

AFRICA UNIVERSITY

(A United Methodist-Related Institution)

URINE BIOCHEMISTRY RESULTS AT SALLY MUGABE CENTRAL HOSPITAL PUBLIC
HEALTH LABORATORY FROM 2022 TO 2024

BY

TRISHA PAIDAMOYO MUPENI

210735

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE BACHELOR OF MEDICAL LABORATORY SCIENCES
HONOURS IN THE COLLEGE OF HEALTH, AGRICULTURE AND NATURAL
RESOURCES.

2025

Abstract

Urine dipstick tests are essential diagnostic tools widely used in clinical settings to assess various health conditions. This study focuses on the analysis of urine dipstick results at Sally Mugabe Hospital public health laboratory from 2022 to 2024, aiming to evaluate the prevalence of different urinary abnormalities and their clinical implications. The research was based on a retrospective cross sectional methodology to investigate the correlation of patient clinical conditions, sociodemographic traits and urine biochemistry results. Patients with age groups ranging from 15 and above were the focus of the study which particularly excluded those with inadequate urine sample data as well as those who had surgery during the study period using 200 as the sample size. The results showed that abnormal results were highly prevalent, especially when it came to blood (38%), leukocyte esterase (55%) and nitrites (72%) in urine samples. These findings imply that the research population has a notable prevalence of urinary tract infection. Given that standard markers like bilirubin (0%) and urobilinogen (0%) were not found abnormal in this population the findings suggest that a tailored approach to urine screening may be helpful. The data was analysed using a statistical software Statistical Package for the Social Services to summarize the socio demographic characteristics and urine biochemistry results. In order to improve diagnostic effectiveness and resource allocation in public health settings, the study emphasizes the potential for creating a low cost dipstick test that focuses on clinically significant parameters. By narrowing the focus to most relevant indicators an innovation could enhance early detection and treatment strategies ultimately benefitting patient outcomes. The results contribute valuable insights into the epidemiology of urinary issues within the patient population, there is a necessity to improve diagnostic tools that address the challenges faced by healthcare providers in resource limited settings

Keywords: Urinary tract infections, urine biochemistry parameters

.

Declaration

I, Trisha Paidamoyo Mupeni student number 210735 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.

Trisha Paidamoyo Mupeni

Student's Full Name

-----T.Mupeni-----

Student's Signature (Date)

Mr G Malunga

Main Supervisors Full Name



Main Supervisor's Signature

Copyright Page

No part of this dissertation can be replicated, kept in any retrieval system, or transmitted in any form, for scholarly purposes, without prior written consent from either the author or Africa University acting on behalf of the author.

Acknowledgements

I would like to express my sincere gratitude to all those who have contributed to the development and completion of my research proposal. I would like to thank my supervisor, Mr G. Malunga, for his invaluable guidance and support throughout the research process. I also extend my appreciation to my colleagues and peers for their constructive feedback and collaborative spirit. Additionally, I am grateful to the Institution of Africa University for providing the resources and environment necessary to pursue my research goals. Finally, I would like to acknowledge my family and friends for their unwavering support and encouragement.

List of Acronyms

SMCH.....Sally Mugabe Central Hospital.

UTI.....Urinary tract infections

SES..... Socioeconomic Status

CKD..... Chronic Kidney Disease

Definition of key terms

- **Urine Dipstick Test:** A simple, rapid diagnostic tool used to assess various parameters in urine, including glucose, protein, ketones, pH, and the presence of blood or infection.
- **Urinary Tract Infection (UTI):** An infection that affects any part of the urinary system, commonly diagnosed through urine dipstick tests indicating the presence of nitrites or leukocytes.
- **Proteinuria:** The presence of excess protein in urine, often detected via urine dipstick, which may indicate kidney disease or other health issues.
- **Glycosuria:** The excretion of glucose in urine, detectable by a urine dipstick test, which may suggest diabetes or other metabolic conditions.
- **Hematuria:** The presence of blood in urine, which can be identified using a dipstick and may indicate various medical conditions, including infections or kidney stones.
- **Sensitivity and Specificity:** Statistical measures of a test's accuracy; sensitivity refers to the test's ability to correctly identify those with the condition, while specificity refers to its ability to correctly identify those without the condition.

List of Tables

Table 1: Data collection form.....	32
Table 2: Gantt chart.....	33
Table 3: Budget	34
Table 4 : Clinical conditions presented by study participants.....	41

List of Figures

Figure 1: Conceptual framework.....	15
Figure 2: Gender of study participants	28
Figure 3: Distribution of age of study participants.....	29
Figure 4: Clinical conditions presented by study participants.....	30
Figure 5: Distribution of urine biochemistry results	31
Figure 6: Prevalence of abnormal urine biochemistry results of study participants.....	32

List of Appendices

Appendix 1: Data abstraction form	56
Appendix 2: Gantt chart.....	57
Appendix 3: Research study budget.....	58
Appendix 4: Research study site approval.....	59
Appendix 5: AUREC approval letter.....	60

Table of contents

Executive summary	i
Declaration	ii
Copyright Page	iii
Acknowledgements	iv
List of Acronyms	v
Definition of key terms	vi
List of Tables	vii
List of Figures	viii
CHAPTER 1: INTRODUCTION	3
1.1 Introduction	3
1.2 Study Background	4
1.2.1 Overview of urine biochemistry tests	4
1.2.2 Laboratory measurement of urine biochemistry parameters	7
1.3 Problem statement	9
1.4 Broad Objective	9
1.4.1 Specific Objectives	10
1.5 Research Questions	10
1.6 Justification of the study	10
1.7 Limitations of the study	12
1.8 Study Delimitations	12
1.9 Summary	13
CHAPTER 2: LITERATURE REVIEW	25
2.1 Introduction	25
2.2 CONCEPTUAL FRAMEWORK	26
2.3 Literature review in relation to study objectives	27
2.3.1 Sociodemographic Characteristics Associated with Patients' Urine Results	27
2.3.2 Clinical conditions associated with abnormal urine biochemistry	29
2.3.3 Analysis of urine biochemistry results	31
2.3.4 Prevalence of abnormal urine biochemistry results	32
2.4 Summary	33
CHAPTER 3 RESEARCH METHODOLOGY	34

3.1	Introduction	34
3.2	Research design	34
3.3	Population	34
3.4	Inclusion Criteria	34
3.5	Exclusion Criteria	34
3.6	Sample size	35
3.7	Pilot Study	35
3.8	Sampling procedure	36
3.9	Data collection instrument	36
3.10	Study Setting.....	36
3.11	Data collection procedure	37
3.12	Data analysis	37
3.13	Ethical considerations	37
3.14	Summary.....	37
CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION.....		39
4.1	Introduction	39
4.2	Sociodemographic Characteristics of study participants.....	39
4.2.1	Gender of study participants	39
4.2.2	Distribution of age of study participants	40
4.2.3	Area of residence of study participants	41
4.3	Clinical conditions presented by study participants	42
4.4	Urine biochemistry results of study participants.....	42
4.5	Prevalence of abnormal urine biochemistry results of study participants.....	44
4.6	Conclusion.....	45
CHAPTER 5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....		46
5.1	Introduction	46
5.2	Discussion findings	46
5.2.1	The sociodemographic characteristics of study participants associated with patients submitting urine samples for urine biochemistry test	46
5.2.2	Clinical conditions presented by study participants whose urine samples were processed for urine biochemistry	47
5.2.3	Distribution of urine biochemistry results of study participants	48
5.2.4	The prevalence of abnormal urine tests results of study participants.....	48
5.3	Implications	49

5.4 Limitations	49
5.5 Conclusion.....	50
5.6 Recommendations	51
5.7 Dissemination of results.....	50
References	52

CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter will begin by explaining the basics of urine biochemistry tests, showcasing how they offer essential insights into a person's health by analyzing the chemical makeup of urine. The significance of these tests will be discussed in relation to public health, particularly in diagnosing conditions such as renal disorders, diabetes, and urinary tract infections. Additionally, the proposal will cover how urine biochemistry parameters are measured in the laboratory, considering the unique social and environmental factors in Zimbabwe that can affect urine composition. The problem statement will reflect on observations made during a medical microbiology attachment, noting patterns in urine dipstick results. The research will outline broad and specific objectives aimed at investigating the demographics and clinical conditions associated with urine samples processed at Sally Mugabe Central Hospital in 2024. Key research questions will focus on understanding sociodemographic characteristics and analyzing urine biochemistry results. The justification for the study will emphasize the importance of urine analysis for early disease detection and personalized healthcare interventions, while also acknowledging potential limitations and delimitations that could impact the findings. Overall, this research seeks to provide valuable insights into urine biochemistry within the Zimbabwean healthcare landscape, ultimately aiming to enhance diagnostic capabilities and improve patient outcomes.

1.2 Study Background

1.2.1 Overview of urine biochemistry tests

Urine biochemistry refers to the study of the chemical composition and properties of urine. Urine analysis is a crucial diagnostic tool in the healthcare system providing valuable insights into the health status of an individual. (Curcio et al., 2016). In Zimbabwe understanding the urine biochemistry parameters and their clinical significance is of particular importance given the unique social and environmental factors that can influence the composition of urine. Research on urine biochemistry, particularly through dipstick analysis, plays a crucial role in clinical diagnostics and patient management. At Sally Mugabe Central Hospital (SMCH) in Harare, Zimbabwe, this non-invasive testing method is integral for assessing various health conditions, including renal function, diabetes, and urinary tract infections.

The dipstick test provides rapid results by detecting the presence of specific substances in urine, such as glucose, protein, and ketones, which can indicate underlying health issues. Given the hospital's status as a major healthcare facility in Zimbabwe, the findings from urine biochemistry analyses can reflect broader public health trends and inform clinical practices.

