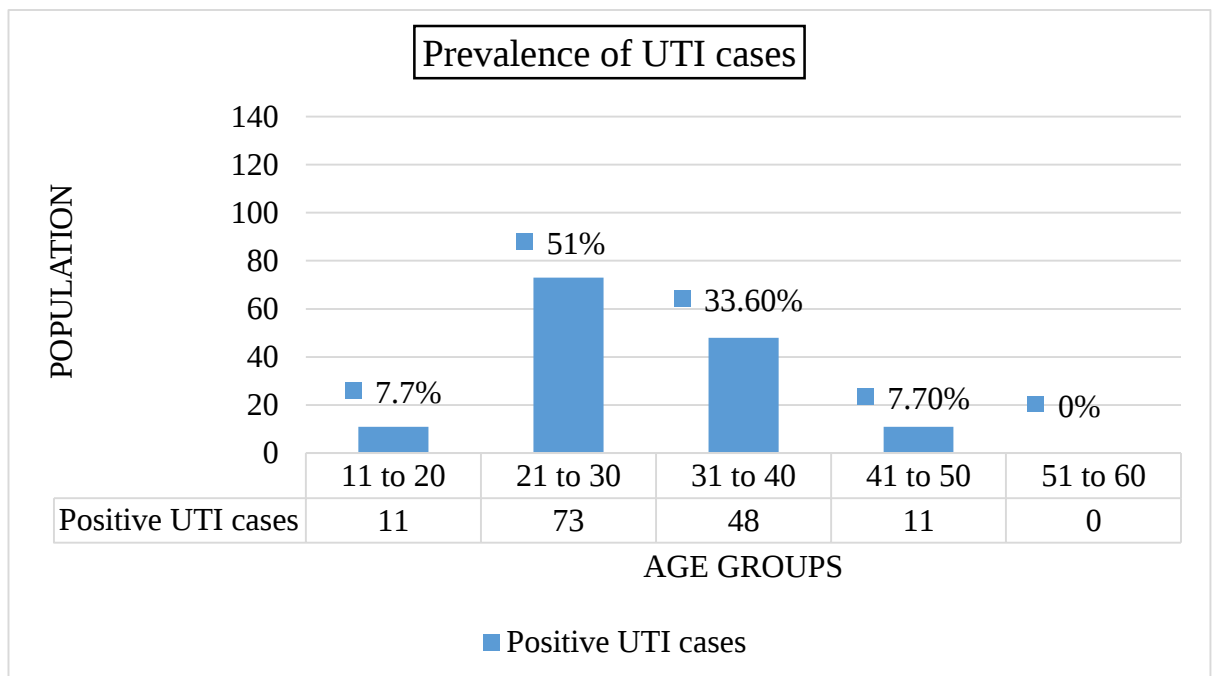


Figure 4. 3: Prevalence of urinary tract infections in pregnant women by age

This study makes use of 143 pregnant participants who were diagnosed with UTIs. To assess the prevalence trend with reference to age, the age ranges were grouped into ten-year intervals with the lower age limit being 13 and the oldest participants diagnosed being 49 years. The highest prevalence of UTIS was in the 21 to 30 age group, with 73 of the 143 participants within this range, making up 51% of the total population. The lowest prevalence had 11 participants in the 11 to 20 age range and 41 to 50 age range, making up 7.7% of the total population.

	Positive UTI	Negative UTI	TOTAL
11-20	11	132	143
21-30	73	70	143
TOTAL	84	202	286

Table 4. 2: Contingency table

Fishers exact was calculated and to do so a 2x2 contingency table was created to determine if age groups are dependent on population distribution.

Fishers exact test calculation (p) formula ∴

$$p = \frac{(a + b)! (c + d)! (a + c)! (b + d)}{n! (a! b! c! d!)}$$

Where:

$a=11$ (positive UTI cases in 11 to 20 age group)

$b=132$ (negative UTI cases in 11 to 20 age group)

$c=73$ (positive UTI cases in 21 to 30 age group)

$d=70$ (negative UTI cases in 21 to 30 age group)

$n=286$ (Total population)

$$p = \frac{(11 + 132)! (73 + 70)! (11 + 73)! (132 + 70)}{286! (11! .132! .73! .70!)}$$

$$P \approx 0.023$$

If the value of p is less than 0.05, it is considered to be statistically significant for the results. To interpret the results, if the p value is a 0 it indicates that the null hypothesis is false, suggesting a highly significant association between the age groups 11 to 20 (with the lowest prevalence of UTIs) and 21 to 30 age groups (with the highest prevalence of UTIs) and the prevalence of UTIs.

