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RISK FACTORS AND AETIOLOGY OF URINARY TRACT INFECTIONS (UTI) AMONG ELDERLY PATIENTS AGED 65 AND ABOVE AT LANCET CLINICAL LABORATORIES FROM JANUARY TO DECEMBER 2023

BY

FERDINAND AKOKA AKOKA
190038

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF THE DEGREE OF BACHELOR OF MEDICAL LABORATORY SCIENCE (HONORS) IN THE COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

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ABSTRACT

Urinary tract infections (UTIs) are infections in any part of the urinary system, and the most frequent cause of bacteraemia/sepsis in elderly people. UTIs are the second most common type of infection in the body and are the reason for more than 8 million visits to the doctor each year. There is however no substantial information on the relevant factors and aetiological agents of UTI in the elderly age from 65 and above in Zimbabwe, a gap that needs to be filled. This research was a retrospective, descriptive cross-sectional study which made use of records stored by the laboratory information system of Lancet Clinical Laboratories Harare from January to December 2023. Therefore, there was a total number of 623 data that were extracted using a data extraction tool, MediTech involving the following: Laboratory Number, Age, Sex, Infection (Isolated organism), Susceptibility and Resistance that catered for the different variables of the study, for maximum efficiency. The total population of those found to be positive of UTIs was 260. The males proved to be less susceptible, with a population of 74, which is 28.46% of the positive cases compared to females 186 (71.54%). 376 or more measurements were needed to have a confidence level of 95% that the real value is within ±5% of the measurement value. Therefore, study sample size of 376 of patients was used for this study. This study brought to light the risk factors and aetiological agents of urinary tract infections in the elderly, analysed the relationship of the condition with age and sex. It also analysed the resistance pattern to the common drugs administered to the concerned patients. The results depicted that of the organisms isolated, and the organism that was mostly isolated was proved to be the main causative agent of urinary tract infections in the elderly and both in the male and female population. The gender most affected by urinary tract infections was the female due to certain features in their anatomy, and most of the organisms isolated were sensitive to most common drugs, despite quite of the amount of ESBL positive organisms were noted. The onset of most of the UTIs might have several underlying factors such as hygiene and general degeneration of the immune functions and other related conditions. A general awareness about the factors was brought to light, so as to minimise the risks. Prescription of medication was noted to be specific and sufficient enough so as to reduce the onset of resistant strains.

Key words: Urinary Tract Infections (UTIs), Elderly patient 65 and above, Risk factors, Gender, Age, Aetiology.

DECLARATION

I declare this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it be submitted to another university for the award of a degree.

Ferdinand AKOKA AKOKA		29/04/2024
NAME OF STUDENT	SIGNATURE OF STUDENT	DATE

Dr Susan L MUTAMBU		29/04/2024
NAME OF SUPERVISOR	SIGNATURE OF SUPERVISOR	DATE

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DEDICATION

This research is dedicated to all the elderly people in our society.

LIST OF ACRONYMS AND ABBREVIATIONS

Amp C	Ampicillin C
ASB	Asymptomatic Bacteriuria
AUREC	Africa University Research and Ethics Committee
ESBL	Extended Spectrum Beta-Lactamases
LIS	Laboratory information system
MRSA	Methicillin Resistant *Staphylococcus aureus*
MRO	Multi-resistant Organisms
Spp	Species
WBC	White blood cell
WHO:	World Health Organisations

DEFINITION OF TERMS

Bacteriuria: This is the presence of Bacteria in urine, with or without symptoms.

Asymptomatic bacteriuria: This is the presence of bacteria in urine, without the presentation of clinical symptoms.

Urinary tract infection: the presence of bacteria in urine, accompanied by the associated clinical symptoms.

Pyelonephritis: this is the inflammation of the kidney, typically due to a bacterial and viral infection. (Belyayeva & Jeong, 2022)

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CHAPTER 1 INTRODUCTION

I.1 Introduction

A urinary tract infection, or UTI, is an infection in any part of your urinary system, which includes kidneys (Pyelonephritis), bladder (Cystitis), ureters, and urethra (Urethritis), (Kovacs, 2007). According to Dutta et al. (2022), older adults frequently contract urinary tract infections (UTIs), primarily as a result of age-related risk factors such as malnourishment, poorly managed diabetes mellitus, insufficient bladder control resulting in incontinence or urine retention, constipation, prolonged hospital stays, vaginal atrophy, and prostate hyperplasia.

This study focused on the risk factors and aetiology of Urinary Tract Infections in elderly patients 65 and above at Lancet Clinical Laboratory from January to December 2023. Therefore, this chapter provides an overview of the study and its background, the problem statement will also be defined. The purpose of this study, its objectives as well as research questions will be stated, and the significance of the study will also be highlighted.

1.2 Background Information

Urinary tract infections (UTIs) are a common cause of bacteraemia in the elderly and are associated with a high probability of hospitalization. Despite the impact of UTIs on health status and quality of life, a limited number of studies have evaluated their aetiology in the elderly population, (Elena De Vecchi, et al., 2013). UTI) is an infection in any part of the urinary system and the most frequent cause of bacteraemia/sepsis in elderly people. UTIs are the second most common type of infection in the body and are the reason for more than 8 million visits to the doctor each year, (*Urology Care Foundation*, 2016).

Most UTIs are not serious, but some can lead to serious problems like kidney infections. Older men, such as those 65 years and older are at a higher risk for UTIs because of problems experienced with going to the bathroom and/or emptying the bladder. Older post-menopausal women are also at a greater risk for UTIs due to lower amounts of vaginal oestrogen, which can change the vaginal climate, (Urology Care Foundation, 2016).

The normal flora, ‘good bacteria,' are looked at as ‘good' because they kill off other types of bacteria that can cause UTIs. Therefore, good bacteria can only grow in slightly acidic vaginal climates and this needs some oestrogen. Systemic oestrogen replacement options like pills and skin patches do not help with this problem, but vaginal oestrogen therapy can be helpful for certain individuals, (Urology Care Foundation, 2016). According to one study, more than one-third of all infections in people in nursing homes were infected with UTIs. More than 10 per cent of women over the age of 65 reported having a UTI within the past year. This number increased to almost 30 per cent in women over 85, (McDermott, 2018).

In older patients, the diagnosis and treatment of UTIs can be more complicated than in younger people, as underlying host factors, including age, diabetes, spinal cord injury, catheterization and general disability, can affect the pathogenesis of these infections, (Tal et al., 2005). Moreover, ageing-related immune-system changes including decreased humoral and cellular immune reactivity may lead to a decreased ability to respond appropriately to antigen challenge and to maintain immunological memory, (Castle, 2000). It may be hard to figure out that an older adult has a UTI because they do not always show classic signs. This may be due to a slower or suppressed immune response.

Antibiotics are the most common form of care or treatment for UTIs. Symptoms include pain or burning when passing urine, cloudy or foul-smelling urine, pressure in the lower stomach, and frequent urges to use the restroom. Most UTIs are caused by bacteria, but they can also be caused by fungi and in rare cases, viruses. Classic UTI symptoms include burning in the urethra during urination, pelvic pain, frequent urination, fever, chills, and urine with an abnormal odour. When older adults experience symptoms of a UTI, they may be unable to disclose it to others. This could be because of age-related conditions like dementia or Alzheimer's disease. It is also important to note that “Women are more likely to get UTIs than men because their urethras are shorter than men's.” (McDermott, 2023).

Non-classic UTI symptoms may include incontinence, agitation, lethargy, falls, urinary retention, decreased mobility, and decreased appetite. Other symptoms may occur if the infection spreads to the kidneys. These symptoms may be severe and can include fever, flushed skin, back pain. nausea, and vomiting. “The classic symptoms of a UTI are burning pain and frequent urination”, (McDermott, 2023).

1.2.1 What causes a urinary tract infection?

Escherichia coli is the most common cause of UTIs, but other organisms can also cause UTIs. In older adults who use catheters or live in nursing homes or other fulltime care facilities, bacteria like *Enterococci* and *Staphylococci* are more common causes of UTIs, (Balogun SA, et al., 2013).

1.2.2 Risk factors for urinary tract infection in older adults

Certain conditions, such as Alzheimer's disease, Parkinson's disease, and diabetes, can cause urinary retention or neurogenic bladder, which raises the risk of urinary tract infections (UTIs). These conditions often require patients to wear incontinence briefs

and if the briefs are not changed regularly, an infection may occur, (Rowe TA, et al., 2013).

