EVALUATION OF MEDICATION ADHERENCE AMONG PHARMACY STUDENTS IN THE UNIVERSITY OF BENIN MANAGING PEPTIC ULCER DISEASE

BY

OKAFOR LEO GREAT

MAT NUMBER: PHA1908565

DEPARTMENT OF CLINICAL PHARMACY AND PHARMACY PRACTICE, FACULTY OF PHARMACY, UNIVERSITY OF BENIN, BENIN CITY, EDO STATE

OCTOBER 2025

Evaluation of medication adherence among pharmacy students in the University of Benin managing peptic Ulcer Disease

By

Okafor Leo Great

Mat Number: PHA1908565

A project submitted to the Department of Clinical Pharmacy and Pharmacy Practice in partial fulfillment of the requirements for the award of a Doctor of Pharmacy (PHARM.D) degree of the University of Benin, Nigeria.

October 2025

CERTIFICATION

We the undersigned hereby agree that this work was carried out by **Okafor Leo Great** with matriculation number **PHA1908565**, in the Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, University of Benin, Benin City, In partial fulfilment of the requirement for the award of Doctor of Pharmacy (Pharm.D) degree.

_____ _____

OKAFOR LEO GREAT DATE

(PROJECT STUDENT)

_____ _____

PROF. PENAERE T. OSAHON DATE
(PROJECT SUPERVISOR)

_____ _____

DR. M. I. OSARENMWINDA DATE

(HEAD OF DEPARTMENT)

DEDICATION

I dedicate this work to GOD ALMIGHTY for always seeing me through; my lovely parents, Mr and Late Mrs Jude Okafor whose immense prayers and massive support have been unwavering the past years of my academic sojourn and to every pharmacy student who made this research possible.

ACKNOWLEDGEMENT

I begin by expressing my profound gratitude to the Almighty God for the precious gift of life and for His endless mercy, love, and compassion that have sustained me every step of the way.

I extend my sincere appreciation to my project supervisor, Prof Penaere T. Osahon, for her invaluable guidance, encouragement, and patience throughout this project. Her dedication, passion, and insightful feedback have been instrumental in shaping this work, pushing me to strive for excellence. Her unwavering support and mentorship have not only enriched my academic journey but have also inspired me to pursue my aspirations with confidence. Thank you Ma, for being an exceptional supervisor and a source of inspiration.

I want to extend my heartfelt appreciation to my parents, Mr. and late Mrs. Jude Okafor. Their unwavering love, support, prayers and encouragement have been the foundation of my strength and determination. Their sacrifices and belief in my abilities have inspired me to pursue my dreams with confidence and resilience. Thank you, Mom and Dad, for being my pillars of support and guiding lights throughout this journey.

To my siblings, Okafor Laura and Okafor Laureate, your love, kindness, and joy have been a source of inspiration and strength throughout my journey. I am grateful for your unwavering support and encouragement.

To my Uncles, Pastor Austin Okafor, Mr Isaac Ibhade, Mr Philip Ibhade, Mr Ikenna Okafor, Mr Andrew Ibhade, Mr Christopher Okafor, and Miss Faith Ibhade thank you for your unwavering support throughout this journey and I express my gratitude wholeheartedly.

I also extend my appreciation to my project colleagues [Prosper, Samuel, Blessing} and to the G7 [Jeff, Isaac, Veejhay, Olabisi, Endurance, Ezeokeke, Orizu, Iteoluwa, Prosper]. To my Friends also, Ojubeli, Ikechukwu, Mart CC, Fortune, Siri, Dako, Godswill, Bamidele, Omiragwa, Beverly, Rachael, Jumoke, Mildred, Thiocyanide, Martha, Alhaji Usman, Esosa, Bizzle, Eze, Ehinomen, Okotie, Habby, Class Rep and Assistant and the Entire Pharmacitamol class for their support and assistance throughout this endeavour. Your encouragement and guidance have been invaluable, and I am deeply grateful.

I would like to extend a special appreciation to a special colleague Miss Christabel Oboh Onome Adagbada, Ibhafidon Elijah and Oladeji Abiodun for consistently being available to lend a helping hand and provide guidance whenever I needed assistance with any aspect of my project.

To all those who have supported and believed in me, I offer my heartfelt thanks. Your contributions have been instrumental in my journey, and I am truly blessed to have you in my life.

Table Of Contents

List Of Tables

Abstract

Medication adherence remains a critical determinant of therapeutic success, particularly in the management of chronic or recurrent conditions such as peptic ulcer disease (PUD). This study assessed the level of adherence to prescribed ulcer medications among pharmacy students at the University of Benin, identified key factors influencing adherence, and examined facilitators that promote consistent medication use. A descriptive cross-sectional design was employed, involving 300 purposively selected respondents. Data were collected using a structured, self-administered questionnaire and analysed with the Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics, including frequencies and percentages, were utilized to summarize participants' characteristics, while Chi-square tests were used to examine associations between adherence levels and influencing variables at a 5% significance level. Findings revealed that 24.7% of respondents demonstrated high medication adherence, 40.2% showed moderate adherence, and 35.1% exhibited low adherence. The major barriers identified included inadequate knowledge (53.1%), forgetfulness (42.8%), financial constraints (48.0%), and academic stress (48.0%). Significant determinants of adherence were gender ($p = 0.038$), forgetfulness ($p = 0.005$), medication cost ($p = 0.030$), inadequate knowledge ($p < 0.001$), limited healthcare access ($p = 0.002$), and academic stress ($p < 0.001$). Conversely, access to free or subsidized medications ($p = 0.028$) and counselling ($p = 0.030$) positively influenced adherence levels. In summary, the findings emphasize the need for multifaceted interventions, incorporating education, financial support, and counselling to improve medication adherence and optimize therapeutic outcomes among students managing peptic ulcers.

Chapter One

INTRODUCTION

1.1 Introduction

Medication adherence refers to the degree to which a patient correctly follows medical advice, particularly in terms of taking prescribed Medications as directed by a healthcare provider. This includes timing, dosage, frequency, and duration of use. The World Health Organization (WHO, 2020) emphasizes that improving medication adherence would have a more significant impact on population health than any specific medical treatment. Adherence is especially vital for managing chronic and long-term conditions, where medication must be taken consistently even in the absence of symptoms to prevent disease progression, recurrence, or complications. Non-adherence can take many forms: missing doses, stopping medication prematurely, altering dosages without medical guidance, or failing to refill prescriptions. It poses serious risks to individual health and places a burden on healthcare systems due to increased hospitalizations, higher healthcare costs, prolonged illness, and avoidable mortality.

Globally, medication adherence among patients with chronic diseases averages around 50% (Kardas et al., 2013), which is alarmingly low considering the stakes involved. Among younger populations, particularly university students and adolescents, adherence rates are often even lower. The reasons are multifaceted, ranging from psychosocial factors and cognitive maturity to environmental and systemic barriers.

A meta-analysis by Brown and Bussell (2015) found that university students are particularly vulnerable to medication lapses due to the transient and disruptive nature of college life. Factors such as erratic schedules, academic pressure, unfamiliarity with health systems, low perceived susceptibility to illness, and reduced supervision from caregivers contribute to poor medication management.

Adherence is a multidimensional behavior influenced by five key domains, as defined by WHO (2020):

- Social and economic factors
- Healthcare system factors
- Condition-related factors
- Therapy-related factors
- Patient-related factors

Among these, patient-related and social/environmental factors are especially dominant in young adults and student populations.

PEPTIC ULCER DISEASE(PUD]

Peptic ulcer disease is a condition marked by an open sore or rupture in the lining of the stomach or the first part of the small intestine, known as the duodenum. Historically, the presence of hydrochloric acid in the stomach was considered the central cause of this disorder, as it can erode the mucosal barrier and lead to tissue damage [Smith J, Lee P, Richards L. Peptic ulcer disease: Pathophysiology and management. J Clin Gastroenterol.

2023;45(2):158-164]. When medical professionals refer to an "ulcer," they are most often referring to a peptic ulcer, which typically falls into one of two main categories: gastric ulcers, which occur in the stomach, and duodenal ulcers, which occur in the duodenum.

Peptic ulcer remains one of the most common conditions affecting the stomach and duodenum, and it is frequently associated with Helicobacter pylori (H. pylori) infection or the prolonged use of non-steroidal anti-inflammatory drugs (NSAIDs). These medications, often prescribed for pain relief, can compromise the integrity of the stomach's protective lining. In the treatment of chronic pain, opioids also present a challenge due to their addictive potential and numerous side effects, making them less ideal for long-term use [Smith M, Patel R. Opioids in chronic pain management: Risks and alternatives. J Pain Manag. 2021;29(7):310-317].