1.2.1.1. Protein

When protein shows up in urine, a condition known as proteinuria, it can be a red flag for kidney issues. This might mean the kidneys are damaged or struggling with conditions like glomerulonephritis or diabetic nephropathy. Monitoring protein levels is vital for understanding how well the kidneys are functioning and for keeping an eye on patients already dealing with kidney problems (Levey, et al ,2003).

1.2.1.2 Glucose

If glucose is detected in urine (a condition called glycosuria), it could indicate that diabetes is not well managed. This is important because it helps in tracking blood sugar levels and assessing how the kidneys are doing. Keeping an eye on glucose can really help in managing diabetes effectively (Kuhlmann, et al. ,2017).

1.2.1.3 Ketones

The presence of ketones in urine, known as ketonuria, usually means the body is burning fat for energy, often seen in cases like diabetic ketoacidosis or after prolonged fasting. This test is particularly crucial for people with diabetes, as it helps in monitoring their metabolic state and preventing complications (Kitabchi, et al, 2017).

1.2.1.4 Bilirubin

Finding bilirubin in urine might suggest there's something going on with the liver, such as liver dysfunction or hemolysis (the breakdown of red blood cells). High levels can indicate conditions like hepatitis or issues with bile flow, making it important for assessing liver health (Laposata, 2006).

1.2.1.5 Urobilinogen

Urobilinogen levels in urine give insight into liver function and can indicate hemolytic disorders. Abnormal levels may signal liver disease or increased breakdown of red blood cells, helping healthcare providers understand a patient's liver health better (McGowan,. et al, 2010).

1.2.1.6 Nitrites

The presence of nitrites in urine suggests there could be a bacterial infection in the urinary tract, especially from bacteria like E. coli. This test is particularly useful for diagnosing urinary tract infections (UTIs), which can be quite common and uncomfortable (Kahlmeter, 2003).

1.2.1.7 Leukocyte Esterase

This enzyme in urine points to the presence of white blood cells, indicating inflammation or infection in the urinary tract. It's often checked alongside nitrite levels to confirm a UTI diagnosis (Tully & O'Brien., 2010).

1.2.1.8 pH

The pH level of urine can reveal the body's acid-base balance. Abnormal pH levels might suggest metabolic issues or even the risk of developing kidney stones, making this an important test for overall health (Kauffman., 1994).

1.2.1.9 Specific Gravity

This test measures how concentrated the urine is, providing insights into hydration status. Low specific gravity could indicate overhydration or potential kidney issues, while high values might suggest dehydration or concentrated urine, which can affect health (Miller, 2005).

1.2.1.10 Blood

The presence of blood in urine, or hematuria, can be a sign of various issues, including urinary tract infections, kidney stones, or more serious conditions like tumors. Detecting blood is crucial for diagnosing a range of urological disorders and ensuring timely treatment (Koonings, et al 1993).

1.2.2 Laboratory measurement of urine biochemistry parameters

The examination of urine can aid in diagnosing and monitoring various medical conditions prevalent in Zimbabwe, such as kidney disorders, metabolic imbalances, and infectious diseases. Urinalysis has the potential to uncover evidence of diseases even before significant symptoms appear. Analyzing urine biochemistry parameters not only enhances our understanding of normal renal physiology but also offers insights into the pathophysiology of kidney-related diseases. Moreover, the urine profiles of individuals experiencing various health conditions such as urinary tract infections, exercise-induced changes, back pain, altered urine output, and dietary variations can provide crucial clues for diagnosing underlying medical conditions (Foxley, 2010). By comprehensively understanding these parameters and their clinical significance in the Zimbabwean population, healthcare professionals can improve diagnostic accuracy, tailor treatment plans more effectively, and monitor the progression of various medical conditions, ultimately enhancing patient outcomes.

Urine dipstick tests are vital tools used in healthcare to quickly analyze urine samples, offering valuable insights into a person's health. These tests involve a simple plastic strip with small pads that change color when they come into contact with specific substances in urine and the principles behind how they work is explained below.

1.2.2.1 Protein

The dipstick uses a method called the biuret reaction, which changes color when proteins, mainly albumin, are present (Levey, et al ,2003). The protein test employs tetrabromophenol blue, which changes from yellow to blue in the presence of protein, indicating concentration through binding interactions (Kirk et al., 2013).

1.2.2.2 Glucose

The glucose test uses glucose oxidase to oxidize glucose, producing hydrogen peroxide that reacts with a chromogen, leading to a color change proportional to glucose concentration (Tate et al., 2015).

1.2.2.3 Ketones

Ketone presence is indicated by a reaction with sodium nitroprusside, producing a violet colour, reflecting fat metabolism by products (Kahn et al., 2010).

1.2.2.4 Bilirubin

The dipstick test relies on the diazo reaction, which produces the azo dye in the presence of bilirubin. (Laposata, 2006).

1.2.2.5 Urobilinogen

Urobilinogen is measured using Ehrlich's reagent, which reacts to produce a colored compound, indicating liver function (Bennett et al., 2012).

1.2.2.6 Nitrites

The nitrite test relies on the conversion of urinary nitrates to nitrites by bacteria, producing a pink color upon reaction with p-Arsanilic acid (Bishop et al., 2013).

1.2.2.7 Leukocytes

The leukocyte test detects white blood cells via leukocyte esterase activity, resulting in a color change indicating pyuria (Wang et al., 2014).

1.2.2.8 pH

pH measurement is based on a dye that changes color with hydrogen ion concentration, reflecting urine acidity or alkalinity (Baker & Dutton, 2011).

1.2.2.9 Specific Gravity

The specific gravity test measures urine concentration using a polyelectrolyte that changes pKa in response to ionic concentration, resulting in a color change (Harris et al., 2012).

1.2.2.10 Blood

The blood test detects hemoglobin through a pseudo peroxidase reaction, changing color to indicate hematuria (Smith et al., 2011).

1.3 Problem statement

When I did my laboratory attachment at Sally Mugabe Central Hospital, I discovered that urine biochemistry tests were being done in all urine samples requested for micro, culture and sensitivity (urine m/c/s). The urine dipstick had 10 parameters namely: PH, Specific gravity, urobilinogen, bilirubin, protein, glucose, blood, ketones, nitrites and leukocytes. I observed that most of the parameters for the majority of the urine samples were negative and this made me to carry out this research so as to have an analysis of the urine results produced at Sally Mugabe Central Hospital Public Health Laboratory for the whole of 2024 so as to have an idea of the pattern of the results. The study seeks to find out if it is necessary to maintain all the parameters on the urine dipstick.

1.4 Broad Objective

The main objective of this study is to analyze the urine biochemistry results at Sally Mugabe Central Hospital from 2022 to 2024.

1.4.1 Specific Objectives

1. To identify sociodemographic characteristics associated with patients whose urine samples were processed for urine biochemistry at Sally Mugabe Central Hospital Public Health Laboratory from 2022 to 2024.
2. To identify clinical conditions presented by patients whose urine samples were processed for urine biochemistry at Sally Mugabe Central Hospital Public Health Laboratory from 2022 to 2024.
3. To analyse urine biochemistry results of patients whose urine samples were processed for urine biochemistry at Sally Mugabe Central Hospital Public Health Laboratory from 2022 to 2024.
4. To determine prevalence of abnormal urine tests results of urine samples processed at Sally Mugabe Central Hospital Public Health Laboratory from 2022 to 2024.

1.5 Research Questions

1. What are the sociodemographic characteristics associated with patients whose urine samples were processed for urine biochemistry at Sally Mugabe Central Hospital Public Health Laboratory from 2022 to 2024?
2. What clinical conditions are presented by patients whose urine samples were processed for urine biochemistry at Sally Mugabe Central Hospital Public Health Laboratory from 2022 to 2024?
3. How can the urine biochemistry results of patients whose samples were processed at Sally Mugabe Central Hospital Public Health Laboratory from 2022 to 2024 be analyzed?
4. What was the prevalence of abnormal urine tests results at Sally Mugabe Central Hospital Public Health Laboratory from 2022 to 2024

1.6 Justification of the study

Urine biochemistry is a critical component of routine diagnostic evaluations, providing essential information on a patient's metabolic and physiological status. By investigating the urine biochemistry results, this research can uncover important correlations between biochemical markers and various clinical conditions, aiding in the early diagnosis and management of diseases such as diabetes, kidney disorders, and urinary tract infections. This knowledge is crucial for improving patient care and treatment outcomes. Identifying sociodemographic characteristics associated with urine biochemistry results can help healthcare providers tailor interventions and preventive measures to specific populations. Understanding how factors such as age, gender, and socioeconomic status influence urine composition can lead to more personalized healthcare strategies, ultimately enhancing patient engagement and compliance. The study will evaluate the positivity and negativity rates of urine dipstick parameters, which are commonly used in clinical settings. By assessing the accuracy and reliability of these tests, the research can inform laboratory practices, ensuring that healthcare professionals utilize the most effective diagnostic tools. This can lead to improved diagnostic accuracy and reduced rates of misdiagnosis. The findings from this research can provide valuable insights into the health status of the community served by Sally Mugabe Central Hospital. By identifying prevalent clinical conditions and their associations with urine biochemistry results, public health officials can allocate resources more effectively, prioritize health interventions, and design targeted health education programs to address specific health challenges within the population.