Several other things put older adults at risk of developing a UTI: a history of UTIs, dementia, catheter use, bladder incontinence, bowel incontinence and a prolapsed bladder. Postmenopausal females are at risk of UTIs because of oestrogen deficiency. Oestrogen may help protect the vagina and urethra from an overgrowth of *E. coli*. When oestrogen decreases during menopause, *E. coli* may take over and trigger an infection. In males, a bladder stone, a kidney stone, an enlarged prostate, catheter use and bacterial prostatitis, which is a chronic infection of the prostate may increase the risk of UTIs. Vague, uncommon symptoms such as confusion make UTIs challenging to diagnose in many older adults, (McDermott, 2023).

Infection depends on the interaction between the infecting organism and the host defence mechanisms. Various components of the membrane interplay with the host to determine virulence. Inoculum size is important and has a positive correlation with the risk of infection. Certain virulence factors have been identified in bacteria. The first step in the infectious process is the adherence of the microbe to the host tissue. Fimbriae facilitate adherence and thus enhance the capacity of the organism to produce disease. *Escherichia coli*, *Proteus mirabilis*, and other gram-negative bacteria contain fimbriae (i.e., pili), which are tiny projections on the surface of the bacterium. Specific chemicals located on the tips of pili enable organisms to attach to selected host tissue sites (e.g., urinary tract endothelium), (Casadevall and Pirofski, 2000).

Enterobacteriaceae and *Pseudomonas* species are the microorganisms most commonly responsible for gram-negative bacteraemia. When these organisms invade the bloodstream, endotoxin, a component of gram-negative bacterial cell walls, apparently triggers a cascade of host inflammatory responses and leads to major

detrimental effects. Because *Proteus* and *Pseudomonas* organisms are gram-negative bacilli, they can cause gram-negative endotoxin-induced sepsis, resulting in systemic inflammatory response syndrome (SIRS), which carries a mortality rate of 20%-50%. Although other organisms can trigger a similar response, it is useful to consider gram-negative bacteraemia as a distinct entity because of its characteristic epidemiology, pathogenesis, pathophysiology, and treatment. The presence of the sepsis syndrome associated with a UTI should raise the possibility of urinary tract obstruction. This is especially true of patients who reside in long-term care facilities, who have long-term indwelling urethral catheters, or who have a known history of urethral anatomic abnormalities, (Casadevall and Pirofski, 2000).

According to the demographic data, (Zimbabwe Demographics Profile, 2022),

542.143 of the total population in Zimbabwe is 65 years and over (male 214.515/female 327.627). This thus shows the need to invest more in the health sector.

1.3 Problem Statement

The elderly population is now increasing in the world. A higher prevalence of bacteriuria and urinary tract infection (UTI) is observed in elderly patients particularly at Lancet Clinical Laboratories Harare, and in both long-term care facilities. Urinary tract infections (UTIs) have high mortality and morbidity, yet there has not been enough focus on them, especially locally in Zimbabwe. A statistical reference to the prevalence could not be made as the information about the matter in Zimbabwe was inaccessible.

1.4 Justification of the study

Urinary tract infections are an enormous nuisance to society, and the elderly, with their diminishing physical capabilities, may experience deadlier consequences compared to

other age groups. The fact that there is no information about the causative agents, the prevalence, and the underlying predisposing factors in Zimbabwe is a gap that needs to be filled. This study aimed at covering that hole and providing insight into what we will be facing. This will thus help speed up the diagnosis of the urinary tract infection, as there will be a general idea of what to expect.

1.5 Research Objectives

1.5.1 Broad Objective

The major objective of this study was to determine the risk factors and aetiology of urinary tract infections in the elderly aged 65 and above tested at Lancet Clinical Laboratories starting from January 2023 to December 2023.

1.5.2 Specific Objectives

1. To determine the prevalence of urinary tract infections in elderly patients aged 65 and above tested at Lancet Clinical Laboratories from January to December 2023.
2. To determine the aetiology of urinary tract infections in elderly patients aged 65 and above tested at Lancet Clinical Laboratories from January to December 2023.
3. To assess the risk factors associated with urinary tract infections in elderly patients aged 65 and above tested at Lancet Clinical Laboratories from January to December 2023.
4. To determine the correlation between the causes of UTI and the stated age (65 and above) at Lancet Clinical Laboratories from January to December 2023.

1.6 Research Questions

1. What is the prevalence of urinary tract infections in elderly patients aged 65 and above tested at Lancet Clinical Laboratories from January to December 2023?
2. What is the aetiology of urinary tract infections in elderly patients aged 65 and above tested at Lancet Clinical Laboratories from January to December 2023?
3. What are the risk factors associated with urinary tract infections in elderly patients aged 65 and above tested at Lancet Clinical Laboratories from January to December 2023?
4. Is there any correlation between the causes of UTI and the elderly aged 65 and above at Lancet Clinical Laboratories from January to December 2023?

1.7 Delimitations of the study

This study was carried out at Lancet Clinical Laboratories Head-Quarters, Harare, Zimbabwe from the period of January to December 2023. Therefore, this study mainly focused on the risk factors and aetiology of UTI in elderly patients aged 65 and above.

1.9 Summary

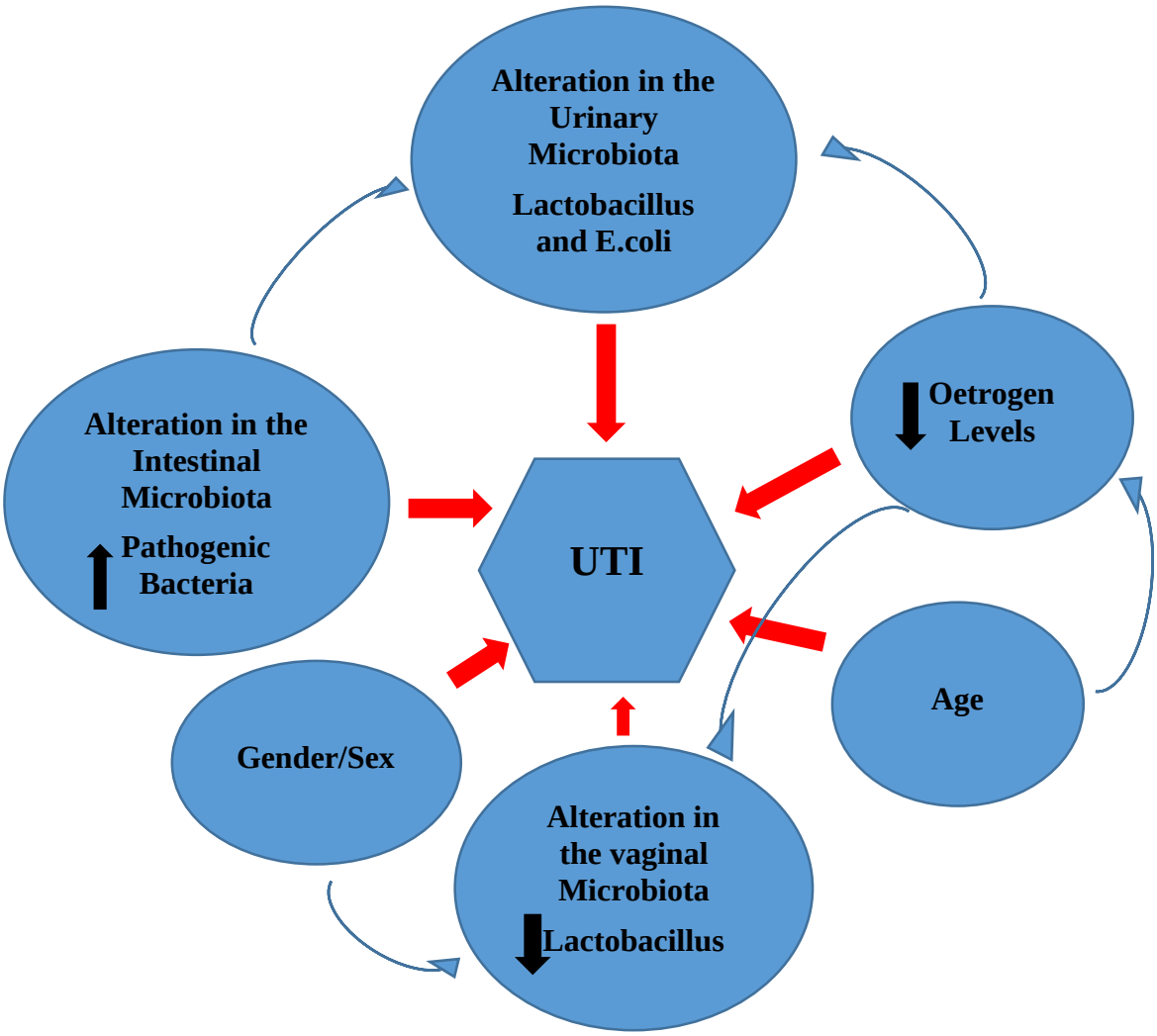
Urinary tract infections (UTIs) are a common cause of bacteraemia in the elderly, and they are associated with a high probability of hospitalization. Despite the impact of UTIs on health status and quality of life, a limited number of studies have evaluated their aetiology in the elderly population. Therefore, UTIs may result from various factors n elderly patients as long as their immune systems has been suppressed by different pathological conditions. The present chapter aligned with the background of the study. As a result, this first chapter has outlined different crucial points of this

research topic such as the background to the study, statement of the problem, research objectives, significance of the study, delimitations and limitation of the study.