Furthermore, the continued use of drugs like aspirin, NSAIDs, and other antiplatelet or anticoagulant medications in managing chronic conditions has led to an increase in drug-induced gastrointestinal complications. This has posed a significant challenge for primary care physicians, who often encounter gastrointestinal side effects in their patients as a result of these medications.

Despite advances in therapy, the incidence of complicated forms of peptic ulcer disease has reduced the overall effectiveness of medical treatment. Peptic ulcers are part of a broader group of acid-related disorders characterized by a breakdown in the protective mucosal barrier of the esophagus, stomach, or duodenum. The disease arises from an imbalance between aggressive factors, such as gastric acid and pepsin, and the protective

mechanisms of the gastrointestinal lining [Nash M, Roberts J. The role of gastric acid and pepsin in peptic ulcer disease. J Clin Pathol. 2023;76(6):221-225.]

Peptic ulcer disease continues to contribute significantly to global mortality rates. In many regions, including hospitals such as Sikasso Hospital in Mali, clinicians frequently encounter a wide array of ulcer-related symptoms and endoscopic findings. These cases highlight ongoing public health challenges, particularly those arising from unregulated medication sales and self-medication practices, both of which contribute to improper use of ulcerogenic drugs and delay effective treatment.

BACKGROUND OF STUDY

Peptic ulcer disease (PUD), which is characterized by mucosal erosions in the stomach or duodenum, is increasingly prevalent among students due to poor dietary practices, chronic stress, irregular meals, use of non-steroidal anti-inflammatory drugs (NSAIDs), alcohol intake, and smoking (Adewale A, 2022). Helicobacter pylori infection, one of the primary causes of PUD, often requires a prolonged course of antibiotics and acid suppressants for eradication. Unfortunately, many students stop medications prematurely due to side effects, financial limitations, or a false sense of recovery, increasing the risk of relapse and complications such as bleeding (Okonkwo CE, 2022; Ugwueze CV, 2023).

Globally, PUD has been reported to affect up to 10% of the population during their lifetime, with higher rates in developing countries where H. pylori infection is widespread [Jones L, Green M, Patel S. Peptic ulcer disease in the 21st century: The role of H. pylori and NSAIDs. JAMA Review. 2024; 312(2):100-108.]

In Nigeria, the condition is commonly seen among young adults, especially undergraduates, who are at heightened risk because of poor nutritional practices, high stress levels, and limited access to quality healthcare services (Oniso et al., 2020; Aleru, 2025). Within academic environments, it is often described as a “student’s disease” because of the strong association with irregular lifestyles, missed meals, and reliance on over-the-counter medications (Anaemene & Ochogu, 2022). Male students tend to be disproportionately affected due to higher rates of alcohol consumption, smoking, and use of NSAIDs.

Complications such as gastrointestinal bleeding, perforation, and gastric outlet obstruction have been reported among students when treatment is not adequately followed. These severe outcomes not only endanger health but also disrupt academic performance through absenteeism, hospital visits, and financial strain associated with repeated treatment cycles.

Medication adherence is defined as the extent to which a person’s behavior aligns with medical advice is essential to achieving positive treatment outcomes (Brown MT, 2023). However, adherence is influenced by various factors including regimen complexity, drug side effects, cost, patient beliefs, psychological distress, and forgetfulness (Ojo OE, 2022; Ekanem EO, 2023). For students, additional barriers include academic workload, unstructured routines, poor health-seeking behavior, misinformation about illness or medications, and financial challenges (Ajayi IA, 2022). Poor adherence contributes to recurrence of PUD, increases the risk of severe complications, and promotes antimicrobial resistance when eradication regimens are not completed.

At the University of Benin, as in many Nigerian tertiary institutions, healthcare delivery challenges such as limited resources, long waiting times, and lack of student-centered follow-up systems further complicate adherence. Many students rely on temporary relief with antacids or herbal mixtures, delaying formal treatment. Consequently, the persistence of PUD among students remains both a clinical and public health concern requiring focused research and interventions.

Peptic ulcer disease, characterized by mucosal erosions in the stomach or duodenum, is increasingly prevalent among students due to poor dietary practices, chronic stress, irregular meals, use of non-steroidal anti-inflammatory drugs (NSAIDs), alcohol intake, and smoking (Adewale A, 2022). Helicobacter pylori infection, one of the primary causes of PUD, often requires a prolonged course of antibiotics and acid suppressants for eradication. Unfortunately, many students stop medications prematurely due to side effects, financial limitations, or a false sense of recovery, increasing the risk of relapse and complications such as bleeding (Okonkwo CE, 2022; Ugwueze CV, 2023).

Medication adherence defined as the extent to which a person's behavior aligns with medical advice is essential to achieving positive treatment outcomes (Brown MT, 2023). However, adherence is influenced by various factors including regimen complexity, drug side effects, cost, patient beliefs, psychological distress, and forgetfulness (Ojo OE, 2022; Ekanem EO, 2023). In university students, adherence is further complicated by academic workload, erratic routines, misinformation about illness or medications, and poor access to healthcare services (Ajayi IA, 2022).

CHARACTERISTICS OF PEPTIC ULCER DISEASE

1. Peptic ulcer disease (PUD) is a condition characterized by a breach or ulceration in the mucosal lining of the stomach or duodenum, which extends into the underlying submucosal layer. This injury typically arises from an imbalance between the aggressive factors that normally aid digestion, such as gastric acid and pepsin, and the protective mechanisms of the gastrointestinal (GI) mucosa [Smith J, Lee P, Thompson R. Recent advances in peptic ulcer disease. Lancet. 2024; 394(10209): 1234-1245]. Under normal conditions, the mucosal lining is equipped with defences to neutralize stomach acid and prevent damage to the tissue. However, when these protective mechanisms fail or are overwhelmed, ulcers can develop.

The most common sites for peptic ulcers are those parts of the stomach and duodenum that are exposed to high concentrations of acid. In particular, the proximal duodenum and the stomach are most vulnerable, as they are directly involved in the secretion and breakdown of gastric acid and pepsin during digestion (Smith et al., 2024). These ulcers are often exacerbated by factors like Helicobacter pylori infection, which further weakens the mucosal defences, and the use of non-steroidal anti-inflammatory drugs (NSAIDs), which can inhibit the production of protective prostaglandins [Jones M, Green H, Patel R. Helicobacter pylori and its role in peptic ulcer pathogenesis. J Gastroenterol Hepatol. 2023; 38(2): 1120-1127].

The imbalance between these aggressive and protective factors creates an environment in which the mucosal tissue is exposed to direct damage. When this damage is not

adequately repaired, it leads to the formation of ulcers, which can cause a variety of symptoms ranging from mild discomfort to severe complications like bleeding or perforation [Brown T, Williams K, Clark S. NSAIDs and peptic ulcer complications: A review. Am J Gastroenterol. 2022; 37(4): 278-284]. Proper treatment and management of peptic ulcer disease are crucial to prevent these complications and restore the balance between the stomach's digestive functions and its protective mechanisms.

TYPES OF PEPTIC ULCER DISEASE

Gastric and Duodenal Ulcers:

These are the two predominant forms of PUD. Gastric ulcers occur in the lining of the stomach, while duodenal ulcers form in the initial segment of the small intestine—areas most vulnerable to acid and pepsin (Vakil M. Peptic ulcer disease. JAMA. 2024;332(12):124-169)

Gastric Ulcers:

Although most gastric ulcers are confined to the stomach, lesions may occasionally extend into surrounding regions such as the lower esophagus or proximal duodenum. Major risk factors include Helicobacter pylori infection, NSAID usage, and lifestyle contributors like alcohol and smoking (Vakil M. Peptic ulcer disease. JAMA. 2024;332(12):12-169)

Duodenal Ulcers:

A subtype of PUD often associated with H. pylori, duodenal ulcers have also been linked to specific virulence factors like DupA. Although dyspepsia is a common co-presenting

symptom, ulcers may form even without it (Tresca AJ. [Very well Health 2025]. Available from: [https://www.verywellhealth.com/nsaids-and-peptic-ulcers-1941723]

Oesophageal Ulcers:

Less common than gastric or duodenal types, oesophageal ulcers result from chronic acid exposure, often in the setting of GastroEsophageal Reflux Disease (GERD). Most patients with oesophageal ulcers also exhibit hiatal hernias, and long-term NSAID use or smoking are notable risk factors [Ankush M. Lonkar, Rohan G. Ajabe, Vaibhav G. Akhand, Vinayak A. Katekar, Nandkishor B. Deshmukh, and Swati P. Deshmukh, Peptic ulcer published in GSC Advanced Research 2025].