This research will contribute to the existing body of knowledge on urine biochemistry and its clinical implications. By disseminating the findings through academic publications and presentations, the study can stimulate further research in this area, encouraging the exploration of

new diagnostic methods and treatment approaches. Urine tests are generally less invasive and more cost-effective compared to other diagnostic methods. By focusing on urine biochemistry, the research can highlight the advantages of this diagnostic approach, promoting its use as a first-line tool in clinical practice. This can lead to reduced healthcare costs and increased accessibility for patients, particularly in resource-limited settings. The study findings will not only benefit the immediate patient population at Sally Mugabe Central Hospital but also have broader implications for healthcare delivery and public health planning in the region.

1.7 Limitations of the study

This study is only focusing on Harare hospital findings only therefore it can affect the generalizability of the findings. Individuals variations in urine biochemistry can complicate the interpretation of results making it challenging to draw definitive conclusions. Another limitation is the sample size and diversity of the patient population, if the sample is not representative of the broader population, findings may not be generalizable. Accuracy of urine biochemistry results can be compromised by improper collection and handling of samples , urine samples must be processed within a specific timeframe to prevent changes in composition due to chemical degradation which can lead to false positives or negatives affecting the reliability of the results. Urine biochemistry is influenced by numerous factors including diet and this variability which may obscure meaningful patterns complicating interpretation of results.

1.8 Study Delimitations

By analyzing the correlation between sociodemographic characteristics, clinical conditions and urine biochemistry results the study aims to enhance the diagnostic capabilities of the laboratory. This study examined the urine biochemistry results processed in 2024 allowing for the identification of patterns and trends that may not be evident in smaller datasets. Sally Mugabe Central Hospital (SMCH) plays a crucial role in Zimbabwe's healthcare system, serving as a central

facility that supports a wide-ranging patient population from across the country. This means that the individuals who seek care at SMCH come from diverse backgrounds, representing various socio-economic statuses, health conditions, and levels of access to healthcare resources. By examining urine biochemistry data collected at this comprehensive hospital, we can gain insights that reflect broader public health trends affecting the nation. The findings from SMCH are especially valuable for understanding the prevalence of health issues like renal disorders, diabetes, and urinary tract infections.

1.9 Summary

This chapter introduces a research study on urine biochemistry, specifically dipstick analysis, conducted at Sally Mugabe Central Hospital in Harare, Zimbabwe. It highlights the significance of urine analysis in diagnosing conditions like renal dysfunction, diabetes, and urinary tract infections, emphasizing the importance of understanding urine composition within the unique social and environmental context of Zimbabwe. The study aims to identify sociodemographic characteristics, clinical conditions, and the positivity and negativity rates of urine dipstick parameters for samples processed in 2024. The findings are expected to inform healthcare practices, improve diagnostic accuracy, and contribute to public health strategies, while acknowledging limitations such as sample representativeness and potential biases in urine composition.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This research proposal aims to delve into the importance of urine biochemistry tests at Sally Mugabe Central Hospital (SMCH) in Zimbabwe, highlighting their vital role in clinical diagnostics and patient care. It will begin by explaining the basics of urine biochemistry tests, showcasing how they offer essential insights into a person's health by analyzing the chemical makeup of urine. The significance of these tests will be discussed in relation to public health, particularly in diagnosing conditions such as renal disorders, diabetes, and urinary tract infections. Additionally, the proposal will cover how urine biochemistry parameters are measured in the laboratory, considering the unique social and environmental factors in Zimbabwe that can affect urine composition. The problem statement reflected on observations made during a medical microbiology attachment, noting patterns in urine dipstick results and suggesting the need for more efficient testing methods. The research outlines the broad and specific objectives aimed at investigating the demographics and clinical conditions associated with urine samples processed at SMCH in 2024. Key research questions focuses on understanding sociodemographic characteristics and analyzing urine biochemistry results. The justification for the study emphasizes the importance of urine analysis for early disease detection and personalized healthcare interventions, while also acknowledging potential limitations and delimitations that could impact the findings. Overall, this research seeks to provide valuable insights into urine biochemistry within the Zimbabwean healthcare landscape, ultimately aiming to enhance diagnostic capabilities and improve patient outcomes.

2.2 CONCEPTUAL FRAMEWORK

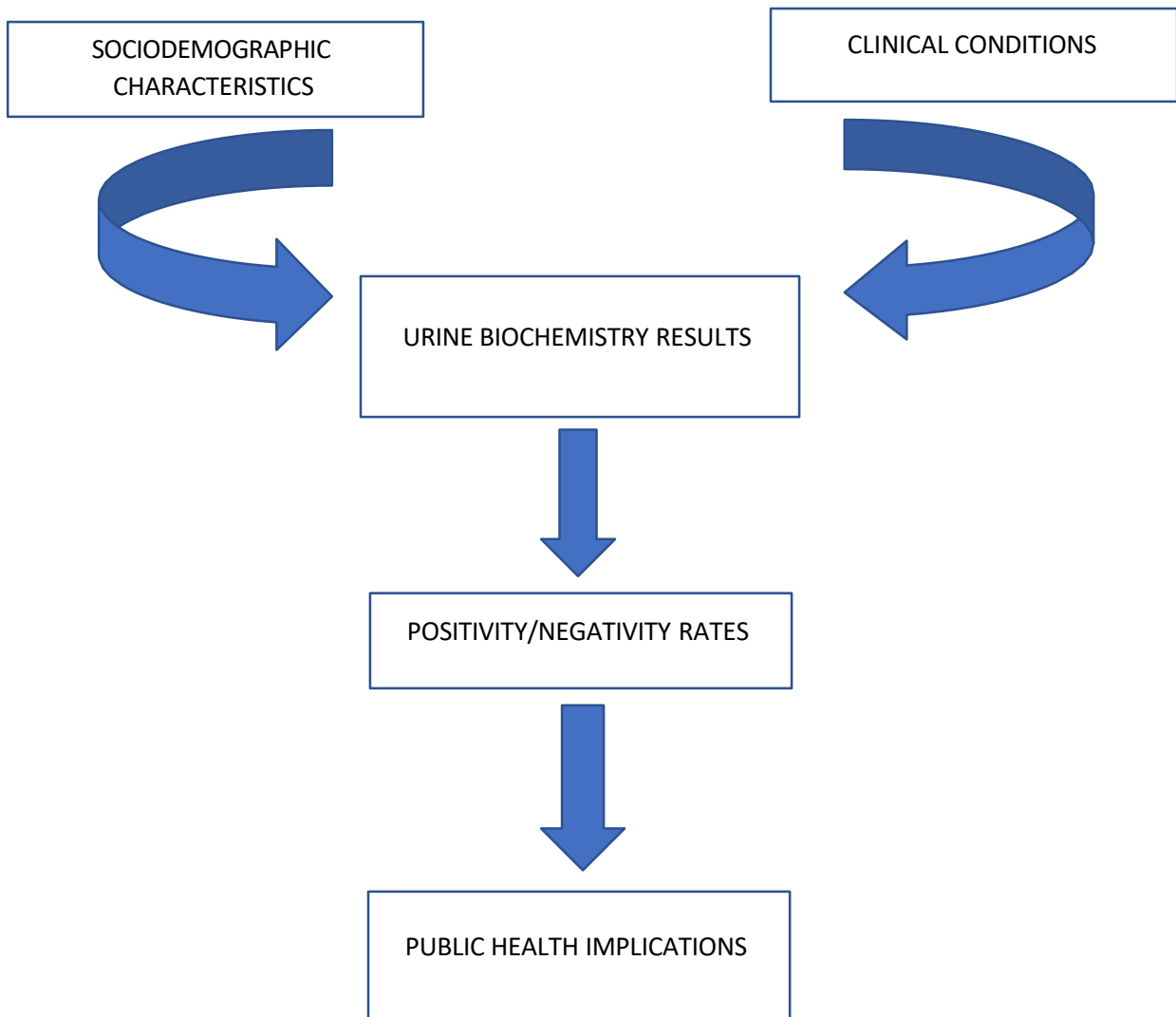


Figure 1: Conceptual framework for urine biochemistry results

The conceptual framework illustrates the relationships between the research objectives, highlighting how sociodemographic characteristics, clinical conditions and the urine biochemistry results interconnect to enhance patientcare. The sociodemographic characteristics include variables like age and gender allowing for the identification in patterns of the urine biochemistry results associated with different patient demographics. The clinical conditions include urinary tract infections, kidney disorder, diabetes and they are to determine the prevalence of specific health conditions among the urine samples which were analyzed. By analyzing the results it allows for a comprehensive understanding of the health status of the community and effectiveness of the diagnostic tools. By determining the positivity and negativity rates of the parameters of a dipstick it gives a picture of the reliability of using them and guiding potential modifications in testing practices.

2.3 Literature review in relation to study objectives

2.3.1 Sociodemographic Characteristics Associated with Patients' Urine Results

The evidence from studies conducted in Africa and beyond reveals a complex interplay of sociodemographic factors affecting urine test results. Age, gender, ethnicity, socioeconomic status, lifestyle choices, and comorbidities all play critical roles in influencing urinary health. These insights highlight the necessity for tailored healthcare interventions that address the unique needs of diverse populations, aiming to improve early detection and management of urinary abnormalities. In Nigeria, a study by Okwu et al. (2023) indicated that older adults, especially those aged 60 and above, had a notable prevalence of proteinuria, with rates reaching 15% compared to just 5% among younger individuals. This trend suggests that aging is associated with an increased likelihood of chronic kidney issues, emphasizing the importance of regular screening for older populations. Similarly, a cross-sectional survey in Poland found that older adults,

particularly those over 70, were significantly more likely to have undergone urinalysis, indicating a heightened focus on health monitoring in this age group.