CHAPTER 2 LITERATURE REVIEW

2.0 Theoretical Framework

The theoretical Framework is the structure that can hold or support a theory of a research study and the theoretical framework introduces and describes the theory that explain why the research problem under study does exist (San Francisco, CA: Berrett-Koehler, 1997).



2.1 Definition, Symptoms and Treatment of UTIs

A urinary tract infection (UTI) is an infection that affects part of the urinary tract. Infection of the lower urinary tract is known as a bladder infection (cystitis) and that of the upper urinary tract is known as a kidney infection

(pyelonephritis). Symptoms arising from a lower urinary tract infection include pain when urinating, frequent urination, and feeling the need to urinate despite having an empty bladder. Symptoms of a kidney infection include fever and flank pain as well as the symptoms of the lower UTI. Rarely the urine may appear bloody. Symptoms may be vague in the elderly, making diagnosis a bit harder. Risk factors include female anatomy, sexual intercourse, diabetes, obesity, and family history. Although sexual intercourse is a risk factor, UTIs are not classified as sexually transmitted infections (STIs), (Bono, 2023).

Kidney infection usually follows a bladder infection but may also result from a bloodborne infection. In those with vague symptoms, diagnosis can be difficult because bacteria may be present without there being an infection. In uncomplicated cases, UTIs are treated with a short course of antibiotics such as nitrofurantoin or trimethoprim/sulfamethoxazole. Resistance to many of the antibiotics is on the rise. In complicated cases, a longer course of intravenous antibiotics may be needed. If symptoms do not improve in two or three days, further diagnostic testing may be needed. Phenazopyridine may help with symptoms. In those who have bacteria or white blood cells in their urine but have no symptoms, antibiotics are generally not needed, (Bono, 2023).

Urinary tract symptoms are frequently lacking in the elderly. The presentations may be vague with incontinence, a change in mental status, or fatigue as the only symptoms, while some present to a health care provider with sepsis, an infection of the blood, as the first symptoms. Diagnosis can be complicated by the fact that many elderly people have incontinence or dementia. Urine cultures may be carried out on those with signs of systemic infection that may be unable to report urinary symptoms, such as when advanced dementia is present. Systemic signs of infection include a fever or increase

in temperature of more than 1.1 °C from usual, chills, and an increased white blood cell count, (Dutta et al., 2022).

Uropathogenic *E. coli* from the gut is the cause of 80–85% of community-acquired urinary tract infections, with *Staphylococcus saprophyticus* being the cause in 5–10%. They are caused by viral or fungal infections. Nosocomial urinary tract infections (mostly related to urinary catheterization) involve a much broader range of pathogens including *E. coli* (27%), *Klebsiella* (11%), *Pseudomonas* (11%), the fungal pathogen *Candida albicans* (9%), and *Enterococcus* (7%) among others. Urinary tract infections due to *Staphylococcus aureus* are typically secondary to blood-borne infections. *Chlamydia trachomatis* and *Mycoplasma genitalium* can infect the urethra but not the bladder. These infections are usually classified as urethritis rather than urinary tract infections, (McIntosh, 2018).

2.2 What makes the elderly an area of interest for the research?

Older adults are more prone than younger individuals to developing urinary tract infections (UTIs) for several reasons, including; incomplete bladder emptying (often related to prostatic enlargement in men); a higher rate of catheter use; and increased susceptibility to infection associated with frailty. A sudden decline in physical and/or cognitive function in older people is usually associated with a UTI, yet this commonly adopted clinical practice is not supported by the research evidence. More than 16% of women older than 65 reported having had a UTI within the past year, increasing to nearly 30% in women over 85, according to figures reported in the March 2014 issue of Infectious Disease Clinics of North America, (Woodford and George, 2011).

2.3 Complications of UTI Diagnosis in the Elderly

One of the major difficulties with a diagnosis of UTI in older people is the high prevalence of asymptomatic bacteriuria (ASB): the presence of bacteria in the urine of people without attributable symptoms. ASB is rare in younger people but over the age of 75 years is found in 7–10% of men and 17–20% of women, and in up to 40–50% of non-catheterised people in care homes. All long-term catheter users have bacteriuria. ASB is associated with white blood cells (WBC) in the urine (pyuria) in over 90% of cases. A patient presenting with symptoms unrelated to the urinary tract who is found to have ASB may then mistakenly be labelled as a 'proven UTI', which propagates the myth of UTIs as a common cause for non-specific symptoms in older people, (Woodford and George, 2011).

Treating ASB does not reduce either mortality or morbidity but increases the risks of antibiotic-related adverse events and colonisation with resistant organisms. "Urinary tract infections are common among people living with Alzheimer's and other dementias," says Ruth Drew, director of information and support services at the Alzheimer's Association. This is partly due to age and partly due to increasing difficulty with hygiene and personal care, (Esposito, 2019). A second major diagnostic difficulty is that many older people presenting with a genuine UTI do not have urinary tract symptoms. Alternative presentations may include acute functional or cognitive decline. This may be due to the presence of either urinary catheters or cognitive impairment (dementia or delirium) that precludes a reliable history. In addition, older people may have chronic urinary symptoms such as incontinence, nocturia and urgency unrelated to a UTI. This group of patients therefore falls outside the conventional ideas of either ASB or symptomatic UTI, making an accurate diagnosis particularly challenging.

Only symptoms of acute onset should be considered relevant to a diagnosis of UTI. It is helpful to distinguish ASB from a genuine UTI by evidence of a septic illness (i.e. pyrexia, raised serum WBC count or inflammatory markers) in the absence of an alternative more likely explanation, (Woodford and George, 2011).

The use of antibiotics is associated with the development of methicillinresistant *Staphylococcus aureus* and *Clostridium difficile* infections. This is particularly true for older people and for broad-spectrum agents (e.g. ciprofloxacin, co-amoxiclav and cephalosporins). Resistance to commonly used antibiotics, especially amoxicillin and trimethoprim, is on the rise. Infections caused by multidrugresistant organisms are more common in older adults, especially those with catheters or residing in long-term care. Uncomplicated UTI is typically caused by less resistant organisms, so initial treatment with a narrow-spectrum antibiotic (e.g. trimethoprim) is appropriate, (Hurkacz et al., 2021).

Complicated UTI is usually best initially treated with a broad-spectrum antibiotic. Consideration should be given to changing the medication to limit the risk of hospitalacquired infection if the causative organism shows a narrow-spectrum of antibiotic sensitivity, (Henry J and James George, 2011).

2.4 General Aetiology of UTI

According to Gus Gonzalez et al., (2005) the genitourinary tract is the site of disease responsible for gram-negative bacteraemia in approximately 35% of patients. In previously healthy outpatients, *E coli* is by far the most often implicated cause of UTIs. In contrast, individuals with multiple prior episodes of UTI, multiple antibiotic treatments, urinary tract obstruction, or infection developing after instrumentation frequently become infected with *Proteus* bacteria or other bacteria such as

Enterobacter, Klebsiella, Serratia, and *Acinetobacter*. Bacteriuria occurs in 10% -15% of hospitalized patients with indwelling catheters. The risk of infection is 3% -5% per day of catheterization, (Gonzalez, 2005).

UTIs are among the most frequent bacterial infections worldwide. According to the Urologic Diseases in America Project, (2000), UTIs accounted for more than 8 million cases and 1.7 million emergency room visits, leading to around 350,000 hospitalizations. In England and Wales, consulting rates in general practice for cystitis and other urinary infections were found to be approximately 315 per 10,000 persons, whereas, in Italy, in 2002, 2.4% of a cohort of more than 450 000 people received a diagnosis of acute cystitis in primary care.