SIGNS AND SYMPTOMS OF PEPTIC ULCER DISEASE

Peptic ulcer disease (PUD) often presents with a range of symptoms, the most common being a burning or gnawing pain in the upper abdomen, which tends to be related to meal timing. This discomfort is frequently accompanied by bloating, heartburn, nausea, vomiting, belching, and a feeling of fullness after eating (early satiety). The pain associated with PUD can vary depending on whether the ulcer is located in the stomach (gastric ulcer) or the duodenum. For those with gastric ulcers, the pain is often worsened by eating, leading to a reduced appetite and subsequent weight loss. In contrast, individuals with duodenal ulcers may find that eating temporarily relieves the pain, which can sometimes result in weight gain due to increased food intake to alleviate symptoms [Vakil M. Peptic ulcer disease. JAMA. 2024; 332(12): 12-169].

While these symptoms can be bothersome, they are usually manageable with treatment. However, in some cases, PUD can lead to more severe complications if left untreated.

These include hematemesis, which is the vomiting of blood, and melena, which refers to the passage of dark, tarry stools due to the presence of digested blood. Other serious complications include perforation, where the ulcer creates a hole in the wall of the stomach or duodenum, and gastric outlet obstruction, which occurs when the ulcer blocks the normal flow of food from the stomach into the small intestine, leading to vomiting and inability to properly digest food [Vakil M. Peptic ulcer disease. JAMA. 2024; 332(12): 12-169]. These complications can be life-threatening and require immediate medical intervention to prevent further damage.

PATHOPHYSIOLOGY OF PEPTIC ULCER DISEASE

Peptic ulcer disease arises from the interplay between physiological and pathological factors:

1. Acid–Pepsin Imbalance:

Peptic ulcer disease has been historically linked to an imbalance between gastric acid, pepsin, and mucosal defense. Excess acid and pepsin overwhelm the mucosal protective mechanisms, leading to ulcer formation. [Smith J, Doe A. The role of acid-pepsin imbalance in ulcer pathogenesis. *Lancet*. 2024;384(10):567–72.]

2. Helicobacter pylori Infection:

H. pylori infection is a significant factor in ulcer pathogenesis. The bacterium releases virulence factors such as CagA and VacA, causing inflammation and mucosal damage. It can alter acid secretion, leading to either hyper- or hypochlorhydria, further destabilizing host defense mechanisms. [Jones C, Williams R. Helicobacter pylori infection and its

impact on gastric acid secretion and ulcer formation. *Wikipedia*. 2025.] Available from: https://en.wikipedia.org/wiki/Helicobacter_pylori

3. NSAID Use:

Nonsteroidal anti-inflammatory drugs (NSAIDs) are known to impair mucosal protection by inhibiting prostaglandin synthesis. This reduces the secretion of protective mucus and bicarbonate and decreases mucosal blood flow, all of which can contribute to ulcer formation. [Adams P, Black L. NSAIDs and their impact on gastric mucosal defense mechanisms. *Int Rev Med*. 2023;22(5):321–30.]

4. Stress and Lifestyle Habits:

While not a direct cause, psychological and physiological stress—including poor sleep—can exacerbate ulcer formation. Stress increases gastric acid secretion and impairs mucosal repair mechanisms, further aggravating ulcer symptoms.:

[Miller R, Thompson S. The role of stress in the exacerbation of peptic ulcers. *Springer Phytochem Rev*. 2024;10(4):56–62. Sharma T, Gupta N. Stress and ulcer formation: a clinical perspective. *J Stress Health*. 2023;34(2):93–104.]

5. University Students and Healthcare Management:

University students are often managing their healthcare independently for the first time. This new responsibility may lead to challenges such as scheduling appointments, purchasing medications, and adhering to treatment regimens, which can impact their overall health and exacerbate conditions like peptic ulcer disease.

[Taylor J, Greenfield M. Healthcare management in university students: challenges and stressors. *J Adolesc Health*. 2025;65(1):11–17.]

.

FACTORS AFFECTING MEDICATION ADHERENCE

Medication adherence, the degree to which patients follow prescribed treatment regimens, is affected by a complex interplay of factors. Recent evidence categorizes these under five domains: patient-related, therapy-related, condition-related, healthcare system/provider, and socio-economic influences (WHO, 2022).

1. Patient-Related Factors

Health literacy and knowledge: Poor understanding of disease and treatment significantly reduces adherence. A systematic scoping review in low- and middle-income countries identified knowledge gaps as a common barrier. [Sorensen K, Van den Broucke S, Fullam J, et al. Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health*. 2012;12:80].

Beliefs and attitudes: Patients who doubt the necessity of medication or fear side effects often skip doses. Trust and perceived benefits enhance adherence.

Psychological state: Depressive symptoms, stress, and anxiety undermine motivation and consistency in taking medication.

Memory and routine: Forgetfulness, especially in elderly individuals or complex regimens, impairs adherence; strong routines and reminders help.

2. Therapy-Related Factors

Regimen complexity: Treatment protocols involving multiple medications, frequent dosing, or complex timing reduce adherence rates [George J, Phun Y- T, Bailey M, et al. The implication of therapeutic complexity on adherence to cardiovascular medications. *J Am Med Intern. Med*. 2012;172(25):1984- 5.

Side effects and tolerability: Adverse effects. Nausea or drowsiness are common reasons for discontinuation. A recommended clearer communication about side effects to improve tolerance.

Perceived immediacy of benefits: Medications with delayed or subtle effects (e.g., for asymptomatic chronic conditions) are prone to poor adherence.

3. Condition-Related Factors

Symptom severity and visibility: Patients with minimal symptoms (e.g., early-stage hypertension or H. pylori infection) often see little reason to continue treatment.

Chronic versus acute illness: Adherence tends to decline over time in chronic illness, particularly after the first six months of therapy.

Comorbidities and disease burden: Multiple health problems increase pill burden and complexity, which can overwhelm patients and reduce adherence.

4. Health System & Provider Factors

Patient–provider communication: Quality of interaction influences adherence. Trust, sufficient consultation time, and negotiated decisions empower the patient.

Healthcare access and follow-up: Easy accessibility to health professionals and scheduled follow-ups support sustained adherence.

Provider support & education: Pharmacist-led education and counseling, as well as community support structures, have been shown to significantly improve adherence in chronic disease settings [Viswanathan M, Golin CE, Jones CD, et al. Interventions to improve adherence to self- administered medications for chronic diseases in the United States: a systematic review. *Ann Intern Med.* 2012;157(11):785- 95.]

5. Socioeconomic Factors

Financial cost: High out-of-pocket costs, lack of health insurance, and expensive drugs reduce adherence, especially in low- and middle-income countries [Braveman P, Gottlieb L. The social determinants of health: it's time to consider the causes of the causes. *Public Health Rep*. 2014;129 Suppl 2:19- 31.

Education and cultural context: Lower education levels correlate with poorer health literacy, while stigma and cultural beliefs may lead some to avoid prescribed drugs.

Social support: Having caregivers or family encouragement improves adherence; isolation or lack of support.

Common barriers to adherence include:

Forgetfulness, especially when medication is not part of a daily routine.

Stigma, particularly for conditions like HIV/AIDS, sexually transmitted infections (STIs), mental illnesses, and epilepsy.

Academic and social pressure can reduce attention to personal health.

Lack of knowledge, including low understanding of their condition or the importance of completing medications.

Furthermore, some students may avoid seeking care or purchasing medications due to financial constraints or fear of parental discovery, especially in sensitive cases like mental health, contraception, or sexually transmitted diseases.

Nigeria, like many low- and middle-income countries, faces systemic challenges in healthcare delivery. These include:

Limited access to healthcare facilities, especially youth-friendly services.

Shortage of trained healthcare personnel, including counsellors and pharmacists.

Frequent stock-outs of medications lead to inconsistent access.

Inadequate campus health infrastructure; many university clinics are under-resourced and not equipped to manage chronic illnesses effectively.

Low health literacy; many students lack adequate knowledge about their condition or medication.

At the University of Benin, like many other tertiary institutions in Nigeria, students may face long queues at the health centre, minimal privacy during consultations, and no follow-up systems. There may also be an absence of digital reminders, support groups, or medication management programs that cater specifically to young people.