The Fischer's exact, which is a measure of association, was found to be 0.023, indicating that the difference in prevalence of urinary tract infections is significant.

4.4 Aetiology of UTI in pregnant women

Infection	Frequency	Percentage (%)	Cumulative
<i>Escherichia coli</i>	42	29.4	29.4
<i>Yeast</i>	29	20.3	49.7
<i>Staphylococcus species</i>	25	17.5	67.2
<i>Coagulase-Negative Staphylococci</i>	18	12.6	79.8
<i>Streptococcus species</i>	12	8.3	88.1
<i>Klebsiella</i>	10	7.0	95.1
<i>Pseudomonas</i>	7	4.9	100
<i>TOTAL</i>	143	100	

Table 4. 3: Aetiology of UTI in pregnant women

143 microorganisms were isolated with *Enterobacteriaceae* dominating with microorganisms like *Escherichia coli* (29.4%) and *Klebsiella* (7.0%) among others. Gram positive bacteria were also isolated including *Staphylococcus species* (17.5%), *Coagulase-Negative Staphylococci* (12.6%), *Streptococcus species* (8.3%), gram negative *Pseudomonas* (4.9%) and lastly yeasts (20.3%).

4.5 Preventative measures to overcome urinary tract infections in pregnant women

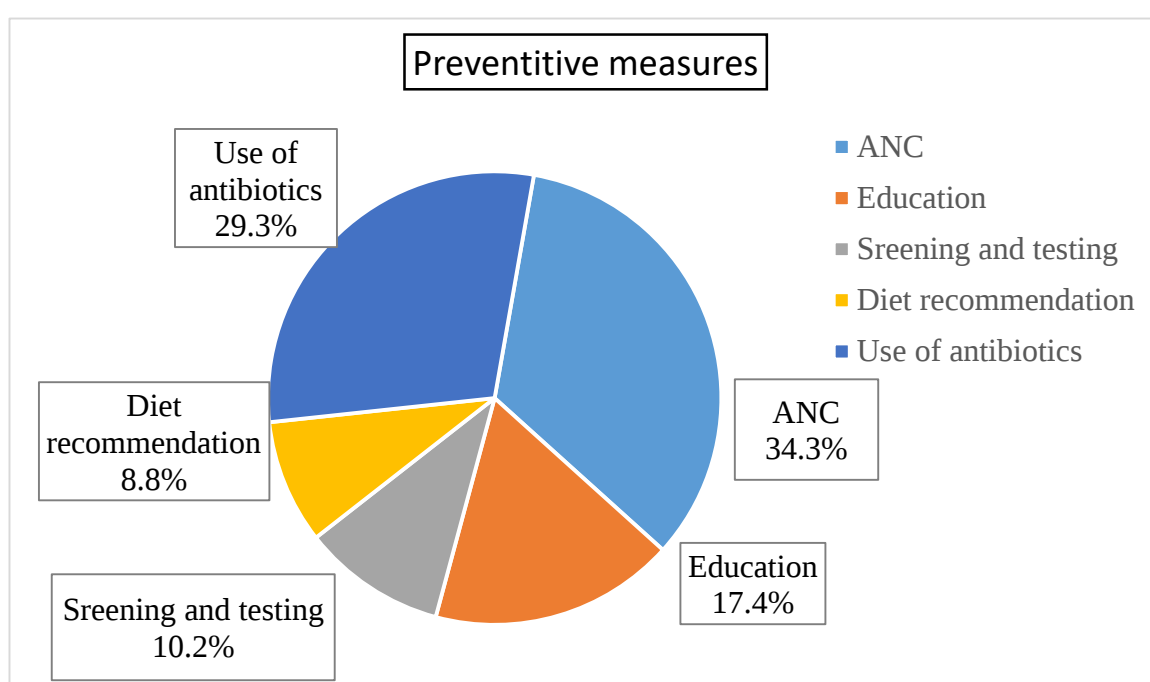


Figure 4. 4: Preventative measures to overcome urinary tract infections in pregnant women

From the above chart it can be deduced that at Victoria Chitepo Provincial Hospital the preventive measures that have been put in place to minimize the occurrences of UTIs in pregnant women include antenatal care (34.3%), use of antibiotics (29.3%), educating expecting mothers (17.4%), diet recommendations (8.8%), screening and testing (10.2%). The most prominent initiative is ANC (34.3%) visits that provide

women with regular check-ups and monitoring. The administration of antibiotics (29.3%) to handle the cause of the UTI with the drug choice including gentamicin, nalidixic, erythromycin, penicillin, clindamycin, norfloxacin, doxycycline and chloramphenicol. Education (17.4%) on UTI prevention and awareness by emphasizing routine check-ups, medication adherence, exercise and good hygiene. screening and testing (10.2%) for STIs, UTIs and glucose levels (in the event of gestational diabetes) and lastly diet recommendation (8.8%) to ensure a rigid immune system is maintained.