Although women, particularly those aged 16–64 years, are significantly more likely to experience UTIs than men, urinary infections frequently occur in both genders and across all age groups; specific populations such as pregnant women, the elderly or patients with spinal cord injuries, catheters, or diabetes are also at increased risk. *E. coli* has been identified as the major causative pathogen in 50–80% of cases; other *Enterobacteriaceae* (*Klebsiella, Proteus, Enterobacter*) together with *Enterococci, Streptococci, Staphylococci,* and *Pseudomonas spp*. account for most of the remaining positive urine cultures. Empiric antibiotic treatment is therefore commonly adopted, (Magliano et al., 2012).

However, due to significant local differences in the frequency of urinary agents, the emergence of new pathogens, and changes in antimicrobial resistance, periodic evaluation of pathogens epidemiology is recommended, such that treatment advice can be revised and corrected. Since underlying host factors may affect urinary aetiology and antibiotic susceptibility, specific patient groups should be investigated in more detail. Among risk factors, patients' gender and age can be easily accessible in surveys

performed at the microbiology laboratory level where patients' clinical features are less well known, (Magliano et al., 2012).

2.5 UTI in the USA

In the USA urinary tract infections cause over one million hospital admissions annually. Surveys screening for bacteriuria (bacteria in the urine) have shown that 1% of schoolgirls aged 5-14 years have bacteriuria and that this figure increased to 4% by young adulthood and then by an additional 1-2% per decade of age. The prevalence of urinary tract infections in young women was 30 times that of young men. However, with increasing age, this ratio decreased as relatively older men developed urinary tract infections, (Life, 2015).

This was probably related to the high incidence of prostatic enlargement in older men, which leads to urinary stasis and an increased risk of infection. 25-30% of women between the ages of 20 and 40 years have had urinary tract infections. 20% of women and 10% of men over 65 years of age have bacteria in their urine. The prevalence of bacteriuria also increases with hospitalisation and concurrent diseases such as diabetes. About 40% of patients with urinary tract infections have a recurrence within one year. A few organisms cause the vast majority of urinary tract infections. *E. coli* account for 80% and *staphylococcus Saprophyticus* for 5-15% of infections. Other less commonly involved organisms include Klebsiella, Proteus species and Enterococci, (Lee & Kuo, 2017).

2.6 Aetiology of UTI in Milan, Italy

A retrospective study was performed at the Bacteriological Laboratory of the "Centro Diagnostico-Italiano" (CDI), based in Milan (Italy), on all bacterial strains isolated from consecutive urine samples received from outpatient clinics of a high-populated

urban area of North Italy, between March 2008 and December 2009. Nearly 80% of all isolates were from women (female to male ratio (F/M) = 3.8) and 58% from subjects aged 60 years or more, (Magliano et al., 2012).

Cumulatively, the two younger age groups accounted for 11.2% of total isolates. Overall, the most frequently encountered pathogen was *Escherichia coli* (67.6%), followed by *Klebsiella pneumonia* (8.8%), *Enterococcus faecalis* (6.3%), *Proteus mirabilis* (5.2%), *Pseudomonas aeruginosa* (2.5%), and *Streptococcus agalactiae* (2.3%), all accounting for around 90% of total isolates. Gram-negative agents represented 90.8% of urinary pathogens. The frequency of isolation of all six main species was found to be statistically different between females and males: *E. coli*, *K. pneumonia*, and *S. agalactiae* were more frequent in females, whereas *E. faecalis*, *P. mirabilis*, and *P. aeruginosa* were more common in men, (Magliano et al., 2012).

2.7 Prevalence of Microbial Species in UTIs in Tripoli, Libya and Susceptibility Patterns

It is estimated that approximately 150 million cases of UTIs occur globally each year. Most infections are caused by the movement of bacteria through the faecal from the colon to the urinary tract via the urethra. The major causative organisms responsible for the most UTI cases are bacteria, mainly gram-negative species which account for 80-85% and the leading causative organisms are *Escherichia coli* (80%) of UTI cases, followed by *Klebsiella pneumonia* and *Proteus mirabilis*, (Mancuso et al., 2023).

A study was conducted to investigate microbial species isolated from patients with UTI who attended Bushra Medical Laboratory, Tripoli, Libya, and to evaluate them in vitro susceptibility patterns to commonly used antimicrobial agents in Libya. Of the 1423 urine specimens tested, 291 (20.4%) specimens were positive for the presence of bacterial pathogens.

The distribution of infection among patients' gender was (237/291, 81.4%) in female patients, while it was (54/291, 18.6%) in male patients. The order of prevalence of uropathogens isolated from female patients was *Klebsiella ozaenae* (87.1%), followed by *Escherichia coli* (83.3%), *Klebsiella pneumonia* (81.9%), *Proteus mirabilis* (77.8%), *Pseudomonas mendocina* (60.0%), *Staphylococcus aureus* (50.0%) and *Pseudomonas alcaligenes* (33.3%). The prevalence in male patients was *Pseudomonas alcaligenes* (66.7%), *Staphylococcus aureus* (50.0%), *Pseudomonas mendocina* (40.0%), Proteus *mirabilis* (22.2%), Klebsiella *pneumonia* (18.1%), *Escherichia coli* (16.7%) and *Klebsiella ozaenae* (12.9%), (Salem, 2018).

Patients' age ranged from 2 to 83 years with an average age of 41.5 years. The highest distribution of infection among patients' age groups was (135/291, 46.4%) adults (2564 years), followed by the elderly (≥ 65 years), then children (2-14 years) and the lowest incidence was (36/291, 12.4%) in youth (15-24 years). (Milud A. S and F. Abdaullah Ahmed, 2018).

2.7 Prevalence and resistance pattern of UTIs in elderly Nigerian patients

According to Saka sule Ajibola, (2018), there have been conflicting reports about the prevalence of Urinary Tract Infections (UTIs) causing bacteria in the elderly in recent times. This study aims to evaluate the prevalence and resistance pattern of UTIscausing bacteria in elderly Nigerian patients. A prospective cross-sectional study was carried out among elderly patients attending the general and medical outpatient clinics of Olabisi-Onabanjo University Teaching Hospital, Sagamu, Nigeria. Patients aged 60 years and above with at least two signs of UTIs were purposefully selected for the study. Clean catch mid-stream urine specimens from 100 eligible patients were

examined for significant bacteriuria. Identification and antibiotic susceptibility patterns of the isolates were determined using standard techniques.

Data was analysed using descriptive statistics such as frequency and percentage. The association between variables was determined using the Chi-squared test. P values<0.05 were considered significant. One hundred elderly outpatients were evaluated. The majority of the study participants were males (68, 68.0%) and (64, 64.0%) were married. More than half of the participants (59, 59.0%) had no significant bacteriuria.

Among the participants with significant bacteriuria (41, 41.0%), males (29/41, 70.7%, p=0.001) were more than the females (12, 29.3%). *Klebsiella pneumonia* (19/41, 46.3%) was the most isolated organism in the participants' urine specimens, (35/41, 85.4%) of the isolates were resistant to nitrofurantoin. *Klebsiella pneumoniae* was the most isolated UTI-causing bacteria among the elderly evaluated. Physicians need to be aware of trends in profiles of UTIs-causing bacteria for effective diagnosis of the disease in the elderly, (Ajibola, 2018).

2.8 Variability in Etiological Agents of Urinary Tract Infections among Patients in Windhoek-Namibia

A retrospective study on the Variability in Etiological Agents of Urinary Tract Infections among Patients in Windhoek-Namibia was carried out. A retrospective analysis was performed on 20,438 urine results submitted to the Namibia Institute of Pathology (NIP), the public health laboratory in the country from January 2012 to December 2012. The results showed that there were 3865 (18.9%) UTI cases due to *Escherichia coli* making it the most prevalent organism isolated, followed by *Proteus mirabilis* 758 (3.7%), *Enterococcus faecalis* 706 (3.5%) and *Klebsiella pneumonia* 640 (3.1%) (Niitembu J. Veronika et al., 2015).

2.9 Summary

In this chapter, the researcher reviewed literature and found out that risk factors for UTIs in elderly patients are numerous and the causative agents depend on both gender and immunity system. Therefore, from the above literature review, it is quite clear that there had not been much focus on the aetiology of UTIs in the elderly in Zimbabwe, and this was a gap that needs to be filled. This study aimed to do just that, for the benefit of our elderly population and the nation at large.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Research Design

The research was a retrospective, descriptive cross-sectional study. It brought to light the prevalence of certain micro-organisms in the urinary tract infections in the elderly patients. It also compared the rates at which the different aetiological agents were found and determined which ones were the most prevalent. As it was retrospective, it made use of records stored by the laboratory, thus this made it a quick and an inexpensive study.