STATEMENT OF THE PROBLEM

Despite increased awareness and access to medications, non-adherence remains a critical challenge in healthcare, particularly among young adults. Non-adherence is associated with an increased risk of treatment failure, unnecessary escalation of care, avoidable healthcare costs, and reduced quality of life. The burden is more severe in resource-limited settings, where even minor lapses in adherence can lead to significant health deterioration.

University students often experience a unique set of challenges, including high academic stress, erratic schedules, poor dietary habits, inadequate sleep, financial instability, and social pressure. These factors may interfere with their ability to follow prescribed medication regimens. In Nigeria, there is limited empirical data focused on understanding these adherence patterns among students. Most available data tend to focus on adult populations or community-based studies.

Without adequate insight into these behaviors, institutional health units may be under-equipped to provide meaningful interventions. A thorough evaluation of the factors affecting student adherence is essential for shaping student-centered healthcare support systems.

JUSTIFICATION OF STUDY

This research is important for several interrelated public health, educational, and policy-making reasons.

Similarly, peptic ulcer disease is common among students due to stress, poor nutrition, self-medication with NSAIDs, and high rates of H. pylori infection. Treatment regimens for PUD often require prolonged and strict adherence to antibiotics and acid-reducing agents. However, many students discontinue therapy prematurely, either due to financial constraints or misunderstanding of the need for complete eradication therapy, leading to relapse and severe complications such as gastrointestinal bleeding (Adewale A, 2022; Okonkwo CE, 2022).

Despite the high burden of these conditions in university settings, little research has been conducted to evaluate how well students adhere to treatment plans or the specific barriers they encounter. Most available studies focus on the general population and overlook the unique circumstances students face, such as academic stress, erratic schedules, and limited access to university health centers (Ajayi IA, 2022; Musa TH, 2023).

By focusing on university students, this study addresses a critical gap in health behavior research and provides insights into a vulnerable group whose future productivity is vital to national development. Findings from this study will inform the design of tailored interventions, promote rational drug use, and enhance awareness strategies on the importance of adherence. Additionally, it will contribute to policy formulation in student health services and support future research on chronic disease management in academic environments (Ogunyemi TO, 2023; Brown MT, 2023).

AIMS AND OBJECTIVES

Aim: To evaluate the level of medication adherence among Pharmacy Students managing recurring health conditions at the University of Benin.

Objectives:

1. To assess the level of medication adherence among university students diagnosed with peptic ulcer disease at the University of Benin.

2. To identify the key factors influencing adherence behavior in the management of peptic ulcer disease among students.

3. To examine the relationship between medication adherence and the recurrence or complications of peptic ulcer disease.

Chapter Two

METHODS

2.1 Research Design

This study will adopt a cross-sectional descriptive survey design. This design is suitable for assessing medical adherence behaviors and identifying associated factors at a particular point in time. It allows for the collection of quantitative data that can be statistically analyzed to make inferences about the broader university student population.

2.2 Study Area

The study will be conducted at the University of Benin, Benin City, Nigeria. The university has a diverse population of undergraduate and postgraduate students from various socio-economic backgrounds, making it ideal for this research.

2.3 Study Population

The study will be conducted among pharmacy students at the University of Benin

2.4 Inclusion Criteria

- 200level-500level Pharmacy Students currently enrolled at the University of Benin.
- Pharmacy Students currently on treatment or who have received treatment within the past 6 months.
- Pharmacy Students who consent to participate.

2.5 Exclusion Criteria

- 100 and 600level pharmacy students
- Students with co-morbidities outside of the focus conditions (e.g., diabetes, hypertension).
- Students who decline to give informed consent.

2.6 Sample Size Determination

The sample size will be determined using the Yamane formula for finite populations:

n=N1+N(e)2n = \f{N}{1 + N(e)^2}

Where:

n = Sample size

e = Margin of error (0.05)

n=811+811(0.05)2=811+1.25== {811}{1 + 811(0.05)^2} = {811}{1 + 1.25} =

{811}{2.25} \approximately. 268

Adding the 10% attrition value

Total sample size = 295, approximately 300 respondents

Thus, approximately 300 students will be targeted.

2.7 Sampling Technique

A structured, self-administered questionnaire was used as the data collection instrument. The questionnaire consists of the following sections:

Section A: Socio-demographic data

Section B: General Knowledge and Attitude on Medication Adherence

Section C: Barriers to adherence (e.g., financial, psychological, knowledge-based)

Section D: Perceived impact of non-adherence on health outcomes

Section E: Recommendation and personal input

The questionnaire was pre-tested for clarity and reliability before use.

2.8 validity and reliability of instruments

Face and content validity was ensured through expert review by lecturers in pharmacy and public health. A pilot study was conducted among 10% of the sample population to assess reliability. The reliability was determined using Cronbach's alpha, which was a value of ≥ 0.89

2.9 Data Collection Procedure

After obtaining ethical clearance and informed consent, participants received the questionnaires in paper form. Research assistants were trained to administer and collect the questionnaires while maintaining confidentiality and encouraging honest responses.

2.10 Data Analysis

Collected data was entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics (frequencies, percentages, means) summarized the data, while inferential statistics (Chi-square tests, logistic regression) assessed associations between medical adherence and influencing factors. The level of significance was set at $p < 0.05$

2.11 Ethical Considerations

Ethical approval was obtained from the Faculty of Pharmacy, University of Benin Ethics Review Board. Informed consent will be sought from all participants. Confidentiality and

anonymity was maintained by assigning unique identifiers instead of names. Participation was voluntary, and participants informed of their right to withdraw at any time.

Chapter Three

3.1 SOCIODEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

A total of 300 questionnaires were distributed, and all were completed and returned, giving a response rate of 100%. Among the respondents, 97 (32.3%) reported having peptic ulcer disease (PUD). As shown in Table 3.1, most of the respondents were female students, and the majority were between 16 and 21 years of age. The remaining sociodemographic characteristics of the respondents are presented in Table 3.1

Table 3.1: Sociodemographic Characteristics of Respondents

Variable	Category	Frequency (Percent)
Gender	Male	120 (40.0%)
	Female	180 (60.0%)
Age (years)	16–21	156 (52.0%)
	22–25	99 (33.0%)
	26–30	45 (15.0%)
Level of Study	200 Level	88 (29.3%)
	300 Level	103 (34.3%)
	400 Level	84 (28.0%)

	500 Level	25 (8.3%)
Marital Status	Single	291 (97.0%)
	Married	3 (1.0%)
	Other	6 (2.0%)
Monthly Income / Allowance	Below ₦10,000	66 (22.0%)
	₦10,001–₦30,000	77 (25.7%)
	₦30,001–₦50,000	126 (42.0%)
	Above ₦50,000	31 (10.3%)
Residence	On campus	108 (36.0%)
	Off campus	192 (64.0%)
Reported PUD	Yes	97 (32.30%)
	No	203 (67.70%)

3.2 MEDICATION AND TREATMENT PROFILE OF RESPONDENTS

A total of 97 respondents were diagnosed with peptic ulcer disease. Among them, 49 (50.5%) were currently on prescribed medication for their condition. The most commonly reported regimen was the triple therapy combination of omeprazole, clarithromycin, and metronidazole, followed by antacids and omeprazole-based therapies. The usual duration of treatment was 14 days (53.6%), while 19 (19.6%) respondents used their medications for 21 days. Regarding adherence behaviour, 38 (39.2%) respondents reported always taking their medications as prescribed, while 23 (23.7%) rarely adhered. In terms of missed doses, 46.4% had missed one or two doses, and 13.4% reported never missing any dose. The detailed results are presented in Table 3.2.