4.6 Chapter summary

This chapter was focused on the results found with regard with UTIs in pregnant women taking note of study objectives and research questions. The determinants of UTIs in pregnant women were presented first. It was observed that among the 143 positive UTI cases in pregnant women, those within the 21 to 30 age range had the highest occurrence with 73 participants, making up 51% of the cases. The next analysis noted the immune state particularly HIV and diabetes. 69 participants were positive for HIV contributing to 48.3% of UTI cases and the 45 participants who were diabetic made up 31.5% of the positive UTI cases highlighting the heightened risk of immune compromised states. The prevalence of UTIs in pregnant women was 33.33%. 143 microorganisms were isolated with *Enterobacteriaceae* dominating with microorganisms like *Escherichia coli* causing 29.4% of UTI cases. The most dominant preventive measures put in place to minimize the occurrences of UTIs in pregnant women included antenatal care (33.7%) and use of antibiotics (29.3%). Fisher's exact was used to establish the statistical significance of the variables. Chapter five, which follows will summarize and conclude the research study.

CHAPTER 5 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses and focuses on results presented in chapter four, pointing out reasons for the observations. It is supported by literature associated with the research problem and from previous studies. The chapter will include the discussion, conclusions, implications, recommendations and suggestions for further research.

5.2 Discussion

The discussion highlighted the findings of the study on the determinants of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare whilst comparing results from the literature section to note if there are differences or similarities.

5.2.1 Determinants of urinary tract infections in pregnant women

The study results revealed that the determinants of UTIs involved age and the immune state of the pregnant woman. In terms of age, women between 21 to 30 years had the highest number of cases contributing 51% of the UTI cases and the lowest occurrence was within the 11 to 20 and 41 to 50 age group with 7.7% of the cases each. A study done by Laari et al., (2022) revealed that the majority of UTI cases were within the age group of 36-45 years with 35.4% and the least within the 15-25 age group constituted 31.6%. This is similar to the study indicating that individuals in the 30 to 40 age range were more susceptible to UTIs. The results indicate that age demographics significantly influences the occurrences of UTIs in pregnant women.

The study results revealed that of the 143 participants, 45 were diabetic making up 31.5% of the UTI cases. This was in consensus with the study by Geerlings, (2008) whose results revealed that patients with DM had a higher prevalence of asymptomatic bacteriuria (ASB) and incidence of UTIs as compared to patients without diabetes

mellitus (DM). This is agreed upon by the fact that individuals who are hyperglycemic are prone to UTIs as they provide a conducive environment for microorganisms to thrive in an immune compromised host.

The results showed that of the 143 participants, 69 were positive for HIV contributing to 48.3% of the cases of UTI cases whilst the rest were negative. A study conducted by Mukosha et al., (2020) at the Women and Newborn Teaching Hospital of the University Teaching Hospitals in Zambia concluded that among the 380 HIV positive study participants, 63 had UTIs, translating to a prevalence of 16.5%. The reduced immune system associated with HIV infection may account for this increase in the observed UTIs.

5.2.2 Prevalence of urinary tract infections in pregnant women

The study results revealed that the prevalence of UTIs in pregnant women was 33.33%. In comparison to previous related literature it was closely linked to the various data. Similar results were obtained in the case of the descriptive cross sectional study which was carried out to determine the risk factors of urinary tract infection among pregnant women in Derna city Libya by Younis et al., (2019) with a prevalence of 49.3%. Another study conducted by Ali and Abdallah (2019) in Kano, Northern Nigeria revealed that the prevalence of UTIs in pregnant woman 15.8 %, slightly lower than this study. It can therefore be deduced that the prevalence of UTIs in pregnant women is 33.3% indicating that a third of the population of pregnant women are at risk of being affected by UTIs. The differences may be explained by differences in the social habits, personal hygiene and educational levels may differ, accounting for the variation.