3.2 Pilot Study

Pre-testing was done at Lancet Pathology Laboratories (Harare), whereby some cases were selected and reviewed via the simple random sampling method. The data was collected and compiled on a Microsoft Excel spreadsheet. The outcomes of the pilot study were used to assess the feasibility of the study, and the reliability and completeness of the records. The pilot study also brought to light the resources and time needed to complete this study, thus this assisted us with the scheduling.

3.3 Data Collection Procedure

A quantitative approach was used in this study. Therefore, the information was collected from past laboratory records that fell into the specified time frame as it is a retrospective study. Permission was sought from the respective authorities and samples were randomly picked using a simple random sampling technique. This was a sample game of choosing any laboratory result reports. Laboratory results reports were placed on a large bench then random picking process was applied. The data of randomly selected participants was then entered on an excel spread sheet in a manner in, which it could be properly analysed that was, in tables, graphs and charts.

3.4 Study Population

The study population included all the elderly patients from 65 and above diagnosed with UTIs at Lancet Clinical Laboratories from January 2023 to December 2023.

3.5 Sample Size

Sample size was calculated using the StatCalc function of Epi info 7 taking into account the prevalence rate, the number of patients tested and predisposing factors. It was calculated at a 95% confidence interval and 50% power.

The following formula was used in order to calculate sample size as it is appropriate for calculating sample size in the study of single proportion.

$$n = \frac{z}{\frac{2\,x\,P(1-P)}{w2}}$$

$$n = \frac{(1.96)2\,x\,50(1-50)}{(5)2}$$

$$n = \frac{8416\,x\,(2450)}{25} \quad 3.$$

$$n = 376.47$$

n: minimal sample size z: standardized z-score at 95%

confidence level which is 1.96 p: estimated proportion of c/s

(50%) and w: is the margin of error (5%)

This means 376 or more measurements were needed to have a confidence level of 95% that the real value is within ±5% of the measurement value. Therefore, study sample size of 376 of patients was used for this study. The sampling size was for a duration of

12 months from January to December 2023. Medical records from the Lancet LIS, also called MediTech were reviewed to make this process easier.

3.6 Inclusion Criteria

Elderly patients at the age of 65 and above screened and tested for urinary tract infections at Lancet Clinical Laboratories from January to December 2023 were eligible for the study.

3.7 Exclusion Criteria

Patients below the age of 65 as well as patients who were not screened and tested for urinary tract infections from January to December 2023 were excluded from the study.

3.8 Data Analysis

The data was expressed in tables, graphs and charts. Therefore, the information was presented as absolute values, percentages and other important numerical information such as the prevalence. Odds ratio was also calculated to give a clear-cut picture of the results.

3.9 Ethical Considerations

Ethical clearance to conduct the study was sought from the respective authorities. Therefore, permission to review clinical records was also sought from Lancet Clinical Laboratories. After the collection of clinical data from the laboratory, results confidentiality was always maintained by keeping the data coded in a data base spread sheet with an encrypted password. As a result, confidentiality was always maintained and the participants were coded with numbers during the course of this research. The information was collected according to the requirements of the Africa University Ethics Committee (AUREC).

3.10 Summary

During the conduction of the research, the researcher used the retrospective, descriptive cross-sectional study and this is because the researcher was aiming to get both statistical and descriptive data toward the existing problem or findings. Due to this, the researcher was in a position of getting or accumulating more data or information as intended to solve the problem. As a result, this study was done to simply assess the risk factors and aetiology of UTIs in elderly patients from 65 and above at Lancet Clinical Laboratories.

CHAPTER 4: DATA ANALYSIS PRESENTATION, ANALYSIS AND PRESENTATION

4.1 Introduction

This chapter contains the results of the study. The data is presented in the form of tables and is accompanied by brief descriptions of the particular set of information presented. The data is presented as absolute values and as percentages where appropriate.

4.2 Prevalence of UTIs in the elderly

Table 1: Prevalence of Urinary Tract Infections in the elderly

UTI	FREQUENCY	PERCENTAGE
NEGATIVE	363	58.27
POSITIVE	260	41.73
TOTAL	**623**	**100**

The total population of the study was 623 participants. Of the 623 participants, 260 were diagnosed with urinary tract infections (UTI). Thus the prevalence of urinary tract infections in the elderly was 41.73%. And 363 of participants were negative (58.27%).

4.3 Prevalence of UTI by Age

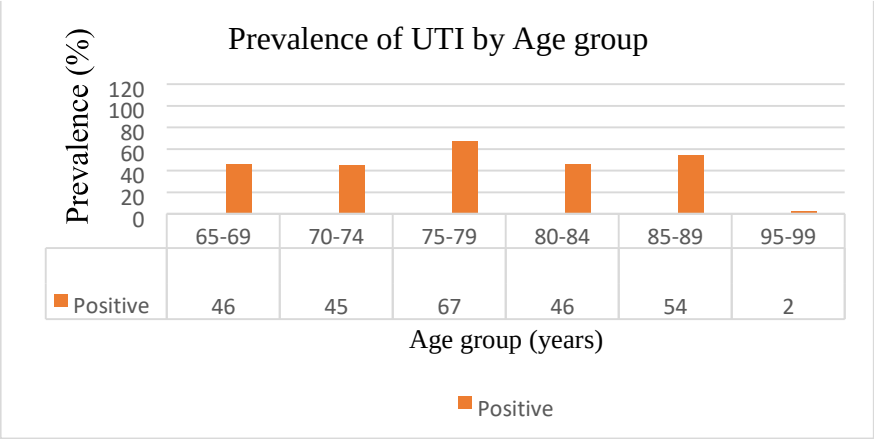


Figure 1: Prevalence of UTI by age

To assess the prevalence trend with reference to age, groups with five year intervals were created, the lower age limit being 65 and the oldest participants diagnosed being 95 years of age. The highest prevalence of UTIs was found to be in the 75-79 age group, with 67 of the 260 participants being found within that age group, making up 23.19% of the total population. The lowest prevalence of 0.97% (2 out of 260 participants with UTI) occurred in the age group 95 years and above.

The Fischer's exact, which is a measure of association, was found to be 0.000, indicating that the difference in prevalence of urinary tract infections was significant.

4.4 Risk factors and Prevalence of UTI by sex

4.4.1 UTI by sex as a risk factors

Of the 623 individuals that were screened, 374 were female, a greater percentage than that of men. There were 249 men screened in total. 49.73% of the examined female participants had pathogenic microorganisms detected and isolated, out of the 186 female participants who tested positive for urinary tract infections. With a population of 186, female gender thus demonstrated to be more vulnerable, accounting for 71.54% of the positive cases found.

Table 2: Risk factors and Prevalence UTI by Sex

SEX	***NEGATIVE***	***POSITIVE***	***TOTAL***
Male	175	74	249
Female	188	186	374
Total	363	260	623

Fisher's exact = 0.000

1-sided Fisher's exact = 0.000

From the information in table 2 below, a clear difference in the gender in noted. Firstly, in terms of participants, the females made a larger number as compared to the males, with a total of 374 out of the 623 who were screened. The total males screened were 249. For the female participants, 186 of them were found to be positive for urinary tract infections, thus 49.73% of the tested females had pathogenic microorganisms identified and isolated. For the male participants, 74 out of the possible 249 were found to be positive, making it 29.71% from the total male population.

The total population of those found to be positive of UTIs was 260. The gender that is then proving to be more susceptible is the female population, with a population of 186, making it 71.54% of the positive cases identified. The males proved to be less susceptible, with a population of 74, which is 28.46% of the positive cases. This difference proves to be highly significant, and this is further proved by the Fischer's exact value, which is 0.000.

Further emphasis of the relationship between the females and urinary tract infection was shown through logistical regression, which is used to model the probability of a certain class or event existing such as being healthy or sick. In this case:

Logistic regression

Number of observations = 623

LR $chi^{2(5)}$ = 49.26

Probability > chi^2 = 0.0000

Log likelihood = -398.64736 Pseudo R^2 = 0.0582

The above calculations were carried out on Epi info 7, through the StatCalc function, and they mainly focused on the relationship of females and UTI, as well as the

likelihood of an elderly female contracting a urinary tract infection. The odds ratio for an infection was also found to be 2.36.

I have then come to say that females are that ones most affected by the UTI due to the structure of heir genital organ and some factors related to various conditions such as Parkinson disease, Diabetes, bladder incontinence, bowel incontinence, prolapsed bladder, and also oestrogen deficiency especially observed in postmenopausal females.