Table 3.2 Medication and Treatment Profile of Respondents

Variable	Category	Frequency (n)	Percent (%)
Who diagnosed your condition?	Doctor	70	72.2
	Pharmacist	11	11.3
	Self-diagnosis	10	10.3
	Other	6	6.2
Are you currently on prescribed	Yes	49	50.5

medication for your condition?			
	No	48	49.5
If yes, which of the following medications were prescribed for you?	Omeprazole + Clarithromycin + Metronidazole	39	40.2
	Antacids only	15	15.5
	Omeprazole only	11	11.3
	Omeprazole + Antacid	14	14.4
	Cimetidine + Antacid	11	11.3
	Herbal/Traditional medicine	7	7.2
How long do you take your medications?	7 days	9	9.3
	10 days	17	17.5
	14 days	52	53.6
	21 days	19	19.6
Do you take your medication as prescribed?	Always	38	39.2

	Often	17	17.5
	Sometimes	10	10.3
	Rarely	23	23.7
	Never	9	9.3
How many doses have you missed before?	None	13	13.4
	1–2	45	46.4
	3–4	21	21.6
	More than 4	18	18.6

3.3 LEVEL OF MEDICATION ADHERENCE

Medication adherence among respondents with peptic ulcer disease was assessed using eight key questions that measured how consistently respondents followed their treatment instructions. Each item was rated on a five-point Likert scale ranging from Always (5) to Never (1), with higher scores indicating better adherence. The total scores were categorized into high, moderate, and low adherence levels to represent overall consistency with medication use. As shown in Table 3.3.1, a considerable number of respondents reported always taking their medications as prescribed and completing the

full course of treatment, while some admitted to forgetting doses or discontinuing medication when they felt better or experienced side effects. The overall adherence levels are presented in Table 3.3.2. Out of the 97 respondents, 24.7% demonstrated high adherence, 40.2% had moderate adherence, and 35.1% showed low adherence to their prescribed ulcer medications.

Table 3.3.1: Frequency of responses to Adherence-Related Questions Among Respondents with Peptic Ulcer Disease (n = 97)

Variable	Always n (%)	Often n (%)	Sometimes n (%)	Rarely n (%)	Never n (%)
Take medication as prescribed	38 (39.2)	17 (17.5)	10 (10.3)	23 (23.7)	9 (9.3)
Forget to take medication	31 (32.0)	27 (27.8)	6 (6.2)	25 (25.8)	8 (8.2)
Careless about taking medication	33 (34.0)	21 (21.6)	14 (14.4)	25 (25.8)	4 (4.1)
Stop medication when feeling better	27 (27.8)	27 (27.8)	14 (14.4)	19 (19.6)	10 (10.3)
Stop medication when feeling worse/side effects	31 (32.0)	27 (27.8)	14 (14.4)	14 (14.4)	11 (11.3)
Visit hospital/pharmacy when symptoms reappear	26 (26.8)	22 (22.7)	28 (28.9)	12 (12.4)	9 (9.3)
Take medication exactly as	34 (35.1)	21 (21.6)	14 (14.4)	18 (18.6)	10 (10.3)

prescribed					
Complete the full course of medication	35 (36.1)	19 (19.6)	22 (22.7)	19 (19.6)	2 (2.1)

Table 3.3.2: Overall Adherence Score of Respondents

Adherence Level	Frequency	Percent	Valid Percent
High Adherence	24	24.7%	24.7%
Moderate Adherence	39	40.2%	40.2%
Low Adherence	34	35.1%	35.1%

3.4 FACTORS FACILITATING MEDICATION ADHERENCE AMONG RESPONDENTS

This section addresses Objective 2, which seeks to identify factors influencing adherence behaviour in the management of peptic ulcer disease among students. Among the 97 respondents with peptic ulcer disease, 26.8% used alarms as reminders, 19.6% relied on family or friends, 18.6% used mobile apps, 17.5% used written notes, while another 17.5% used no reminder method. Only 6.2% had ever received counselling on medication adherence. In terms of support, healthcare providers (24.7%) were the most common source, followed by friends (22.7%), family (17.5%), and university staff (12.4%), while

22.7% reported no support. Respondents suggested peer support groups (65.6%), health education (57.7%), counselling (54.2%), reminder or alarm systems (52.1%), and free or subsidized medications (50.0%) as effective measures to improve adherence. The detailed results are presented in Table 3.4.

Table 3.4 Factors Facilitating Medication Adherence among Respondents

Facilitator Variable	Response Category	Frequency (n)	Percent (%)
Method used to remember medication	Alarm	26	26.8
	Notes	17	17.5
	Apps	18	18.6
	Family or friends	19	19.6
	None	17	17.5
Received counselling on medication adherence	Yes	6	6.2
	No	91	93.8
Source of support in managing	Friends	22	22.7

Facilitator Variable	Response Category	Frequency (n)	Percent (%)
condition			
	Family	17	17.5
	Healthcare provider	24	24.7
	University staff	12	12.4
	None	22	22.7
Suggestions for improving adherence (Multiple Response)	Health education	56	57.7
	Reminders or alarms	50	52.1
	Free or subsidized medications	48	50.0
	Counselling	52	54.2
	Peer support groups	63	65.6
	Other suggestions	59	61.5

3.5 BARRIERS TO MEDICATION ADHERENCE AMONG RESPONDENTS

In line with the study's objective of identifying the key factors influencing adherence behaviour in the management of peptic ulcer disease, Table 3.5 presents the major barriers reported by respondents. The most common reasons for skipping doses were side effects (48.5%), running out of medicine (47.4%), and forgetfulness (45.0%). Similarly, lack of information (50.9%) and forgetfulness (50.6%) were leading challenges encountered during medication use. Broader factors such as inadequate knowledge (53.1%), lack of money (48.0%), and stress from school (48.0%) also emerged as prominent barriers affecting adherence among respondents. Detailed findings is shown in Table 3.5.

Table 3.5 Barriers to Medication Adherence Among Respondents

Barrier Category	Specific Barrier	Frequency (n)	Percentage (%)
Reasons for Skipping a Dose	Forgot to take medication	77	45.0
	Felt better	74	43.3
	Experienced side effects	83	48.5
	Ran out of medicine	81	47.4
	Too busy	67	39.2
	Financial constraints	74	43.3

	Did not believe it was needed	77	45.0
	Other reasons	85	49.7
Challenges Faced in Taking Medication	Forgetfulness	137	50.6
	Side effects	134	49.4
	Cost of medication	128	47.2
	Stigma or fear of judgment	127	46.9
	Inconvenience	125	46.1
	Lack of information	138	50.9
	Academic schedule	112	41.3
Factors Hindering Medication Adherence	Lack of money	130	48.0
	Forgetfulness	116	42.8
	Fear of side effects	122	45.0
	Inadequate knowledge	144	53.1

Stress from school	130	48.0
Poor access to healthcare	123	45.4
Religious or cultural beliefs	115	42.4
Peer influence	119	43.9

3.6 ASSOCIATION BETWEEN MEDICATION ADHERENCE AND SOCIODEMOGRAPHIC CHARACTERISTICS

A Chi-square test of association was conducted to examine the relationship between medication adherence and sociodemographic characteristics of respondents with p values < 0.05 considered significant. Table 3.6 shows that only gender showed a statistically significant association with medication adherence ($\chi^2 = 8.400$, df = 3, $p = 0.038$). This suggests that adherence patterns differed between male and female respondents. No significant associations were observed for age ($\chi^2 = 3.339$, df = 6, $p = 0.765$), level of study ($\chi^2 = 15.984$, df = 9, $p = 0.067$), marital status ($\chi^2 = 8.663$, df = 6, $p = 0.193$), monthly income or allowance ($\chi^2 = 15.579$, df = 9, $p = 0.076$), or residence ($\chi^2 = 0.281$, df = 3, $p = 0.964$).

Table 3.6 Association Between Medication Adherence and Sociodemographic Characteristics

Variable	χ^2	df	p-value
Age	3.339	6	0.765
Gender	8.400	3	**0.038***
Level of Study	15.984	9	0.067
Marital Status	8.663	6	0.193
Monthly Income/Allowance	15.579	9	0.076
Residence	0.281	3	0.964

3.7 ASSOCIATION BETWEEN MEDICATION ADHERENCE AND BARRIERS TO ADHERENCE

A Chi-square test was conducted to determine the association between reported barriers and medication adherence among respondents. As shown in Table 3.7, significant associations were observed for forgetfulness ($\chi^2 = 10.665$, $p = 0.005$), cost of medication ($\chi^2 = 6.993$, $p = 0.030$), academic or school schedule ($\chi^2 = 6.403$, $p = 0.041$), lack of money ($\chi^2 = 6.993$, $p = 0.030$), inadequate knowledge ($\chi^2 = 15.612$, $p = 0.001$), stress from school ($\chi^2 = 21.005$, $p = 0.001$), poor access to healthcare ($\chi^2 = 12.373$, $p = 0.002$), and religious or cultural beliefs ($\chi^2 = 11.292$, $p = 0.004$).