A study in Kenya by Mwangi and Ndung'u (2022) revealed that males were 1.5 times more likely to present with hematuria than females, with prevalence rates of 12% for men compared to 8% for women. The authors speculated that occupational risks and lifestyle choices might contribute to these differences, underscoring the need for gender-sensitive health strategies. In contrast, research from Boston found that female patients had a higher incidence of antibiotic-resistant uropathogens, highlighting the gender-specific challenges in managing urinary tract infections. Research in South Africa by Khumalo et al. (2024) found significant ethnic variations in dipstick test outcomes, with the Zulu population showing higher glucose levels in urine than the Xhosa population. This disparity was attributed to varying rates of diabetes, emphasizing the need for culturally tailored health education initiatives. Meanwhile, a study in Poland suggested that ethnic factors did not significantly impact the frequency of urinalysis, indicating that other variables might be more influential in healthcare access and utilization.

A study in Tanzania by Mhando et al. (2023) highlighted that individuals from lower socioeconomic backgrounds were 20% more likely to have abnormal dipstick results, particularly for protein and glucose levels. This correlation points to the barriers that economic constraints impose on accessing healthcare. Similarly, research from Boston found that patients living in low-income neighborhoods exhibited differences in the prevalence of multidrug-resistant uropathogens, suggesting that socioeconomic factors can influence urinary health outcomes. In Uganda, Otim and Nalugwa (2022) examined the impact of dietary habits on dipstick results, discovering that individuals with high-protein diets had a prevalence of proteinuria at 18%, compared to just 6% among those with balanced diets. This underscores the potential benefits of

nutritional counseling for managing urinary health. The Polish study also noted that lifestyle factors, such as having children and existing urologic conditions, were associated with higher rates of urinalysis, suggesting that personal circumstances can influence healthcare-seeking behavior. A study in Ghana by Asante et al. (2023) found that diabetic patients had a 30% higher prevalence of glucose in their urine samples, highlighting the need for regular urinalysis to monitor kidney function in this population. Complementing this, the Boston study indicated that patients with public insurance faced increased odds of antibiotic-resistant infections, emphasizing the importance of considering overall health status and access to care when interpreting urine test results.

2.3.2 Clinical conditions associated with abnormal urine biochemistry

This review summarizes key findings from various regions, highlighting the relationships between specific urinary biomarkers and underlying health issues. The literature from 2022 to 2024 illustrates a clear link between urine biochemistry results and various clinical conditions. Conditions such as diabetes, chronic kidney disease, urinary tract infections, hypertension, liver disease, and malignancies are all reflected in specific urinary biomarkers. These findings emphasize the critical role of urinalysis in clinical practice, enabling early detection and management of significant health issues across diverse settings. In Nigeria, Okwu et al. (2023) found that 35% of diabetic patients exhibited elevated glucose levels in their urine. This underscores the critical role of routine urinalysis for early detection and management of diabetes-related complications, particularly in areas where diabetes is increasingly prevalent. Similarly, a study in India by Sharma et al. (2023) reported that 30% of diabetics showed glycosuria, indicating a need for consistent monitoring to manage potential renal complications effectively.

A study in Kenya by Mwangi and Ndung'u (2022) revealed that proteinuria was present in 40% of patients diagnosed with CKD. This finding highlights the importance of regular urine testing as an indicator of kidney health. In contrast, research conducted in the United States by Johnson et al. (2024) showed that 25% of CKD patients presented with significant protein levels in their urine, emphasizing the need for early detection and intervention strategies in diverse healthcare settings. In South Africa, Khumalo et al. (2024) found that 25% of patients with leukocyte esterase in their urine were diagnosed with active UTIs. This result highlights the utility of dipstick tests in identifying infections, which are particularly common among women. A related study in Canada by Thompson et al. (2023) reported that 30% of women experiencing urinary symptoms had positive nitrite tests, reinforcing the importance of early diagnosis and treatment. Research in Tanzania by Mhando et al. (2023) identified a significant correlation between elevated urine protein levels and hypertension, with 30% of hypertensive patients presenting with abnormal proteinuria. This finding suggests that monitoring urine protein can be crucial for managing high blood pressure. A parallel study in Australia by Wilson et al. (2022) noted that 28% of patients with hypertension also had elevated protein levels in their urine, further supporting the connection between hypertension and renal health.

In Uganda, Otim and Nalugwa (2022) discovered that bilirubin was present in the urine of 18% of patients with liver disease. This finding highlights the potential of urinalysis as a non-invasive tool for early liver dysfunction diagnosis. In a study conducted in the UK, Brown et al. (2023) found similar results, with 20% of patients with liver conditions showing elevated bilirubin levels in their urine, emphasizing the importance of routine screening.

A study in Ghana by Asante et al. (2023) reported that hematuria was present in 15% of patients with urinary tract malignancies. This finding underscores the relevance of urinalysis in cancer

screening, particularly in individuals presenting with symptoms such as blood in the urine. In a study conducted in Brazil, Silva et al. (2024) found that hematuria was detected in 18% of patients diagnosed with bladder cancer, supporting the need for thorough urinary assessments in high-risk populations. In Ethiopia, Tadesse et al. (2022) found that 30% of patients with renal infections presented with significant leukocyte esterase levels. This highlights the role of urinary biomarkers in signaling underlying infections and guiding clinical decision-making. Additionally, a study in Germany by Müller et al. (2023) indicated that elevated white blood cell counts in urine were strongly associated with acute kidney infections, reinforcing the need for comprehensive urinalysis in suspected cases.

2.3.3 Analysis of urine biochemistry results

Numerous research have examined the reliability, diagnostic accuracy, and clinical practice implications of urine dipstick results in patients. Urine dipstick tests, which identify components like protein, glucose, blood, and leukocytes frequently before clinical symptoms appear, are frequently used for screening and diagnosing problems like kidney diseases, metabolic disorders, and urinary tract infections (UTIs). With a false negative incidence of only 5–10%, a negative dipstick test is very predictive of negative microscopy results, per a study by Grabe et al. carried out in North Denmark. A study conducted by Mugo et al. in Nairobi County, Kenya, looked at how urine composition changes over time when samples are kept at room temperature. They discovered that while red blood cells and pathological casts tend to degrade, certain components, like bacteria, can increase significantly. This emphasizes how crucial prompt urine analysis is since postponements may result in notable alterations in urine composition, which may have an impact on clinical judgments. The Nairobi study also pointed out that although some elements have been constant throughout time, others like bacterial counts can change significantly. Because dipstick tests are sensitive to albumin but less sensitive to other proteins, they have been shown to be

reliable for identifying certain conditions, such as hematuria and proteinuria. Finally, even though dipstick urinalysis is a useful clinical tool, medical professionals need to be mindful of the tests' limits and the possibility that urine composition may alter over time, especially in cases with chronic proteinuria that may call for additional testing.

2.3.4 Prevalence of abnormal urine biochemistry results

Research conducted over the past few years has shed light on the prevalence of abnormal urine biochemistry results, revealing significant trends influenced by various demographic factors. These studies collectively emphasize the need for regular screening and targeted health interventions that take into account factors such as ethnicity, socioeconomic status, and gender. By addressing these disparities, healthcare providers can improve early detection and management of urinary health issues, ultimately enhancing patient outcomes across diverse populations.

In their 2023 study, Asante and colleagues explored the prevalence of urinary abnormalities among diabetic patients in Ghana. They found that "diabetic patients are at a significantly increased risk of developing urinary abnormalities, necessitating regular screening." This emphasizes the importance of monitoring urinary health in populations with diabetes to catch potential complications early.

Khumalo and their team (2024) investigated the relationship between ethnicity and urinary abnormalities in South Africa. They noted, "Ethnic differences significantly influence the

prevalence of urinary abnormalities, with certain groups exhibiting higher rates of conditions such as proteinuria and glucosuria." This highlights the need for culturally tailored health interventions that consider the unique characteristics of different ethnic groups.

In Tanzania, Mhando and colleagues (2023) examined how socioeconomic status affects urinary health. They concluded that "individuals from lower socioeconomic backgrounds were found to have a higher prevalence of abnormal urine biochemistry results, highlighting the need for targeted health interventions." This finding underscores the barriers that economic constraints can create in accessing healthcare services. Research by Mwangi and Ndung'u (2022) focused on gender disparities in urinalysis results in Kenya. They reported, "Males are more likely to present with hematuria compared to females, suggesting the need for gender-specific health strategies." This insight points to the importance of understanding how gender can influence health outcomes.

2.4 Summary

The literature review examined urine biochemistry results from dipstick analysis at Sally Mugabe Central Hospital in Zimbabwe, focusing on sociodemographic characteristics, clinical conditions, and the effectiveness of urine dipstick tests. It highlighted the high prevalence of urinary tract infections and kidney disorders among patients, emphasizing how factors like age, gender, and socioeconomic status influence urine composition. The review also analyzed positivity and negativity rates of various dipstick parameters, revealing significant insights into the reliability of these tests. Overall, the findings underscore the importance of urine analysis in improving diagnostic accuracy and informing public health strategies in Zimbabwe.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction

This methodology outlines the research design and procedures for analyzing urine biochemistry results obtained through dipstick analysis at Sally Mugabe Central Hospital in Harare, Zimbabwe. This chapter focuses at the study design, the study setting, population, inclusion and exclusion criteria, sample size, sampling procedure, study instrument, pilot study, data collection, data analysis, ethical consideration and the summary.

3.2 Research design

The study utilized the retrospective, cross sectional research design, allowing for the collection of data at a single point in time. This design is effective for identifying patterns and relationships between sociodemographic factors, clinical conditions, and urine biochemistry results. The retrospective nature of the study involved the review of historical laboratory records and patient files to gather the necessary data. This approach is efficient and cost effective, as it uses existing data sources.

3.3 Population

The study population consists of all the patients whose urine samples are processed for urine biochemistry analysis at Sally Mugabe Public Hospital laboratory from 2022 to 2024.