4.5 Aetiology of UTI in the Elderly

Table 3: Aetiology of UTI in the Elderly

INFECTION	FREQUENCY	PERCENTAGE	CUMULATIVE
Escherichia coli	169	65	65
Klebsiella species	33	12.69	77.69
Enterococcus faecalis	25	9.62	87.31
Klebsiella *pneumonia*	7	2.69	90.00
Pseudomonas aeruginosa	5	1.92	91.92
Candida Species	4	1.54	93.46
Streptococcus group b	4	1.54	95.00
Proteus mirabilis	3	1.15	96.15
Acinetobacter baumanii	2	0.77	96.92
Proteus vulgaris	2	0.77	97.69
proteus species	2	0.77	98.46
citrobacter species	1	0.38	98.85
Staphylococcus aureus	1	0.38	99.23
Serratia species	1	0.38	99.62
Trichomonas vaginalis	1	0.38	100.00
Total	260	100.00	

Among the 260 isolated microorganisms mentioned in Table 3 above, *Enterobactericeae* dominated the roster, with organisms including *E. coli* (65%), *Klebsiella species* (12.69%), *Klebsiella pneumonae* (2.69%), *Proteus mirabilis*

(1.15%) and *Acinetobacter baumanni* (0.77%) among others. Gram positive bacteria were also found, with the organisms including *Enterococcus faecalis* (9.62%), *Streptococcus group B species* (1.54%) and *Staphylococcus species* (0.38%). Yeasts were also isolated as *Candida species* made up 1.54% of the cases. Parasites were also isolated with *Trichomonas vaginalis* (0.38%) being isolate

4.6 Susceptibility and Resistance of UTI in the elderly

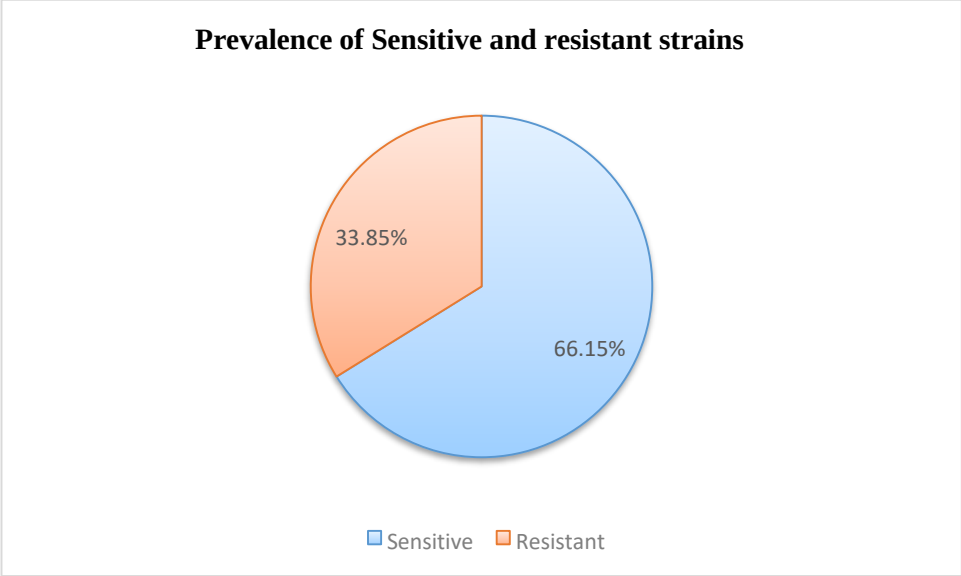


Figure 2: Prevalence of sensitive and resistant strains of microbes

From the above pie chart, it can be deduced that the isolated organisms are generally sensitive to common drugs administered to counter them, with 172 of the 260 cases being treated with them. However, 88 out of the 260 cases did exhibit resistance to the drugs commonly used to deal with them. *E. coli* (66) had the population with more resistant strains followed by *Klebsiella species* (12).

4.7 Types of Resistant Organisms in UTI Elderly patients

4.7.1 Ampicillin C

Proteuse species were the only class of bacteria observed in this type of resistant with one case.

4.7.2 ESBL

E. coli dominated this class with 66 cases following by Klebsiella species 12, *Enterococcus feacalis and Klebsiella pneumonia* with 2 cases and *proteuse vulgaris, proteuse species, citrobacter species, proteuse mirabilis* had each one case.

4.7.3 Multi-resistant

The only organism found multi-resistant was *Pseudomonas aeruginosa* with one case.

Table 4: Types of resistant Organisms in UTI Elderly patients

Infection	***Ampicillin c***	***ESBL***	***Multiresistant***	***Sensitive***	***Total***
Acinetobacter baumanni	0	0	0	2	2
Candida spp	0	0	0	4	4
Citrobacter species	0	1	0	0	1
Escherichia coli	0	66	0	103	169
Enterococcus faecalis	0	2	0	23	25
Klebsiella pnemoniae	0	2	0	5	7
Klebsiella species	0	12	0	21	33
Pseudomonas aeruginosa	0	0	1	4	5
Proteus mirabilis	0	1	0	2	3
Proteus vulgaris	0	1	0	1	2
Proteus species	1	1	0	0	2
Staphylococcus aureus	0	0	0	1	1
Serratia species	0	0	0	1	1
Streptococcus group B	0	0	0	4	4
Trichomonas vaginalis	0	0	0	1	1
Total	1	86	1	172	260

According to the data collected, most of the organisms isolated were found to be sensitive to the common antibiotics. The sensitive organisms isolated were up to 172, making up 66.15% of the population. The organisms possessing the ESBL enzyme which renders them resistant to third and fourth generation beta lactamases amounted to 86, making 33.08% of the population. The organisms' resistant to Ampicillin C antibiotics amounted to 0.38%, and the generally resistant organisms made up 0.38%.

4.8 Summary

This chapter has given the details on how various data collected have been analysed according to different data analysis tools provided. Therefore, several point have been discussed in this chapter such as chapter synopsis, prevalence of UIT in Elderly, prevalence of UTI by age, Prevalence of UTI by sex, aetiology of UTI in Elderly, susceptibility and resistance of UTI in the elderly as well.

CHAPTER 5: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the results presented in the previous Chapter (Chapter 4), elaborating on the reasons for the outcomes noted. It is supported by literature from past studies linked to the research problem as well.

5.2 Prevalence of UTI in the elderly

Urinary tract infections are a common condition in every human being. UTI is the second most common infection diagnosed in the acute hospital setting, and accounts for almost 5% of all emergency department visits by adults aged 65 years and older in the United States each year. In long-term care facilities, UTI accounts for approximately 30% to 40% of all health care–associated infections. (Theresa Anne Rowe, Manisha Juthani-Mehta, 2013)

The prevalence of UTI in the elderly in this particular study was found to be 41.73%. There are a number of factors which lead to bacteraemia in both the old and the younger age groups, and these include diabetes mellitus, immunosuppression, an enlarged prostate or even kidney stones. The elderly patients are most likely to have a number of these conditions, which is why the prevalence is quite high. Living conditions are also predisposing factors, which include hygiene and general cleanliness of the surrounding environment. Zimbabwe, as a third world country, may have a lower level of these conditions. This combined with the other factors results in a higher chance of acquiring the infections, thus leading to a higher prevalence.

5.3 Prevalence of UTI by Age Group

It has been noted that as the immune system of the elderly population continues to decline with age. The body’s first line of defence continues to depreciate thus giving

way to opportunistic infections to enter from the external environment. Due to decreased bone marrow activity, production of white blood cells to defend the body from infectious microorganisms is reduced, resulting in a diminished number of the white blood cells, giving way to the opportunistic infections including those that would have been normal flora given that the immune system is functioning efficiently. There is also a slower response to the infections, thus the efficiency of the immune response towards the microbes. (Montecino-Rodriguez, 2013)

Figure 1 showed fluctuations in the prevalence among different age groups. No proper trend can be concluded from the information but the outstanding detail is the low number of participants who were above 90. This was probably due to the low amount of population at that age. The life expectancy in Zimbabwe in 2023 was 61.9 years (59.2 for males and 64.3 for females) according to *Zimbabwe Demographics 2023 (Population, Age, Sex, Trends)*. Elderly men and women also experience a weakening of the muscles of the bladder and pelvic floor, which can lead to increased urine retention, which is not completely emptying the bladder, and incontinence.