3.7 Association Between Medication Adherence and Barriers to Adherence

Barrier Variable	χ^2 Value	df	p-value
Stigma or fear of judgment	14.566	2	0.142
Forgetfulness	10.665	2	**0.005***
Cost of medication	6.993	2	**0.030***
Fear of side effects	14.197	2	0.118
Academic/school schedule	6.403	2	**0.041***
Lack of money	6.993	2	**0.030***
Inadequate knowledge	15.612	2	**0.001***
Lack of information	22.794	2	0.189
Stress from school	21.005	2	**0.001***
Poor access to healthcare	12.373	2	**0.002***
Religious or cultural beliefs	11.292	2	**0.004***
Inconvenience	18.421	2	0.217

3.8 ASSOCIATION BETWEEN MEDICATION ADHERENCE AND FACILITATORS OF ADHERENCE

The chi-square test of association was used to examine the relationship between various facilitators of adherence and medication adherence among respondents. The analysis revealed that use of reminders or alarms ($\chi^2 = 10.203$, df = 2, p = 0.006), free or subsidized medication ($\chi^2 = 7.124$, df = 2, p = 0.028), and counselling on adherence ($\chi^2 = 8.583$, df = 2, p = 0.030) were significantly associated with medication adherence. However, health education ($\chi^2 = 2.156$, df = 2, p = 0.142) and peer support ($\chi^2 = 3.108$, df = 2, p = 0.078) showed no statistically significant association.

Table 3.8 Association Between Medication Adherence and Facilitators of Adherence

Facilitators of Adherence	χ^2 Value	df	p-value
Use of reminders/alarms	10.203	2	**0.006***
Free/subsidized medication	7.124	2	**0.028***
Counselling on adherence	8.583	2	**0.030***
Health education	2.156	2	0.142
Peer support	3.108	2	0.078

CRONBACH’S ALPHA

The reliability of the questionnaire items used to assess medication adherence, prescribing patterns, and potentially inappropriate medications was tested using Cronbach’s alpha. The result yielded a coefficient of **0.897** for **36 items**, indicating excellent internal consistency of the instrument.

Reliability Statistics

Cronbach's Alpha	N of Items
.897	36

Chapter Four

DISCUSSION

4.1 medication adherence levels among respondents

Findings revealed that medication adherence among students with PUD was suboptimal. Only 24.7% demonstrated high adherence, while 40.2% exhibited moderate adherence and 35.1% showed low adherence. This suggests that less than one-third of students strictly follow their prescribed ulcer treatment regimens. These results align with earlier findings by Ekanem and Tukur (2023) and Musa et al. (2023), who reported similarly low adherence rates among university populations managing chronic illnesses. The moderate-to-low adherence levels observed may be attributed to several factors typical of university students, such as irregular schedules, forgetfulness, financial challenges, and low

perceived severity of illness. Given that most respondents (53.6%) reported taking their medications for 14 days, it appears that while initial adherence during treatment is satisfactory, maintaining consistency over time remains a major challenge. Incomplete adherence to ulcer therapy, especially eradication regimens involving omeprazole, clarithromycin, and metronidazole, increases the risk of relapse and antimicrobial resistance. This corroborates Okonkwo and Etim (2022), who observed that premature discontinuation of therapy is a key factor in recurrent ulcer cases among undergraduates.

4.2 Sociodemographic Influences On Adherence

1. The analysis revealed a statistically significant relationship between gender and adherence ($p = 0.038$), while other demographic factors such as age, level of study, marital status, income, and residence showed no significant associations. The gender difference suggests that female students tend to adhere more strictly to medication schedules, possibly due to greater health consciousness or a higher tendency to seek healthcare support. Similar trends were reported by [Ojo OE, Chukwuma A. Gender differences in health-seeking behavior and medication adherence among university students. Niger J Clin Pract. 2022;25(3):345–52]. who found that women generally show stronger health-seeking behaviours and compliance with medical instructions. The lack of significant association with other demographic factors may imply that non-adherence is a widespread behavioural issue among students, cutting across age groups and income levels. Although financial limitations were reported as a major barrier, the p-value (0.076)

for income indicates that poor adherence occurs even among students with relatively higher allowances, suggesting that other psychosocial factors such as motivation and awareness play more prominent roles.

4.3 Barriers to Medication Adherence

1. These findings indicate that a combination of personal, academic, financial, and environmental factors contributes to poor medication adherence among students. The strong link between forgetfulness and adherence is consistent with previous research, where Brown and Bussell described memory lapses as one of the most persistent barriers to consistent medication use among young adults [Brown MT, Bussell JK. Medication adherence: WHO cares? Mayo Clin Proc. 2023;98(4):304–14]. Academic stress and scheduling conflicts also negatively affected adherence, reflecting how students' study demands can interfere with regular treatment. This aligns with Ajayi, who highlighted that long study hours and irregular meal patterns disrupt timely medication intake, particularly for self-managed conditions like peptic ulcer disease [Ajayi IA. Factors affecting medication adherence among university students. Afr J Pharm Pharmacol. 2022;16(5):78–86]. Financial constraints further exacerbate the problem, as students unable to afford full courses of medication often discontinue therapy prematurely or rely on self-medication with antacids, as reported by [Otuogidi E, Gilbert F. Financial barriers and self-medication practices among students with peptic ulcer disease. Niger J Clin Pract. 2023;26(2):145–52].

4.4 Facilitators of Medication Adherence

The study further explored mechanisms that support adherence. Respondents who used reminder alarms or mobile apps ($p = 0.006$), received free or subsidized medications ($p = 0.028$), or obtained counselling from healthcare professionals ($p = 0.030$) demonstrated significantly better adherence. These findings emphasize the value of behavioural and system-based interventions in improving adherence. Use of digital reminders was particularly effective, supporting the growing evidence that mobile health (mHealth) technologies can enhance medication-taking behaviour in young populations (Musa et al., 2023).

Similarly, counselling emerged as a powerful facilitator, highlighting the critical role of pharmacists and healthcare providers in promoting medication literacy and reinforcing adherence behaviour. The low percentage (6.2%) of students who had ever received counselling underscores a significant gap in current campus health practices. Peer support groups and educational campaigns, though not statistically significant predictors in this study, were identified by most respondents as desirable interventions. This suggests that community-based engagement strategies could help build supportive environments for adherence improvement.

4.5 Relationship between adherence and disease recurrence

Although recurrence rates were not directly measured, the observed low adherence among students suggests a potential link with repeated ulcer episodes. Non-adherence to H. pylori eradication therapy is well-documented to result in treatment failure and reactivation of infection (Bello et al., 2018). Given that a substantial portion of respondents admitted to missing doses or stopping medication when feeling better or worse, relapse is likely frequent among this population.

This finding aligns with Dongo et al. (2017) and Debruyne (2022), who emphasized that inconsistent treatment is a major predictor of recurrent ulcer complications. Therefore, interventions to enhance adherence could directly reduce the frequency of PUD relapse and associated morbidity in university settings.

4.6 implications for practice and policy

The results underscore the urgent need for institutional interventions within the university healthcare system. Routine adherence counselling, medication refill reminders, and access to affordable therapy could significantly improve outcomes. Establishing student-focused health programs including digital adherence platforms, pharmacy-led education sessions, and peer support clubs can help address behavioural and structural barriers simultaneously.

The success of these interventions is consistent with recent global findings (Wu et al., 2025; Wang et al., 2024) that advocate for the integration of mHealth (mobile health) solutions and pharmacist-led support systems in chronic disease management. In summary, the findings demonstrate that medication adherence among pharmacy students

with PUD remains suboptimal and is influenced by behavioural, economic, and systemic barriers. Improving adherence requires a multidimensional strategy, one that simultaneously addresses cognitive, motivational, and structural factors. The study highlights the essential role of pharmacists, health educators, and university administrators in designing supportive programs that can promote adherence and reduce the burden of peptic ulcer disease within the student population.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This research examined the level of medication adherence among pharmacy students at the University of Benin who are managing peptic ulcer disease (PUD), identified the factors influencing adherence, and explored interventions that could improve treatment outcomes. The study's findings revealed that medication adherence was generally low, with only 24.7% of participants demonstrating high adherence, while the majority fell into moderate or poor adherence categories. This finding underscores a critical public health concern, particularly within a population presumed to possess higher health literacy and awareness of the consequences of non-adherence.

Peptic ulcer disease, especially those associated with *Helicobacter pylori* infection, requires strict adherence to combination therapy involving proton pump inhibitors and antibiotics for successful eradication. The low adherence observed among students

implies that many do not complete their prescribed regimens, leading to risks of treatment failure, recurrence, and antibiotic resistance. These outcomes corroborate previous findings that inconsistent therapy adherence significantly undermines disease control and increases the likelihood of relapse and reinfection.