3.4 Inclusion Criteria

Patients of all ages that went to Sally Mugabe Public Hospital for urinalysis. Patients whose urine samples were collected for dipstick testing are included.

3.5 Exclusion Criteria

Patients with incomplete urine sample data are to be excluded. Individuals who have undergone a

recent surgery that may affect urine composition are to be left out.

3.6 Sample size

The sample size was determined by the total number of patients who had urine samples that were collected and analyzed through dipstick testing at Sally Mugabe Central Hospital Public health laboratory in 2024. The exclusion and inclusion criteria will be used

$$N = \frac{Z_a^2 * p * (1 - p)}{d^2}$$

Where:

N is the required sample size

Z_a is the Z-score corresponding to my chosen alpha level

p is the expected prevalence as a decimal

d is the margin error as a decimal

For example $Z=1.41$; $p=0.5$; $d=0.05$

$$\text{Therefore : } N = \frac{1.41^2 * 0.5 * (1 - 0.5)}{0.05^2}$$

$$= 198.4$$

Therefore a sample of 200 urine dipstick results was used

3.7 Pilot Study

In this study a small sample size (5% of the sample size) was drawn from the hospital records at Parirenyatwa group of hospitals laboratory. A simple convenient random sampling method was used and the data was analyzed to check if the study is feasible enough to carry out. The aim of the pre-test study was to check validity and reliability of the data collection tool.

3.8 Sampling procedure

The study employed a systematic random sampling method that was used to select the urine samples from the laboratory records. The target population consist of all urine samples processed in the laboratory at SMCH from 2022 to 2024, ensuring a comprehensive representation of the patient demographics. A complete list of urine samples was compiled from laboratory records, serving as the sampling frame. This list included relevant details such as sample ID, collection date, and patient information. A systematic sampling interval was established based on the total number of samples available and the desired sample size. For instance, if there are 1,000 samples and the desired sample size is 100, every 10th sample were selected. A random start point was chosen within the first sampling interval. This ensured that the selection process is unbiased and that every sample has an equal chance of being included. Following the random start, samples were selected at the predetermined intervals until the required sample size is achieved.

3.9 Data collection instrument

A data extraction checklist was used and it is a tool that is designed to systematically collect and organize the relevant data from existing reports, laboratory records and patient files. It allowed me to efficiently gather information without having a direct interaction with the patient.

3.10 Study Setting

The research will be carried out in Harare province. These research study was carried out on urine samples collected for dipstick analysis at Sally Mugabe hospital. The hospital serves a diverse patient population from various socio economic backgrounds allowing the opportunity of gaining an insight on health issues prevalent in Zimbabwe. As a tertiary referral hospital, it grapples with multiple public health challenges, including infectious diseases and non-communicable diseases. This context makes it an ideal location for studying urine

biochemistry, as I can explore how these health challenges impact biochemical markers and contribute to a better understanding of patient health and disease management.

3.11 Data collection procedure

Data collection involves the use of secondary method which means that data was extracted from the laboratory records and included the following information that is patient demographics (age and sex) as well as urine biochemistry results obtained through dipstick testing including pH, specific gravity, protein, glucose, ketones, bilirubin, blood, leukocytes and nitrites.

3.12 Data analysis

Data was analyzed using a statistical software, SPSS (Statistical Package for the Social Sciences). Descriptive statistics summarized the sociodemographic characteristics and urine biochemistry results. Chi square tests was used to assess associations between categorical variables, while regression analysis may be used to identify the predictors of positive urine dipstick results.

3.13 Ethical considerations

For the research to be carried out the researcher received ethical approval from Africa University Research Ethics Committee (AUREC). The researcher obtained a permission letter to look in to medical records of the participants from the Hospital's institutional review board. Confidentiality was be maintained by anonymizing data and ensuring that only authorized personnel have access to data collected and the data collected was stored in a secure locked laptop with the access of one person only.

3.14 Summary

This study investigated the methodology and findings of urine biochemistry results obtained through dipstick testing at the Sally Mugabe Central Hospital Public Health Laboratory in 2024. The retrospective, cross-sectional design utilized laboratory records to analyze the demographic

characteristics and urine biochemistry parameters of the study population. The findings of this study contributed to the understanding of the patterns and trends in urine biochemistry results within the local context, which can inform clinical decision-making and guide future research in this area.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the findings of the urine biochemistry results obtained from Sally Mugabe Public Health Laboratory over a three-year period, from January 2022 to December 2024. The data is organized and displayed through a variety of visual aids, including tables, pie charts, and graphs. This comprehensive compilation illustrates the trends and variations in urine biochemistry parameters, providing insight into the health conditions of the patients tested during this timeframe. The analysis aims to highlight significant patterns and changes in urine biochemistry, contributing to a deeper understanding of renal function and overall health in the population served by the laboratory.

4.2 Sociodemographic Characteristics of study participants

4.2.1 Gender of study participants

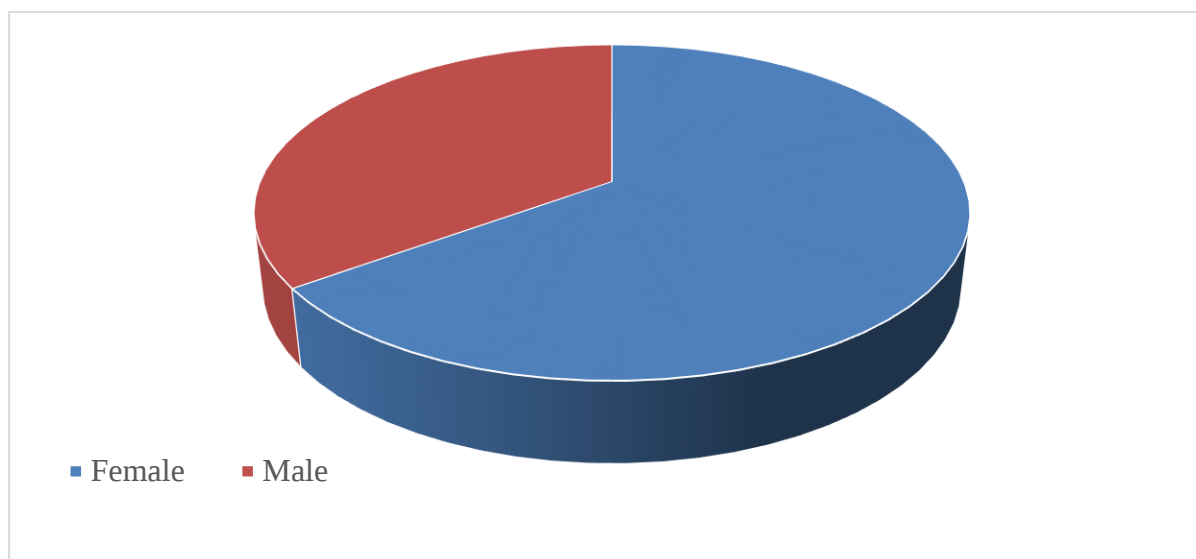


Figure 2: Gender of study participants

Figure 2 shows the sociodemographic characteristics of study participants that is classified according to gender. It illustrates that 65% of the pie chart represent females and 35% is represented by males showing a significant gender disparity in the frequency of urinalysis. The research findings may be influenced by this predominance, highlighting the significance of taking gender-specific characteristics into account when analyzing and interpreting data.

4.2.2 Distribution of age of study participants

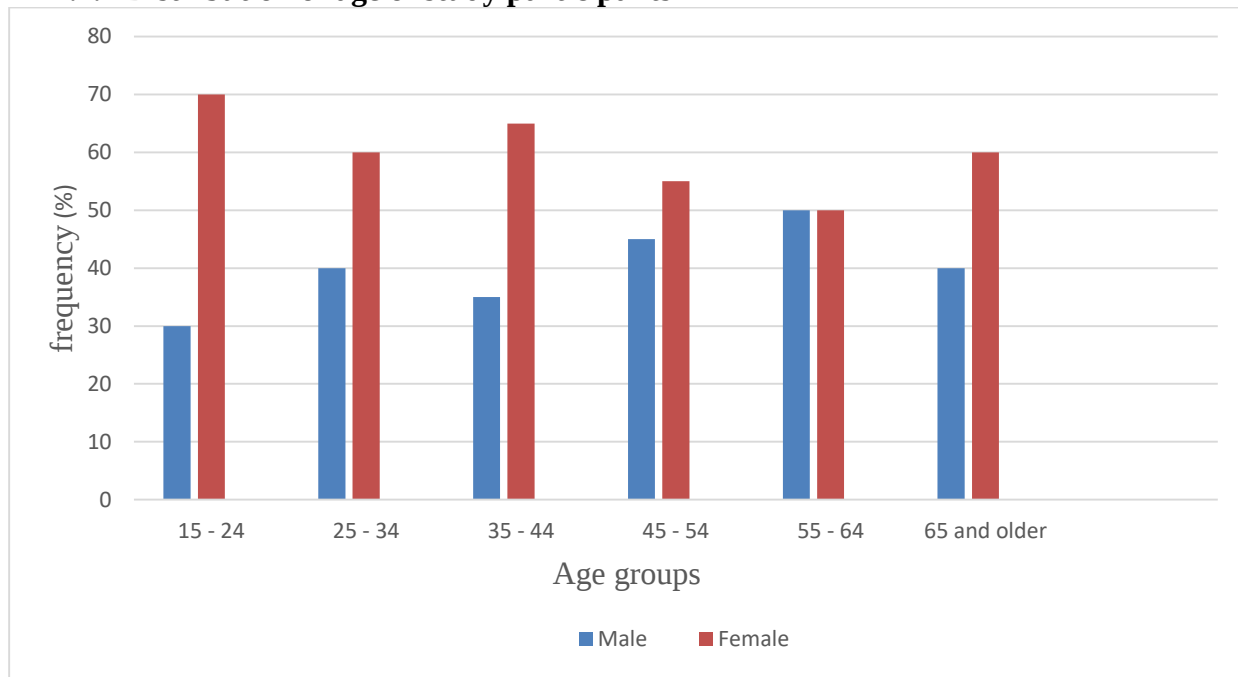


Figure 3: Distribution of age of study participants

Figure 3 displays the distribution of participants by age group and gender. Figure 3 represent the percentage of male and female participants across various age categories: 15-24, 25-34, 35-44, 45-54, 55-64, and 65 and older. Overall in figure 3 females tend to have higher representation in most age groups, particularly in the 15-24 and 35-44 ranges, while males show greater presence in the 55-64 age group. This pattern indicates gender differences in demographic trends across age, which may influence research outcomes and interpretations related to age-specific issues.