5.2.3 Aetiology of urinary tract infections in pregnant women

In terms of aetiological agents, *Escherichia coli* was the most prevalent organism accounting for over 29.4% of the cases of UTIs. The studies conducted by Ali and Abdallah, (2019) at Murtala Muhammad Specialist Hospital Kano, Nigeria (25.9%) and by Begum, Barua and Nur, (2023) at Holy Family Red Crescent Medical College Hospital Dhaka, Bangladesh (60%) share the same opinion in regard to *Escherichia coli* being the leading cause of UTIs in pregnant women.

Other notable organisms that caused UTIs in this study included *Staphylococcus species* (17.5%), *Coagulase-Negative Staphylococci* (12.6%), *Streptococcus species* (8.3%), *Klebsiella* (7.0%), *gram negative Pseudomonas* (4.9%) and lastly yeasts (20.3%). This is in agreement with the study by Ali and Abdallah, (2019) which showed that the other organisms were *Staphylococcus aureus* (20.9%), *Klebsiella* (14.8%), *Pseudomonas aeruginosa* (14.8%), *Proteus sp.* (13.7%) while the least prevalent organisms was *Staphylococcus epidermidis* (9.9%). The study also concurs with the organisms observed in the study by Begum, Barua and Nur, (2023) which added *Klebsiella pneumoniae* (16.67%), *Staphylococcus aureus* (12.50%), *Enterococcus spp.* (6.67%), and other (4.17%) agents as the primary etiological agents of UTIs in pregnant women. It can therefore be concluded that the etiological cause of UTIs in pregnant women were *Escherichia coli*, *Klebsiella*, *Staphylococcus species*, *Coagulase-Negative Staphylococci*, *Streptococcus species*, *Pseudomonas* and yeasts.

5.2.4 Preventative measures to overcome urinary tract infections in pregnant women

The study results deduced that the preventive measures put in place to minimize the occurrences of UTIs in pregnant women included antenatal care (34.3%) as the most dominant mechanism followed by use of antibiotics (29.3%), educating expecting

mothers (17.4%), diet recommendations (8.8%), screening and testing (10.2%). A study conducted by Corrales, Corrales-Acosta, & Corrales-Riveros, (2022) harmonized with the use of antibiotics. A study by Wawrysiuk et al., (2019) emphasized that the use of antibiotics has led to higher rates of resistant uropathogens thus non-antibiotic treatment options were of great importance and reviewed non-antibiotic options for UTI management. Another study by Belete and Saravanan, (2020) agreed with this notion, stating that bacteria were resistant to antimicrobial drugs that were regularly used, showing the need to incorporate culture and drug susceptibility tests into the routine antenatal care for pregnant women and monitoring of drug resistance.

The study revealed the antibiotics (29.3%) of choice included gentamicin, nalidixic, erythromycin, penicillin, clindamycin, norfloxacin, doxycycline and chloramphenicol. This was in consensus with the study by Corrales, Corrales-Acosta, & Corrales-Riveros, (2022) which also was in alignment with the use of antibiotics as a preventative measure for UTIs. Therefore, the preventive measures put in place to minimize the occurrences of UTIs in pregnant women include antenatal care as the most dominant mechanism followed by use of antibiotics.

5. 3 Conclusion

According to the study, the determinants associated with the development of urinary tract infections in pregnant women at Victoria Chitepo Provincial Hospital in Mutare from January 2023 to December 2023 are age during pregnancy onset and immune compromised state. Women between 21 to 30 years had the highest number of UTI cases and those with immune compromised states with HIV and or diabetes were more susceptible to UTIs. The study results revealed that the prevalence of UTIs in pregnant women was 33.33% and that the main aetiological agent was *Escherichia coli*. The

study concluded that the preventive measures put in place to minimize the occurrences of UTIs in pregnant women included antenatal care as the most dominant mechanism followed by use of antibiotics.

5.4 Implications

This study brought into perspective the need to assess the determinants of UTIs in immune compromised pregnant women as they are vulnerable. The main notable features are that the main aetiological agent of UTIs was *Escherichia coli* in immune compromised pregnant women. With this information the Council of Mutare can work hand in hand with the Ministry of Health and Child Care of Zimbabwe to increase resources particularly in expanding the antenatal care provision to expecting mothers to get regular monitoring, enhanced testing equipment to reduce turn-around-time and adequate staffing. It is also important to equip health personnel on better educating of expecting mothers and the importance of drug adherence.