5.4 Prevalence of UTI by sex

Women tend to get urinary tract infections more often than men due to the ease that bacteria can reach the bladder in women. The urethra is shorter in women than in men, so bacteria have a shorter distance to travel. The urethra is located near the rectum in women. Bacteria from the rectum can easily travel up the urethra and cause infections. Menopause can also cause changes in vaginal bacteria that increase your risk for urinary tract infection. Women also tend not to empty their bladders as completely as men do. (Raisa O Platte, 2019)

In older women, the tissues of the urethra and bladder become thinner and drier with age. In Men, most UTIs are due to something that blocks urination. The results depicted in table 3 show a clear picture of how women are more susceptible to urinary tract infections as compared to men. Most of the organisms isolated were from the female population, and the lesser cases being those of the male population.

5.5 Risk factors and Aetiology of UTI in the elderly

When it came to the causative agents, *Escherichia coli* was the most prevalent organism, just as in other regions across the world as well as in other age groups, affecting 65% of the population. *E. coli* is part of the Enterobacteriae found in humans and is an opportunistic gram negative bacteria. It is part of the normal flora of the gut but when it moves to other parts of the body it becomes more infectious. The decrease in immune-competence of the elderly population is obviously one of the underlying risk factors of the high prevalence of bacteraemia and most importantly that of *E. coli*, an opportunist. A general decrease in the body organ functions may also be a factor such as Parkinson disease, Diabetes and oestrogen deficiency. Inefficient functioning of the bladder leads to a higher retention of urine, which will thus result in the growth and multiplication of the bacteria.

There were also a large number of Gram negative bacilli isolated in Table 4 including: *Klebsiella species* (12.69%), *Klebsiella pneumonae* (2.69%), *Pseudomonas aeruginosa* (1.92%), *Proteus mirabilis* (1.15%), *Proteus vulgaris* (0.77%), *Acinetobacter baumanni* (0.77%), *Proteus species* (0.77%), *Serratia species* (0.38%) and *Citrobacter species* (0.38%). Most of the organisms isolated are part of the enterobacteriae family like the *Klebsiella* and *enterobacter species.*

Gram positive cocci also made the roster with *Enterococcus faecalis* (9.62%), *Streptococcus Group B species* (1.54%) and *Staphylococcus species* (0.38%). In women, *Streptococcus group B species* are mainly diagnosed as infectious in women of child bearing age, as they may affect the unborn children. Thus the ones isolated in this study were from the male population as men retain the ability to reproduce even at very late stages in their lives and may pass it on to other women. The prevalence of yeasts like *Candida species* (1.54%) was very low, as well as parasitaemia caused by *Trichomonas vaginalis* (0.38%).

5.6 Susceptibility and resistance of UTI in the elderly

Antibiotics are critical tools for treating infections caused by specific bacteria. In health care, antibiotics are one of our most powerful drugs for fighting bacterial infections. Treatment however, usually starts before the microbiological results are produced. This is usually done in anticipation of the possible result. This may unfortunately give rise to resistant strains of the microbes that could not be treated by the prescribed antibiotics. (Gupta et al., 2001)

For the maximum benefit of the patients, Lancet Clinical Laboratories would carry out susceptibility testing on each of the positive cases. This was to avoid the issuing of antibiotics that would not completely eradicate the infectious agent, and identify the resistance pattern as well. The findings were based on the zones of clearing corresponding to a particular antibiotic disk on a Muller-Hinton agar plate, or in the Sheep blood agar plate in cases of Streptococcus Group B organisms.

Antibiotic resistance happens when the bacteria no longer respond to the antibiotics designed to act on them. Bacteria and fungi are continuously finding new ways to avoid the effects of antibiotics. Bacteria that are resistant to many antibiotics are known as

multi-resistant organisms (MRO). Some bacteria are naturally resistant to some antibiotics. An example is benzyl penicillin, which has very little effect on most organisms found in the human digestive system (gut).

The most common form of resistance came from the extended spectrum betalactamase (ESBL) positive organisms. This group was mainly made up of Gram negative enterobacteria, and they were resistant to 3rd and 4th generation cephalosporins. This is depicted in table 6, where ESBL positive bacteria made up 34.78% of the isolated organisms. Ampicillin C beta-lactamases (AmpC) are enzymes which convey resistance to penicillins, second and third generation cephalosporins and cephamycins.

These results agree with reports from other countries, with minor differences, which could be due to the environment, social habits, standards of hygiene and difference in Health care systems.

5.7 Implications of the study

Further studies can branch out form this research. It was broad and did not focus on a specific organism. There are however different species that affect the urinary tract infections, and one can look further into these and also identify the patterns of infection as well as susceptibility to the common antibiotics. Viral infections can also be looked into if the facilities for identifying them are available as well.

5.8 Limitations of the study

Secondary date was made use of and they were too laborious to acquire. Therefore, it might have been also subjected to alterations, which resulting into reducing the accuracy and integrity of the findings, as bias could have been be incurred. Some alterations could have been made in order to keep the laboratory standard or reputation as Lancet Clinical Laboratories are private laboratories so that only those who can

afford would go to be tested in the private sector. Lastly, the study was conducted in one setting and the findings cannot be generalized to other health facility or any other laboratories in Zimbabwe. The researcher controlled by the University calendar hence period to do the study was short, which might have contributed to the study being done hurriedly which might have distorted the study results.

5.9 Conclusion

Of the 260 organisms isolated, *Escherichia coli* proved to be the main causative agent of urinary tract infections in the elderly and both in the male and female population. The female gender was the most affected by Urinary tract infections with high risk factors due to certain features in their anatomy, and most of the organisms isolated were sensitive to most common drugs, despite quite the amount of ESBL positive organisms being noted. The onset of these diseases may have a number of underlying factors like hygiene and general degeneration of the immune functions.

5.10 Recommendations

A general awareness about urinary tract infections, their causes, prevention and cure, should be spread among the elderly such that they may do what they can to maintain their health. Treatment should also be specific to the organisms isolated and should be administered to full effect such that the incidence of resistant organisms may reduce.

REFERENCES

American Urological Association. (2023). What is a Urinary Tract Infection (UTI) in Adults *(https://www.urologyhealth.org/urology-a-z/u/urinary-tractinfections-in-adults)*? Accessed 4/6/.

Balogun SA, et al. (2013). Delirium, a symptom of UTI in the elderly: Fact or fable? A systematic review. DOI: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3940475/

Belyayeva, M., & Jeong, J. M. (2022, September 18). *Acute pyelonephritis*. StatPearls - NCBI Bookshelf. https://www.ncbi.nlm.nih.gov/books/NBK519537/

Bono, M. J., Leslie, S. W., Reygaert, W. C., & Doerr, C. (2023, November 13). *Uncomplicated urinary tract infections (NURSING)*. StatPearls - NCBI Bookshelf. https://www.ncbi.nlm.nih.gov/books/NBK568701/

Casadevall, A., & Pirofski, L. A. (2000). Host-Pathogen interactions: basic concepts of microbial commensalism, colonization, infection, and disease. *Infection and Immunity, 68*(12), 6511–6518. https://doi.org/10.1128/iai.68.12.6511-6518.2000

Dutta, C., Pasha, K., Paul, S., Abbas, M. S., Nassar, S. T., Tasha, T., Desai, A., Bajgain, A., Ali, A., & Mohammed, L. (2022). Urinary Tract Infection Induced delirium in elderly patients: a systematic review. *Cureus*. https://doi.org/10.7759/cureus.32321

De Vecchi, E., Sitia, S., Romanò, C. L., Ricci, C., Mattina, R., & Drago, L. (2013).

Aetiology and antibiotic resistance patterns of urinary tract infections in the elderly: a 6-month study. *Journal of Medical Microbiology*, *62*(6), 859–863. https://doi.org/10.1099/jmm.0.056945-0

Esposito, L. (2019). Urinary tract infection or dementia: Which one do I have? *US News & World Report*. https://health.usnews.com/conditions/braindisease/dementia/articles/urinary-tract-infection-or-dementia

Garofalo CK, Hooton TM, Martin SM, et al. (2007). Escherichia coli from urine of female patients with urinary tract infections is competent for intracellular bacterial community formation *(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1828379/)*. *Infect Immun*.;75(1):52-60. Accessed 4/6/2023.