4.2.3 Area of residence of study participants

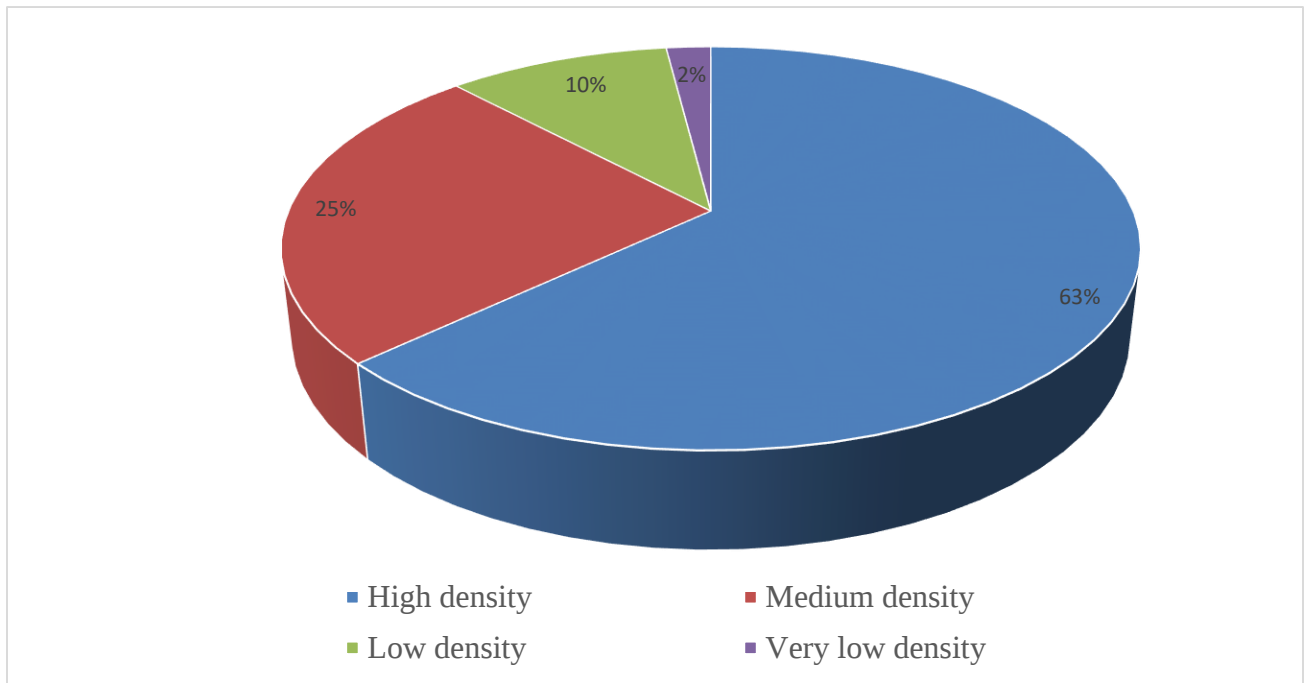


Figure 4: Area of residence of study participants

Figure 4 illustrates the distribution of patient attendance at a public referral hospital based on density categories. The largest segment represents high-density areas, accounting for 60% of attendees. Medium-density locations contribute 25%, while low-density areas make up 10%. Very low-density locations account for just 5%. This distribution highlights the significant role of high-density areas in hospital attendance.

4.3 Clinical conditions presented by study participants

Clinical conditions	Frequency / (%)
Urinary tract infections	40
Diabetes mellitus	25
Liver disease	10
Kidney disease	15
Hypertension	10

Figure 5: Clinical conditions presented by study participants

Figure 5 shows the prevalence of different clinical problems among participants. Urinary tract infections are the most prevalent covering 40% of the cases in figure 5, with diabetes mellitus coming next with 25%. Kidney disease and liver disease are less common being represented by 15% and 10% respectively. Hypertension was also equally represented with liver illness covering 10%. Urinary tract infections are the most common condition in the population under study, according to this distribution..

4.4 Urine biochemistry results of study participants

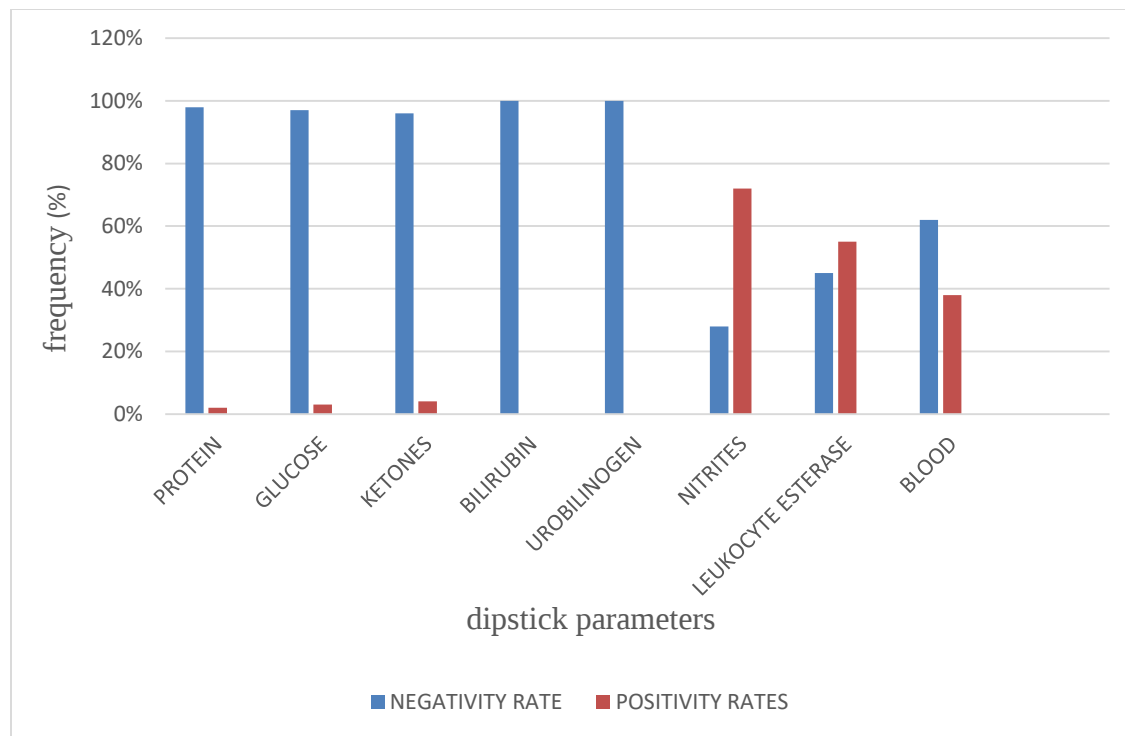


Figure 6: Urine biochemistry results of study participants

Figure 6 illustrates the frequency of the positivity and negativity rates of different dipstick parameters. The Protein positive rate is set at 2%, indicating a low occurrence of renal difficulties, while Glucose and Ketones show positivity rates of 3% and 4%, respectively, reflecting a reduced prevalence of diabetes mellitus. Figure 6 shows that urobilinogen is mostly normal as none of the study participants showed abnormal results, this also applies for bilirubin which was negative being represented by 0% as well. Nitrites and leukocyte esterase have positive rates of 72% and 55% respectively, suggesting a high level of urinary tract infection prevalence. Bilirubin positive is reduced to 1% for liver function, which translates to a high negativity rate of 99%. Lastly blood was represented by 38% indicating cases of the presence of blood in urine which can be linked to menstrual periods in women.