5.5 Recommendations

Antenatal care should be easily accessible in communities with the incorporation of mobile health clinics to enable routine screening of diseases. This will also work hand in hand with the use of posters campaigning for the need to adhere to drug prescriptions and regularly visiting health care facilities. Antimicrobial resistance should also be educated to avoid its potential disastrous outcomes within the community. In laboratory set-ups, the advancement in diagnostic technology, sensitive tests and the possible reduction in terms of waiting period in organism identification and isolation. This will avoid the pressure to provide broad spectrum antibiotics by health personnel.

5.6 Suggestions for further research

Research should focus on developing effective prevention and management strategies for UTIs in pregnant women. There should be an investment in the development and

validation of new diagnostic mechanisms to rapidly diagnose UTIs in pregnant women. The implementation of point-of-care testing to provide accurate results, prompt treatment and prevention of complications. Health education campaigns should be implemented to raise awareness of the importance of ANC, drug adherence, AMR and regular monitoring. Lastly resources should be adequately allocated to support public health programs and research initiatives that are focused on improving women's health.

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APPENDICES

Appendix 1 Template of Excel Spreadsheet Data collection tool

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1			URINALYSIS												ORGANISM ISOLATED	ANTI-SUSCEPTIBILITY TESTING					IMMUNE COMPROMISED STATUS				
2	LAB #	AGE	SG	PH	PROTEIN	GLUCOSE	KETONE	BLOOD	WBC	RBC	EPITHEL	CASTS	CRYSTA	OTHER (S. haematobium, Yeasts, T.vag)		penicilin	clindamycin	gentamicin	erythromycin	nalidixic	doxycycline	chloramphenicol	norfloxacin	HIV	Diabetes
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Appendix 2 Supervisor's Letter of study approval to AUREC



"Investing in Africa's Future"

**DEPARTMENT OF PUBLIC HEALTH AND NURSING: COLLEGE OF
HEALTH, AGRICULTURE AND NATURAL RESOURCES**

23 January 2025

To: AUREC Administrator

Dear Madam

RE: PERMISSION TO SUBMIT TO AUREC FOR MATURURE RUFARO

**PROGRAMME: BACHELOR OF MEDICAL LABORATORY SCIENCES
DEGREE HONORS.**

This letter serves to confirm that I have supervised the above-mentioned student and she has satisfied all the requirements of the college in developing her research proposal and is ready for ethical review.

Your facilitation for review of the proposal is greatly appreciated.

Thank you

Mr Tawanda Thabani Dzvairo
Research Supervisor

Appendix 3 AUREC approval letter



AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 Website: www.africau.edu

Ref: AU 3701/25

12 March, 2025

RUFARO EVE MATURURE

C/O Africa University

Box 1320

MUTARE

RE: **DETERMINANTS OF URINARY TRACT INFECTIONS IN PREGNANT WOMEN AT VICTORIA CHITEPO PROVINCIAL HOSPITAL MUTARE: A ONE YEAR RETROSPECTIVE STUDY (JANUARY 2023-DECEMBER 2023).**

Thank you for the above-titled proposal you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

a) Research proposal

- **APPROVAL NUMBER** AUREC 3701/25
This number should be used on all correspondences, consent forms, and appropriate document
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** March 12, 2025
- **EXPIRATION DATE** March 12, 2026
- **TYPE OF MEETING:** Expedited
After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be submitted a month before the expiration date for renewal purposes.
- **SERIOUS ADVERSE EVENTS** All serious problems concerning subject safety must be reported to AUREC within 3 working days on the standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.



Yours Faithfully

MARY CHINZOU

FOR CHAIRPERSON

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE

Appendix 4 Study site approval letter

Telephone: 263-020-64321 Fax: +263-020-67048 E-mail: mp hosp@syscom.co.zw	 ZIMBABWE	Reference: Victoria Chitepo Provincial Hospital P.O. Box 30 Mutare MANICALAND ZIMBABWE
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24 July 2024

Attn: Rufaro Maturure

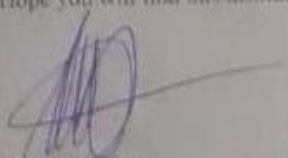
**Re: PERMISSION TO CARRY OUT A RESEARCH ON DETERMINANTS OF
UNRINARY TRACT INFECTIONS IN PREGNANT WOMEN AT VICTORIA
CHITEPO PROVINCIAL HOSPITAL.**

In reference to the above subject matter:

I have no objection to your request.

You can go ahead with your research.

Hope you will find this institution helpful in your research.


DR. H. Makiwa
ACTING MEDICAL SUPERINTENDENT