Gonzalez, G., MD. (2005. n.d.). *Proteus Infections: background, pathophysiology, epidemiology*. https://emedicine.dev01.medscape.com/article/226434overview

Gupta, K., Hooton, T. M., & Stamm, W. E. (2001). Increasing antimicrobial resistance and the management of uncomplicated Community-Acquired urinary tract infections. *Annals of Internal Medicine*, *135*(1), 41. https://doi.org/10.7326/0003-4819-135-1-200107030-00012

Ha, V. T., Nguyen, T. N., Nguyễn, T. X., Nguyen, H. T. T., Nguyen, A. T., Pham, T., & Vu, H. T. T. (2021). Prevalence and Factors Associated with Falls among Older Outpatients. *International Journal of Environmental Research and Public Health*, *18*(8), 4041. https://doi.org/10.3390/ijerph18084041

Henry J and James George. (2011). Diagnosis and management of urinary infections in older people. *Clinical Medicine*.

Hurkacz, M., Dobrek, Ł., & Wiela-Hojeńska, A. (2021). Antibiotics and the nervous System—Which face of antibiotic therapy is real, Dr. Jekyll (Neurotoxicity) or Mr. Hyde (Neuroprotection)? *Molecules*, *26*(24), 7456. https://doi.org/10.3390/molecules26247456

Lee, C., & Kuo, H. (2017). Pathophysiology of benign prostate enlargement and lower urinary tract symptoms: Current concepts. *Tzu Chi Medical Journal*, *29*(2), 79. https://doi.org/10.4103/tcmj.tcmj_20_17

Life. (2015, October 16). Urinary tract infection. *Life*. https://www.news24.com/life/wellness/body/conditioncentres/diseases/urinary-tract-infection-20120721

Magliano, E., Grazioli, V., Deflorio, L., Leuci, A. I., Mattina, R., Romano, P., & Cocuzza, C. (2012). Gender and Age-Dependent etiology of CommunityAcquired urinary tract infections. *The Scientific World Journal*, *2012*, 1–6. https://doi.org/10.1100/2012/349597

Mancuso, G., Midiri, A., Gerace, E., Marra, M., Zummo, S., & Biondo, C. (2023). Urinary tract infections: the current scenario and future prospects. *Pathogens*, *12*(4), 623. https://doi.org/10.3390/pathogens12040623

McDermott, A. (2023). *Urinary tract infections (UTIs) in older adults*. Healthline. https://www.healthline.com/health/uti-in-elderly#symptoms.

McIntosh, J. (2018, November 6). *What to know about urinary Tract Infections*. Retrieved from Medical News Today: https://www.medicalnewstoday.com/articles/189953

Merck Manual, Consumer Version. (2023). Overview of Urinary Tract Infections

(UTIs) *(https://www.merckmanuals.com/home/kidney-and-urinary-tract-disorders/ urinary-tract-infections-utis/overview-of-urinary-tract-infectionsutis)*. Accessed 4/6/

Milud A. S and F. Abdaullah Ahmed. (2018). Bacterial Profile of Urinary Tract Infection and Antimicrobial Susceptibility Pattern Among Patients Attending at Bushra Medical Laboratory, Tripoli, Libya. *Journal of Gastroenterology and Hepatology Research*, 1-5.

Montecino-Rodriguez, E., Berent-Maoz, B., & Dorshkind, K. (2013). Causes, consequences, and reversal of immune system aging. *˜the œJournal of Clinical Investigation/˜the œJournal of Clinical Investigation*, *123*(3), 958–965. https://doi.org/10.1172/jci64096

Niitembu J. Veronika et al. (2015. A Retrospective Study of the Variability in Etiological Agents of Urinary Tract Infections among Patients in Windhoek-Namibia. *Open Journal of Medical Microbiology*, *05*(04), 184–192. https://doi.org/10.4236/ojmm.2015.54023

Raisa O Platte, M. P. (2019). *Why are urinary tract infections (UTIs) more common in women than in men?* Retrieved from Medscape: https://www.medscape.com/answers/452604-54622/why-are-urinary-tractinfections-utis-more-common-in-women-than-in-menRoux, D. P. (2015). Urinary tract infection. *Health24*.

Rowe, T., & Juthani-Mehta, M. (2014). Diagnosis and management of urinary tract infection in older adults. *Infectious Disease Clinics of North America*, *28*(1), 75–89. https://doi.org/10.1016/j.idc.2013.10.004

Saka, S. A., & Okunuga, B. E. (2018). Profiling urinary tract infections bacteria among elderly population in a Nigerian Teaching Hospital. *Journal of Medical and Biomedical Sciences, 6*(3), 15–22. https://doi.org/10.4314/jmbs.v6i3.3

Salem, M. A., & Ahmed, F. A. (2018). Bacterial profile of urinary tract infection and antimicrobial susceptibility pattern among patients attending at Bushra Medical Laboratory, Tripoli, Libya. *Journal of Gastroenterology and Hepatology Research, 7*(4), 2671–2675. https://doi.org/10.17554/j.issn.2224-3992.2018.07.788

Urology Care Foundation. (2016). Retrieved from https://www.urologyhealth.org/patient-magazine/magazinearchives/2016/summer-2016/understanding-utis-across-the-lifespan

Woodford, H. J., & George, J. (2011). Diagnosis and management of urinary infections in older people. *Clinical Medicine, 11*(1), 80–83. https://doi.org/10.7861/clinmedicine.11-1-80

APPENDICES

Appendix 1 Budget

MATERIAL	COSTS IN US $
Transport costs	**$80**
Internet usage cost	**$50**
Stationery	**$50**
Printing	**$25**
Refreshments	**$50**
Total	**$255**

Appendix 2: Grant chart

Activities	November	December	February	March	April	May
Developing proposal						
Seeking for approval						
Data collection						
Analysis of results						
Submission						

Appendix 3: DATA COLLECTION INSTRUMENT

3.1 Patient records on MediTech program (Software) at Lancet Clinical Laboratories

3.2 Data Collection tool

Laboratory number	Age	Sex	Infection (Organism)	Susceptibility/Resistance

Appendix 4: AUREC APPROVAL LETTER

AFRICA UNIVERSITY
Investing in Africa's future

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: AU3191/24

20 March, 2024

FERDINAND AKOKA
C/O Africa University
Box 1320
MUTARE

RE: **RISK FACTORS AND AETIOLOGY OF URINARY TRACT INFECTIONS (UTI) AMONG ELDERLY PATIENTS AGED 65 AND ABOVE AT LANCET CLINICAL LABORATORIES FROM JANUARY TO DECEMBER 2023**

Thank you for the above-titled proposal that 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** AUREC3191/24
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** March 20, 2024
- **EXPIRATION DATE** March 20, 2025
- **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.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)
APPROVED
P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU
ASSISTANT RESEARCH OFFICER: FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE

Appendix 5: STUDY SITE APPROVAL LETTER

Ferdinand AKOKA AKOKA

Fairview, Nyanga Road, Old Mutare, Manicaland, Africa University, Zimbabwe

+263786919453

16/02/2024

Mr MAGAISA, Lancet Clinical Laboratories Manager, Zimbabwe

22 Fife Avenue, Cnr Blakiston Street, Harare, Zimbabwe

Tel: +263773414720

REF: APPLICATION FOR PERMISSION TO CONDUCT MICROBIOLOGY RESEARCH AT LANCET

Warm greetings dear Manager,

I am currently enrolled in the Bachelor of Science degree in medical laboratory science at Africa University, Mutare, Zimbabwe. I was attached at your Harare branch corner of Fife Avenue and Blackstone and I gained interest in the Microbiology field henceforth, I decided to do a research dissertation within that department as part of my degree requirements. I would like to carry out a retrospective, descriptive cross-sectional study on the topic:

The topic reads: RISK FACTORS AND AETIOLOGY OF URINARY TRACT INFECTIONS (UTI) AMONG ELDERLY PATIENTS AT THE AGE OF 65 AND ABOVE AT LANCET CLINICAL LABORATORIES FROM JANUARY TO DECEMBER 2023

I am eager to do the dissertation under the mentorship and guidance of esteemed staff members at your institution and use the data in your database for the proposed topic. I therefore request for your authority to be allowed access into your system achieve and retrieve data essential for my research project.

I am confident that my dedication and hard work will make valuable contributions to the research endeavours at Lancet Clinical laboratories.

Anonymity of patients will be guaranteed as no names or identifying features will be

recorded. Please find a copy of my research proposal.

I am looking forward to your favourable response. Thank you for considering my application.

Yours faithfully

Ferdinand AKOKA, Medical Laboratory Student, **Africa University,** Mutare Zimbabwe.

PERMISSION TO CONDUCT RESEARCH **FERDINAND AKOKA**

APPROVED 19/02/24

BRIAN MAGAISA

LABORATORY MANAGER

LANCET
CLINICAL LABORATORIES
22 FIFE AVE / Cnr BLAKISTONE ST.
P.O. BOX BW260
BORROWDALE, HARARE