Gender emerged as a significant predictor of adherence, with female students generally adhering better to medication instructions. This trend aligns with global and regional findings suggesting that females tend to exhibit stronger health-seeking behaviours and are more consistent with medical advice. However, other demographic variables such as age, marital status, and financial allowance did not significantly predict adherence, implying that the issue cuts across demographic boundaries and is influenced by more complex psychosocial and behavioural determinants.

.

The presence of academic stress and lack of accessible healthcare further complicated adherence. University students often juggle multiple responsibilities that interfere with consistent medication use. Despite being future healthcare professionals, the findings reveal gaps in personal medication management, reinforcing the notion that health knowledge does not automatically translate into adherence behaviour. This highlights the importance of behavioural change communication (BCC) strategies, motivational support, and consistent follow-up, especially within university settings.

However, the study also identified several facilitators of good adherence. Participants who received pharmacist counselling, used mobile or alarm reminders, and had access to free or subsidized medications demonstrated significantly higher adherence rates. This

supports a growing body of evidence emphasizing multifaceted interventions—combining education, digital technology, and financial support as the most effective approach to improving adherence among young adults.

5.2 Recommendations

Based on the study findings, the following recommendations are proposed to improve medication adherence among students managing peptic ulcer disease and similar chronic conditions:

1. Strengthen pharmacist-led adherence counselling

Pharmacists occupy a critical position in enhancing medication adherence through education, motivation, and monitoring. It is recommended that the University of Benin Health Centre and associated pharmacies institutionalize structured adherence counselling sessions. Pharmacists should provide clear explanations about treatment regimens, possible side effects, and the risks associated with non-adherence. Follow-up consultations whether in-person, by phone, or via digital platforms should be routinely conducted to reinforce adherence behaviour.

2. Integrate mobile and digital adherence tools

The study showed a positive correlation between the use of reminders (such as alarm systems and mobile apps) and adherence rates. Therefore, the introduction of mobile health (mHealth) technologies, such as automated SMS reminders and adherence tracking apps, should be encouraged. These tools can serve as behavioural nudges and help

students maintain consistent medication-taking habits. Universities can partner with health tech developers to customize user-friendly applications for students with chronic conditions.

3. Improve affordability and access to medicines

Financial constraints were identified as a significant barrier to adherence. It is recommended that the university's health services collaborate with pharmaceutical suppliers, NGOs, and public health programs to provide free or subsidized anti-ulcer medications for students with financial limitations. Establishing a "Student Health Access Fund" could also assist in ensuring continuity of therapy among economically disadvantaged students.

4. Embed adherence and health behaviour education into the curriculum

While pharmacy students have pharmacological knowledge, many still exhibit poor adherence behaviours. Therefore, the pharmacy curriculum should include more experiential training on patient counselling, health psychology, and behaviour modification strategies. Role-playing, peer education, and field projects focused on adherence promotion can equip future pharmacists with both personal and professional adherence competencies.

5. Develop peer-support and adherence advocacy programs

Peer-led health promotion initiatives should be established to provide mutual support and accountability among students managing chronic conditions. Support groups can foster

open discussions about treatment challenges and coping mechanisms, reducing stigma and enhancing collective motivation for adherence.

6. Establish institutional policies and monitoring systems

The university should implement periodic health audits and adherence evaluations for students accessing treatment for chronic illnesses. This data will guide policy formulation and enable the health department to develop evidence-driven interventions. Standardized adherence screening should also be incorporated into routine consultations at the university clinic.

7. Promote continuous research and innovation

Further research is needed to explore the long-term outcomes of adherence interventions, including digital health technologies and pharmacist follow-up models. Future studies should adopt longitudinal or randomized controlled designs to assess the effectiveness of multifaceted strategies in improving adherence and reducing PUD recurrence.

5.3 **Implications for public health and pharmacy practice**

The findings of this research carry significant implications for public health and pharmacy education. At the public health level, they highlight the need to address adherence as a behavioural health priority within university settings. Poor adherence to PUD therapy contributes not only to relapse but also to antimicrobial resistance, an issue of global concern. At the pharmacy practice level, the findings reaffirm the pharmacist's role as a patient educator and adherence advocate. Embedding adherence management

within the scope of pharmaceutical care can improve outcomes across multiple chronic conditions. Furthermore, these findings encourage universities to adopt integrated health systems, where pharmacists, counsellors, and medical practitioners collaborate to deliver coordinated adherence support. Such a model could serve as a prototype for other tertiary institutions in Nigeria and beyond.

In conclusion, this study has demonstrated that despite their medical training, pharmacy students still face significant challenges in adhering to peptic ulcer disease therapy. The problem is multifactorial shaped by behavioural, socioeconomic, and systemic influences. Effective adherence improvement requires a holistic, evidence-based, and context-sensitive approach that integrates digital innovation, professional counselling, financial support, and continuous monitoring. By implementing these strategies, universities can foster a culture of responsibility and health awareness that not only benefits students but also prepares them to become future pharmacists who exemplify best adherence practices.

REFERENCES

1. Adewale A. Peptic ulcer disease and medication adherence among students. *Niger J Pharm Health Sci.* 2022.
2. Ajeru GO. Prevalence of peptic ulcer and dietary patterns among students in a Nigerian university. *Nat J Food Nutr Res.* 2025;9(19):249–256.
3. Ajayi IA. Factors affecting medication adherence among university students. *Afr J Pharm Pharmacol.* 2022;16(5):78–86.
4. Anaemene DI, Ochogu EU. Prevalence, symptoms and lifestyle aspects of PUD among undergraduate students. *Afr J Biomed Res.* 2022;25(2):129–133.
5. Ankush M, Lonkar R, Ajabe RG, Akhand VG, Katekar VA, Deshmukh NB, Deshmukh SP. Peptic ulcer. *GSC Advanced Research.* 2025.
6. Bayana E, Olani A, Biratu Y, et al. Peptic ulcer disease: symptoms and risk factors among students at Jimma University, Ethiopia. *Gastrointestinal Nurs.* 2021;19(2):36–40.

7. Bello A, Umar A, Borodo M. Prevalence and risk factors for *H. pylori* infection in gastroduodenal disease in Kano, Nigeria. *Afr J Med Health Sci.* 2018;17(1):41–47.

8. Braveman P, Gottlieb L. The social determinants of health: it's time to consider the causes of the causes. *Public Health Rep.* 2014;129 Suppl 2:19–31.

9. Brown MT, Bussell JK. Medication adherence: a review of barriers and strategies. *Mayo Clin Proc.* 2023;98(1):6–10.

10. Brown T, Williams K, Clark S. NSAIDs and peptic ulcer complications: a review. *Am J Gastroenterol.* 2022;37(4):278–284.

11. Debruyne PR. Patterns and complications of peptic ulcer disease: contemporary review. *Sci Direct Gastroenterol.* 2022;15(1):50–58.

12. Dongo AE, Uhunmwagho O, Kesieme EB, et al. Perforated peptic ulcer disease review at Irrua, Nigeria. *ISRN Surg.* 2017;2017:8375398.

13. Dongo AE, Uhunmwagho O, Kesieme EB, et al. Risk factors and management of peptic ulcer disease in university community, south-south Nigeria. *Pharm Bioprocess J.* 2017;5(6):7–15.

14. Ekanem EO, Tukur MA. Medication adherence behaviors among Nigerian university students. *J Pharm Policy Pract.* 2023;16:40.

15. Eniojukan JF, Okonkwo OC, Adje UD. Risk factors and correlates of PUD in university community, south-south Nigeria. *J Pharm Biosci.* 2017;5(6):7–15.

16. Fashner J, Gitu AC. Peptic ulcer disease overview for primary care. *Gastroenterol Nurs.* 2015;42(5):451–454.

17. Fulzele P. Peptic ulcers and their complications: management review. *J Drug Deliv Ther.* 2022;12(2):137–142.

18. George J, Phun YT, Bailey M, et al. The implication of therapeutic complexity on adherence to cardiovascular medications. *J Am Med Intern Med.* 2012;172(25):19845.

19. Ile VP, Nonaka D, Senamonty P, et al. *H. pylori* virulence factors and duodenal ulcer risk: a systematic review. *EAS J Nutr Food Sci.* 2020;2(5):257–264.

20. JAMA Review – Vakil N. Comprehensive review of peptic ulcer disease. *JAMA.* 2024;332(21):1832–1842.

21. Jones C, Williams R. *Helicobacter pylori* infection and its impact on gastric acid secretion and ulcer formation. *Wikipedia.* 2025. Available from: https://en.wikipedia.org/wiki/Helicobacter_pylori

22. Jones L, Green M, Patel S. Peptic ulcer disease in the 21st century: the role of *H. pylori* and NSAIDs. *JAMA Review.* 2024;312(2):100–108.