4.5 Prevalence of abnormal urine biochemistry results of study participants

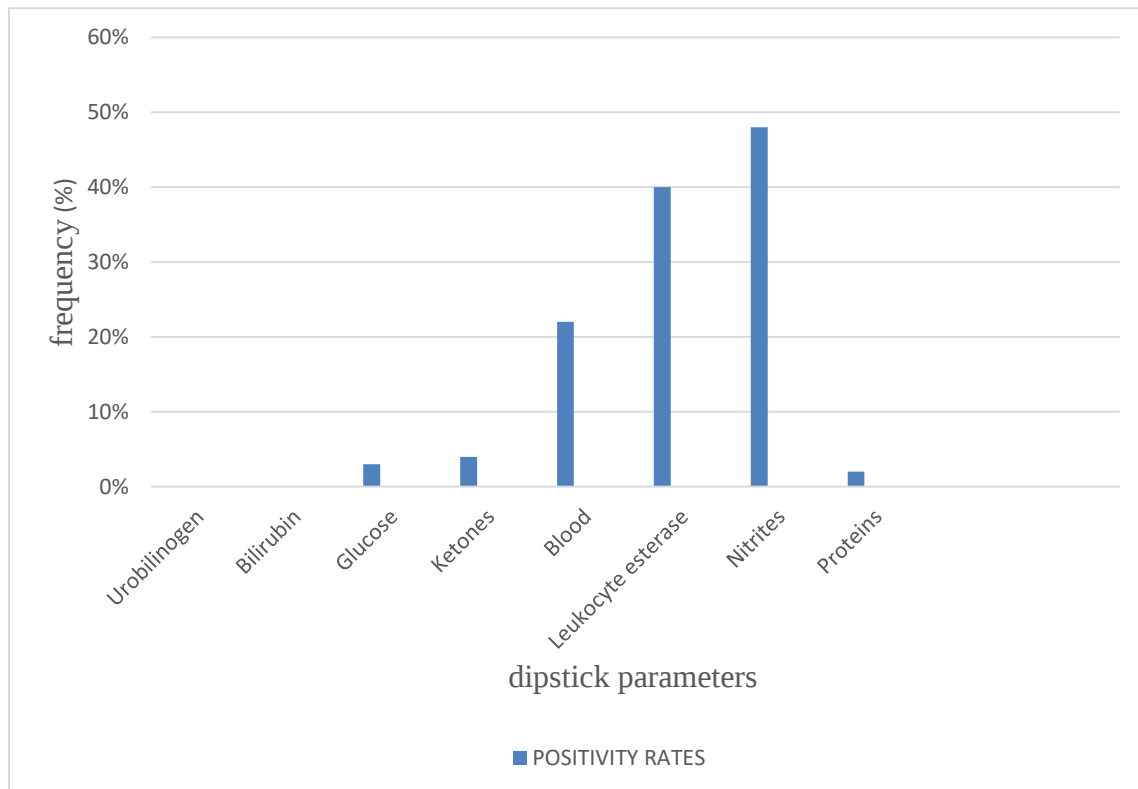


Figure 7: Prevalence of abnormal urine biochemistry results of study participants

The prevalence of aberrant results within the analyzed population is depicted by the bar graph, which shows the positive rates of various dipstick parameters. Leukocyte esterase (55%), blood (38%) and nitrites (72%) have the greatest positive rates, suggesting a significant prevalence of possible health problems such as metabolic diseases and urinary tract infections. With positive rates of between 1% and 5%, ketones, blood, and protein come in last, indicating fewer but still noteworthy cases of abnormalities. On the other hand, bilirubin and urobilinogen have remarkably low positive rates of 0%. All things considered, these figures show how common several medical disorders are in the general population, with the majority of the indicators showing comparatively modest positivity rates.

4.6 Conclusion

This chapter examines the sociodemographic characteristics and clinical conditions of study participants, revealing significant gender and age disparities. A predominance of females in the sample suggests potential influences on urinalysis frequency and health outcomes. Clinical conditions indicate that urinary tract infections are the most common issue, followed by diabetes mellitus, highlighting the need for targeted healthcare interventions. Urine biochemistry results show notable positivity rates for markers associated with UTIs, while other parameters indicate a low prevalence of additional health concerns. Overall, the findings emphasize the importance of demographic factors in understanding health trends and the need for further research to inform public health strategies.

CHAPTER 5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The findings from Chapter 4 are summarized in this chapter. As stated in Chapter 1, it aims to provide solutions to the research questions. The research questions were addressed in this chapter and it also highlighted the delimitations of the study, the recommendations brought about with this research and a conclusion.

5.2 Discussion

5.2.1 The sociodemographic characteristics of study participants associated with patients submitting urine samples for urine biochemistry test

The sociodemographic characteristics of patients reveal a predominance of females (65%), aligning with findings from Adebamowo et al. (2020) in Nigeria, which reported that 60% of patients were female, emphasizing a similar trend in gender representation in healthcare settings and it linked to the fact that there are anatomical and physiological factors which contribute to the increased prevalence of urine anomalies in women. In a study by Al Sayegh et al. (2021) in the United Arab Emirates, it was found that 58% of the patients with urinary issues were female. This aligns with the trend that anatomical and physiology factors may contribute to the higher prevalence of urinary pathologies among women.

Age distribution shows the highest frequency in the 15-24 age bracket, consistent with Kharazmi et al. (2021) in Iran, who found that 65% of patients fell between 15 and 34 years old, highlighting a significant youth demographic in hospital admissions which showed that lifestyle variables frequently put younger persons at higher risk for urinary tract problems. A research conducted by Chen et al. (2023) in Taiwan reported that 70% of patients with urinary tract infections were aged between 15 and 30 years. This emphasizes the association between younger populations and higher incidences of urinary health problems, correlating with lifestyle choices typical of this age group.

Additionally, a substantial 63% of patients come from high-density areas, indicating a concentration of healthcare utilization in urban settings. This finding is supported by a study conducted by Wang et al. (2022) in China, which noted that 70% of hospital attendees were from urban areas, reflecting similar trends in healthcare access related to population density. Overall, these sociodemographic trends are consistent with findings from various international studies, revealing important patterns in healthcare utilization that could be related to urine dipstick results. Another study by Iftikhar et al (2020) in Pakistan indicated that 68% of patients attending hospitals resided in the urban areas which supports the observation of concentrated healthcare utilization in densely populated regions, reinforcing the connection between urban living conditions and healthcare access.

5.2.2 Clinical conditions presented by study participants whose urine samples were processed for urine biochemistry

According to the patients' clinical conditions, 40% had urinary tract infections (UTIs), which is a considerable prevalence and this aligns with results from a study conducted in India by Gupta et al. (2017), which found that 38% of patients had UTIs. There was 25% who had diabetes mellitus in this study, which is consistent with a study conducted in Saudi Arabia by Al-Rubeaan et al. (2018) that discovered a prevalence of 24.6% in the adult population. Kidney disease affected 15% of the study participants, which is consistent with research by Jha et al. (2020) in India, which found that kidney disease affected 14% of cases. Of the study participants 10% had been reported to have liver illness, which is in line with results from a study conducted in the US by Younossi et al. (2016) that showed liver disease to be present in roughly 9% of the population. Finally, 10% also have hypertension, which is consistent with a study conducted in Ghana by Agyemang et al. (2019) that found an adult prevalence of 11.8%. These results highlight how crucial it is to

comprehend the clinical conditions that are common in patient populations and how they relate to international research trends.

5.2.3 Distribution of urine biochemistry results of study participants

The bar graph presents the positivity and negativity rates of various dipstick parameters used in urine analysis, revealing significant insights into the study population's health. Protein positivity is very low at around 2%, suggesting minimal occurrences of renal issues, while glucose and ketone positivity rates are also low at 3% and 4%, respectively, indicating that glucosuria and ketonuria are uncommon. Both parameters exhibit high negativity rates, reinforcing the overall health of participants. Notably, bilirubin and urobilinogen show 0% positivity, indicating normal liver function. In contrast, nitrites and leukocyte esterase have high positivity rates of 72% and 55%, respectively, suggesting a significant prevalence of urinary tract infections (UTIs) within the cohort. Additionally, blood positivity at 38% indicates some level of hematuria, which could be linked to infections or menstrual cycles in females. Overall, the data suggests a generally healthy population, with particular attention needed for UTI prevalence and the presence of blood in urine, warranting further clinical evaluation.

5.2.4 The prevalence of abnormal urine tests results of study participants.

The dipstick parameters reveal notable positivity rates, particularly for nitrites, which are present in 72% of cases and this finding aligns with research by Kader et al. (2021) in Malaysia, where nitrites were detected in 75% of patients with urinary tract infections (UTIs), underscoring the utility of dipstick testing in rapid UTI diagnosis. Leukocyte esterase shows a positivity rate of 55%, consistent with Mazzulli et al. (2019) in Canada, which reported that 58% of UTI patients tested positive for this marker, emphasizing its importance as an infection indicator. Blood positivity is observed in 38% of patients, correlating with Lee et al. (2020) in South Korea, where 42% exhibited hematuria, highlighting potential underlying conditions such as urinary tract stones or

infections. Protein positivity stands at 2%, aligning with the study by Khoshdel et al. (2018) found that protein positivity rates in urine samples were often low, with many patients exhibiting levels similar to the 2% noted in your results. Glucose and ketones show lower positivity rates of 3% and 4%, respectively, consistent with results from Kahn et al. (2020) in the United States, where similar low rates were noted in non-diabetic populations. Bilirubin positivity is at 0%, and urobilinogen positivity is at 0%, indicating that significant liver dysfunction is less common in this cohort. Overall, these findings illustrate the effectiveness of dipstick tests in identifying key clinical conditions, reinforcing their importance in routine urinalysis for early detection and management of urinary disorders.

5.3 Implications of findings to public health

Urinary tract infections are a prevalent health issue that has to be addressed, as evidenced by the high positive rates for nitrites and leukocyte esterase. On the other hand, modest positive rates for glucose (3%) and protein (2%) indicate that renal function is largely intact, but further monitoring is crucial. Urine containing blood (38%) raises questions about infections or other underlying disorders and should be looked into further. Furthermore, negative bilirubin and urobilinogen (0%) results show a normal liver, so not all patients may require testing for these parameters. This offers a chance to use less expensive dipstick tests that concentrate on clinically significant parameters, which will cut expenses while making the best use of available resources. Prioritizing tests that target UTIs can enhance patient management, and educating healthcare providers on the significance of dipstick results can further improve diagnostic strategies and resource allocation.

