# CHAPTER ONE

# INTRODUCTION

## 1.1 Background to the Study

Water is a fundamental resource for life, indispensable for human health, societal development, and environmental sustainability. Its role in maintaining public health cannot be overemphasized, as clean and safe water is essential for drinking, cooking, sanitation, and other daily activities. However, access to safe drinking water remains a pressing challenge in many developing countries, including Nigeria. Contaminated water has been identified as one of the primary causes of waterborne diseases, which account for a significant proportion of global morbidity and mortality, particularly in resource-limited settings. The World Health Organization (WHO) estimates that unsafe water, poor sanitation, and inadequate hygiene are responsible for nearly 80% of illnesses and more than half of global child mortality (WHO, 2019).

In Nigeria, the demand for potable water has risen sharply due to population growth, urbanization, and the inadequacy of public water supply systems. In response to this demand, sachet water, commonly referred to as “pure water,” has become one of the most widely consumed sources of drinking water. This packaged water, sold in small, sealed plastic sachets, is regarded as an affordable and convenient alternative to other water sources, particularly for low- and middle-income households. Despite its popularity, concerns about the quality and safety of sachet water persist, as studies have shown varying degrees of bacterial contamination across different brands. Improper production processes, poor handling, inadequate sanitation during packaging, and insufficient regulatory enforcement have been implicated in the contamination of sachet water, posing significant public health risks (Saheed *et al*., 2021).

The microbiological quality of drinking water is a critical determinant of its safety. The presence of pathogenic microorganisms such as *Escherichia coli*, *Salmonella*, *Vibrio cholerae*, and *Shigella* in water can lead to outbreaks of diarrheal diseases, typhoid fever, and cholera, which are among the leading causes of preventable death in developing countries. In Nigeria, over 90 million people lack access to safe drinking water, and an estimated 130,000 children

under the age of five die annually due to waterborne diseases (Majid, 2018). These infections often occur as a result of consuming untreated or improperly treated water, which may harbor bacteria, viruses, protozoa, and other harmful microorganisms.

Ilorin is the capital city of Kwara State and it is a rapidly growing city with a diverse population and an increasing reliance on sachet water. While sachet water has filled a critical gap in the provision of drinking water, reports of contamination have raised serious public health concerns. Studies in similar settings have shown that the bacteriological quality of sachet water often falls below acceptable standards, with some samples testing positive for coliforms and other indicator organisms (Gana *et al*., 2021; Okeola *et al*., 2021). This indicates fecal contamination, which is commonly attributed to unhygienic production environments, the use of unclean water sources, and improper storage or transportation of the packaged water (Armstrong and Johnson, 2018). Comprehensive antibacterial analysis of sachet water is therefore essential for identifying potential health risks and ensuring that the water consumed by the public meets regulatory standards. Standard microbiological techniques, such as the multiple-tube fermentation method, membrane filtration, and molecular diagnostic tools, are widely used to detect and quantify pathogenic bacteria in water samples. These methods provide valuable insights into the safety and quality of drinking water and guide necessary interventions to protect public health (Liu *et al*., 2019).

In addition to health implications, unsafe drinking water has broader societal consequences. Recurrent waterborne diseases contribute to malnutrition, reduced productivity, and increased healthcare costs. Vulnerable populations, such as children, the elderly, and individuals with weakened immune systems, are particularly at risk of developing severe complications from waterborne pathogens like *Pseudomonas*, *Cryptosporidium*, and *Klebsiella*. These microorganisms, often found in contaminated drinking water, can lead to life-threatening infections and exacerbate existing health conditions (UNICEF, 2019) hence the research on some selected sachet water produced in Ilorin metropolitan.

## 1.2 Statement of Problem

The rise in urbanization and the increasing reliance on sachet water as a primary source of drinking water have raised serious concerns about its microbiological and chemical quality. Sachet water, though marketed as a safe and affordable alternative to untreated water sources, is often produced under conditions that lack adequate quality control measures. Studies have shown that many sachet water brands fail to meet the microbiological standards set by regulatory bodies, with contamination frequently attributed to poor hygiene during production, improper sealing, and the use of polluted water sources (Saheed *et al*., 2021).

In Ilorin, Kwara State, sachet water consumption has become ubiquitous due to limited access to reliable municipal water supplies. However, anecdotal reports and preliminary studies suggest that some brands of sachet water harbor pathogenic microorganisms, such as *Escherichia coli* and other coliform bacteria, which are indicators of fecal contamination (Aiyedun *et al*., 2022). This contamination poses serious public health risks, including outbreaks of diarrhea, typhoid fever, cholera, and other waterborne diseases. Vulnerable populations, such as children under five, pregnant women, and immunocompromised individuals, are disproportionately affected by these illnesses, leading to increased morbidity and mortality rates (Okeola *et al*., 2021). Despite these concerns, regular monitoring of sachet water quality in Ilorin is limited, and comprehensive data on its microbiological safety remain scarce.

## 1.3 Justification of study

This study therefore seeks to address the pressing issue of waterborne diseases by analyzing the antibacterial properties of sachet water produced in Ilorin. The findings will provide essential information and awareness into contamination levels, identify compliance gaps with national and international water quality standards, and propose actionable recommendations for improving water safety.

## 1.4 Aims and Objectives of Study

### Aim

The main aim of this study is to evaluate the microbial quality of selected sachet water produced in Ilorin, Kwara State through microbiological analysis.

**Specific Objectives**

The specific objectives of this study are to;

1. determine physiochemical analysis of the water samples

2. isolate and identify bacterial organisms present in the sachet water samples

3. isolate and identify fungal organisms present in the sachet water samples