23. Kainat S, et al. Determinants of peptic ulcer disease: systematic review. *EAS J Nutr Food Sci.* 2020;2(5):257–264.

24. Kardas P, et al. Global medication adherence in chronic diseases: a systematic overview. *BMC Med.* 2013;11(2):231–240.

25. Lim L, Debruyne PR, Lau JY. Lifestyle aspects of PUD among university undergraduates in Nigeria. *Afr J Biomed Res.* 2022;25(2):129–133.

26. Miller R, Thompson S. The role of stress in the exacerbation of peptic ulcers. *Springer Phytochem Rev.* 2024;10(4):56–62.

27. Musa TH, Tola HH, Abegaz TM. Medication adherence determinants in Nigerian university settings. *J Public Health Res.* 2023;12(2):100–108.

28. Nash M, Roberts J. The role of gastric acid and pepsin in peptic ulcer disease. *J Clin Pathol.* 2023;76(6):221–225.

29. Nigerian Medical Journal article by Isokariari OM-A, et al. Adherence to chronic meds in tertiary institutions. *Nig Med J.* 2023;64(1):166.

30. Ojo OE, Chukwuma OS. Challenges to medication adherence in youth: a review. *BMC Public Health.* 2022;22(1):1092.

31. Ogunyemi TO, Bello MA. Recurring illness and academic impact in Nigerian university students. *Educ Health.* 2023;36(1):12–17.

32. Okonkwo CE, Etim SS. Medication use and PUD recurrence among university students. *Clin Gastroenterol Hepatol.* 2022;20(5):e84–e89.

33. Oniso JI, Wasini KB, Zibima SB. Peptic ulcer prevalence and risk factors among students in a south-south Nigerian university. *IJHSR.* 2020;10(6):1–7.

34. Otuogidi AP, Gilbert AT. Medication adherence and health-related quality of life in ulcer patients in Bayelsa State, Nigeria. *Pharmacognosy J.* 2023;5(1B):122–129.

35. Smith J, Doe A. The role of acid–pepsin imbalance in ulcer pathogenesis. *Lancet.* 2024;384(10):567–572.

36. Smith J, Lee P, Richards L. Peptic ulcer disease: pathophysiology and management. *J Clin Gastroenterol.* 2023;45(2):158–164.

37. Smith J, Lee P, Thompson R. Recent advances in peptic ulcer disease. *Lancet.* 2024;394(10209):1234–1245.

38. Sorensen K, Van den Broucke S, Fullam J, et al. Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health.* 2012;12:80.

39. Taylor J, Greenfield M. Healthcare management in university students: challenges and stressors. *J Adolesc Health.* 2025;65(1):11–17.

40. Tresca AJ. NSAIDs and peptic ulcers. *VeryWell Health.* 2025. Available from: https://www.verywellhealth.com/nsaids-and-peptic-ulcers-1941723

41. Vakil N. Diagnosis and treatment of peptic ulcer disease. *JAMA.* 2024;332(21):1832–1842.

42. Viswanathan M, Golin CE, Jones CD, et al. Interventions to improve adherence to self-administered medications for chronic diseases in the United States: a systematic review. *Ann Intern Med.* 2012;157(11):785–795.

43. WHO. *Adherence to Long-Term Therapies: Evidence for Action.* Geneva: World Health Organization; 2020.

44. WHO. *Medication adherence framework update.* Geneva: World Health Organization; 2020.

45. WHO. *Health systems factors influencing adherence.* Geneva: World Health Organization; 2022.

46. Wu L, Wang Q, et al. Mobile health and pharmacist-led support in chronic disease management. *Int J Pharm Pract.* 2025;33(3):200–212

APPENDIX

Questionnaire: Evaluation of Medication Adherence Among Pharmacy Students in the University of Benin Managing Peptic Ulcer Disease

This questionnaire is designed to assess the level of medication adherence among students at the University of Benin who are managing Peptic Ulcer Disease. Your responses will remain confidential and are for research purposes only.

Section A: Demographic Information

1. Age:

[ ] 16–21years [ ] 22–25years [ ] 26–30years [ ] Above 30years

2. Gender:

[ ] Male [ ] Female

3. Level of Study:

[ ] 200 [ ] 300 [ ] 400 [ ] 500

4. Faculty: _____

5. Marital Status:

[ ] Single [ ] Married [ ] Other

6. Monthly Income/Allowance:

[ ] Below ₦10,000 [ ] ₦10,001–₦30,000 [ ] ₦30,001–₦50,000 [ ] Above ₦50,000

7. Residence:

[ ] On campus [ ] Off campus

Section B: Health Condition and Medication

8. Do you suffer from Peptic Ulcer Disease?

[ ] yes [ ] No [ ] Not sure

9. Who diagnosed your condition?

[ ] Doctor [ ] Pharmacist [ ] Self-diagnosis [ ] Other: _____

10. Are you currently on prescribed medication for your condition?

[ ] Yes [ ] No

11. If yes, which of the following medications were prescribed for you?

[ ] Omeprazole+clarithromycin+Metronidazole [ ] Antacids only [ ] Omeprazole only [ ] Omeprazole+Antacid [ ] Cimetidine+Antacid [ ] Herbal/Traditional medicine

12. How long do you take your Medications?

[ ] 14 days [ ] 10 days [ ] 7 days [ ] 21 days

Section C: General Knowledge And Attitude On Medication Adherence

13. Do you take your medication as prescribed?

[ ] Always [ ] Often [ ] Sometimes [ ] Rarely [ ] Never

14. Do you sometimes forget to take your medication?

[[ ] Always [ ] Often [ ] Sometimes [ ] Rarely [ ] Never

15. Are you careless at times about taking your medication?

[ ] Always [ ] Often [ ] Sometimes [ ] Rarely [ ] Never

16. Do you stop taking your medication when you feel better?

[ ] Always [ ] Often [ ] Sometimes [ ] Rarely [ ] Never

17. Do you stop taking it when you feel worse or experience side effects?

[[ ] Always [ ] Often [ ] Sometimes [ ] Rarely [ ] Never

18. How many dose have you missed before?

[ ] None [ ] 1–2 [ ] 3–4 [ ] More than 4

19. Do you take your medications exactly as prescribed by your health provider?

[ ] Always [ ] Sometimes [ ] Rarely [ ] Never

20. Have you ever skipped a dose of your medication?

[ ] Yes [ ] No

21. If yes, what were your reasons? (Tick all that apply)

[ ] I forgot [ ] Felt better [ ] Side effects [ ] Ran out of medicine[ ] Too busy [ ] Financial constraints [ ] Didn't believe I need it [ ] Other: _____

22. How often do you visit a hospital/pharmacy when symptoms reappear?

[ ] Always [ ] Sometimes [ ] Rarely [ ] Never

23. Do you complete the full course of your medications?

[ ] Always [ ] Often [ ] Sometimes [ ] Rarely [ ] Never

24. Do you use any method to help remember your medication?

[ ] Alarm [ ] Notes [ ] Apps [ ] Family/Friends [ ] None

25. Do you believe herbal or traditional remedies are more effective than prescribed drugs?

[ ] Yes [ ] No [ ] Not sure

26. Have you received any counseling on medication adherence?

[ ] Yes [ ] No

Section D: Barriers and Support

27. What challenges do you face in taking your medication?

[ ] Forgetfulness [ ] Side effects [ ] Cost [ ] Stigma/Fear of judgment [ ] Inconvenience [ ] Lack of information [ ] School /academic schedule

28. Do you feel supported by any of the following in managing your condition?

[ ] Friends [ ] Family [ ] Healthcare provider [ ] University staff [ ] None

29. Which of the following hinder your ability to adhere to medications? (Tick all that apply)

[ ] Lack of money [ ] Forgetfulness [ ] Fear of side effects [ ] Inadequate knowledge

[ ] Stress from school [ ] Poor access to healthcare [ ] Religious/cultural beliefs [ ] Peer influence

Section E: Recommendations and Personal Input

30. What would help you improve your medication adherence? (Tick all that apply)

[ ] Health education [ ] Reminders/Alarms [ ] Free or subsidized medications

[ ] Counseling [ ] Peer support groups [ ] Other: _____

31. In your opinion, how serious is medication non-adherence among university students?

[ ] Very serious [ ] Somewhat serious [ ] Not serious [ ] I don't know

Thank You!