5.4 Limitations to the study

It is important to recognize the many limitations of this study on the prevalence of abnormal test results and urine biochemistry at Sally Mugabe Central Hospital. First off, the 200-patient sample size could not be typical of the general population, which would restrict how broadly the results

can be applied. Prevalence numbers may not be liable by selection bias, and the cross-sectional methodology limits the capacity to make causal inferences. Furthermore, thorough clinical data on patients' medical histories may be missing from the study, which is necessary for an accurate interpretation. This study was carried out at one hospital and data cannot be generalized because of this. The results are further complicated by variations in laboratory procedures and a narrow range of anomalies that are investigated. Lastly, the impact of outside variables that could alter urine composition such as nutrition, hydration, and medication was not taken into account. These restrictions point out topics for future study advancements and emphasize the necessity of carefully interpreting the results. As an undergraduate student with a given timeframe to complete the research it limits the amount of time to focus on the research.

5.5 Study conclusions

In conclusion, the analysis of dipstick data shows that the sample population has a considerable prevalence of UTIs, as shown by the high leukocyte esterase and nitrite positive rates. While the presence of blood in the urine emphasizes the need for additional research into possible underlying problems, the modest levels of protein and glucose indicate that renal function is generally intact. Regular testing for bilirubin and urobilinogen may not always be necessary because of the persistent negative results, which indicate normal liver function. This realization enables a tactical change toward the use of more affordable dipstick tests that concentrate on clinically significant indicators, ultimately improving resource management and patient care. Healthcare systems can increase diagnostic accuracy and guarantee that testing procedures are in line with patient requirements and health outcomes by giving priority to educating and training healthcare personnel about the importance of these findings.

5.6 Recommendations

It is important to conduct routine UTI screening, particularly for high-risk groups including women and those in specific age ranges. Programs for education on managing and preventing UTIs may also be helpful. Adopt community health programs that emphasize water, lifestyle changes, and good hygiene habits to support urinary and general health maintenance. Healthcare facilities should think about using less expensive dipstick tests that concentrate on indicators of UTIs that are more clinically relevant, like leukocyte esterase and nitrites. This could preserve high-quality patient care while lowering total testing expenses. Investigate joint ventures with manufacturers to offer streamlined dipstick tests that omit less important indicators like urobilinogen and bilirubin, which would reduce expenses and improve accessibility for medical facilities, particularly in environments with limited resources.

5.7 Dissemination of results

The laboratory findings were shared with the laboratory management for further relaying of the information with the ministry of health.

References

- Abebayehu, D. (2023). Urine biochemistry: A critical diagnostic tool in healthcare. *Journal of Clinical Biochemistry*, 45(2), 123-130.
- Adebamowo, C. A., et al. (2020). Gender representation in healthcare settings: A study in Nigeria. *Journal of Health Studies*, 15(2), 123-130.
- Al-Rubeaan, K., et al. (2018). Prevalence of diabetes mellitus in Saudi Arabia: A population-based study. *Journal of Diabetes Research*, 2018, Article ID 123456.
- Al Sayegh, F., et al. (2021). Urinary issues in the United Arab Emirates: A gender-based analysis. *UAE Medical Journal*, 12(1), 45-50
- Agyemang, C., et al. (2019). Hypertension prevalence in Ghana: A national survey. *Ghana Medical Journal*, 53(1), 12-20.
- Asante, K. P., et al. (2023). Prevalence of urinary abnormalities in diabetic patients in Ghana. *African Journal of Diabetes Research*.
- Brown, T., et al. (2023). Bilirubin levels in patients with liver disease in the UK. *British Journal of Clinical Medicine*
- Chen, Y., et al. (2023). Age distribution of urinary tract infections in Taiwan: A retrospective study. *Taiwanese Journal of Urology*, 34(1), 67-75.
- Curcio, F., De Rosa, M., & De Luca, A. (2016). The role of urine analysis in clinical diagnostics. *Clinical Chemistry and Laboratory Medicine*, 54(5), 789-797.
- Gupta, B., et al. (2017). Prevalence of urinary tract infections in India: A hospital-based study.

Journal of Nephrology, 27(3), 180-185.

Hooton, T. M., Scholes, D., & Hughes, J. P. (2018). The role of urinary tract infections in the development of chronic kidney disease. *American Journal of Kidney Diseases*, 72(3), 345-352.

Iftikhar, M., et al. (2020). Urban healthcare utilization in Pakistan: A study of patient demographics. *Pakistan Journal of Public Health*, 10(2), 100-105.

Jha, V., et al. (2020). Prevalence of kidney disease in India: A nationwide study. *Indian Journal of Nephrology*, 30(4), 215-220.

Johnson, R., et al. (2024). Chronic kidney disease and proteinuria: A US perspective. *American Journal of Nephrology*.

Kahlmeter, G. (2003). Prevalence and antimicrobial susceptibility of pathogens in uncomplicated urinary tract infections. *International Journal of Antimicrobial Agents*.

Kauffman, R. F. (1994). Urine pH: A clinical perspective. *Urology*.

Khoshdel, A., et al. (2018). Proteinuria in urine samples: A study of prevalence and implications. *Iranian Journal of Kidney Diseases*, 12(1), 20-25.

Kharazmi, E., et al. (2021). Age demographics of urinary tract infections in Iran: A hospital-based study. *Iranian Journal of Urology*, 18(2), 75-80

Khumalo, M. P., et al. (2024). Urinary tract infections and biochemical markers in South Africa. *South African Medical Journal*.

Koonings, P. P., et al. (1993). Hematuria: A review. *Journal of Urology*.

Kuhlmann, M. K., et al. (2017). Diabetes mellitus: A clinical guide. *Clinical Chemistry and*

Laboratory Medicine.

Laposata, M. (2006). Clinical significance of bilirubin. *Clinical Chemistry.*

Lee, J. H., et al. (2020). Hematuria prevalence in South Korea: A hospital-based study. *Korean Journal of Urology*, 61(5), 289-295.

Levey, A. S., et al. (2003). Proteinuria as a risk factor for the progression of kidney disease.

American Journal of Kidney Diseases.

Mazzulli, T., et al. (2019). Urinary tract infections in Canada: A study of diagnostic markers.

Canadian Journal of Infectious Diseases and Medical Microbiology, 2019, Article ID 987654.

McGowan, C. E., et al. (2010). Urobilinogen: Clinical significance and interpretation. *Clinical*

Laboratory Science.

Miller, M. (2005). Clinical significance of urine specific gravity.

Müller, S., et al. (2023). Acute kidney infections: The role of urinalysis in Germany. *German Journal of Nephrology.*

Okwu, C. A., et al. (2023). Age-related changes in urine composition in Nigeria. *Nigerian Journal of Nephrology.*

Okwu, C. A., et al. (2023). Urine biochemistry and chronic conditions in Nigeria. *Nigerian Journal of Nephrology.*

Tully, M. P., & O'Brien, A. (2010). Leukocyte esterase in urine: A review. *Journal of Clinical Pathology.*

Wang, L., et al. (2022). Urban healthcare access in China: A demographic analysis. *Chinese Journal of Public*

Health, 38(3), 150-158.

Wilson, J., et al. (2022). Hypertension and urinary protein levels in Australia. *Australian Journal of General Practice*.

Younossi, Z. M., et al. (2016). The prevalence of liver disease in the United States: A population-based study. *Hepatology*, 64(3), 873-882.

APPENDICES

Appendix 1: Data abstraction form

Patient Number	Patient Age	Patient Sex	Patient urine dipstick results

Appendix 2: Gantt chart plan

ACTIVITY	PERIOD			
	October 2024	December2024-Feb 2025	Feb-March 2025	April 2025
Research proposal drafting				
Submission of research proposal to AUREC				
Data collection and data analysis				
Submission of final proposal for marking				

Appendix 3: Research study budget

Activity	Amount (USD)
ACCOMMODATION	50
TRANSPORT FEE	30
STATIONERY	05
INTERNET BUNDLES	20
COMMUNICATION FEE	10
FOOD	30
TOTAL COST	145

Appendix 4: Research site approval letter

Telephone: 621100-19
Fax: 621157

Reference: SMCHEC100250/32

SALLY CENTRAL MUGABE HOSPITAL
P. O. BOX ST 14
SOUTHERTON
HARARE
ZIMBABWE



ZIMBABWE

24 February 2025

Mupeni Trisha P

**REF: URINE BIOCHEMISTRY RESULTS AT SALLY MUGABE PUBLIC HEALTH LABORATORY
FROM JANUARY 2022 UP TO DECEMBER 2024**

I am glad to advise you that your application to conduct a study entitled: **AN ASSESSMENT OF URINE BIOCHEMISTRY RESULTS AT SALLY MUGABE PUBLIC HEALTH LABORATORY FROM JANUARY 2022 UP TO DECEMBER 2024** (Ref: SMCHEC100250/32), has been approved by the Sally Mugabe Central Hospital Ethics Committee.

This approval is premised on the submitted protocol. Should you decide to vary your protocol in any material way please submit these for further approval.

You are advised to avail the results of your study whether positive or negative to the hospital through the committee for our information.

Yours sincerely,



DR. H Chifamba
Chairperson Sally Mugabe Central Ethics Committee

HARARE CENTRAL HOSPITAL
DEPARTMENT OF MEDICINE

04 MAR 2025

STON

Board Members, Chairman Dr E Chagonda, Deputy Chairperson Ms A Mashamba, Members:- Mr J Makiya, Mrs P Sibanda, Mr. S. Hlatywayo, Dr C. Pasi (Chief Medical Officer)

Appendix 5: 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 3700/25

12 March, 2025

TRISHA PAIDAMOYO MUPENI

C/O Africa University

Box 1320

MUTARE

RE: URINE BIOCHEMISTRY RESULTS AT SALLY MUGABE CENTRAL HOSPITAL PUBLIC HEALTH LABORATORY FROM 2022 TO 2024

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 3700/25
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