ASSESSMENT OF PHARMACIST INTERVENTION IN THE IDENTIFICATION AND RESOLUTION OF DRUG THERAPY PROBLEMS AMONG HYPERTENSIVE PATIENTS AT THE UNIVERSITY OF BENIN TEACHING HOSPITAL, BENIN CITY.

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BENIN-CITY

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A DISSERTATION SUBMITTED TO THE DEPARTMENT OF CLINICAL PHARMACY AND PHARMACY PRACTICE, FACULTY OF PHARMACY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DOCTOR OF PHARMACY (PHARM.D) DEGREE OF THE UNIVERSITY OF BENIN, BENIN CITY, EDO STATE, NIGERIA.

NOVEMBER, 2025

CERTIFICATION

This is to certify that this work was done by **MOMOH EMOSHIOKE FAVOUR** in the Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, University of Benin, Benin City, Nigeria, in partial fulfillment for the award of Doctor of Pharmacy (Pharm. D) degree of the University.

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DEDICATION

This research work is dedicated to God Almighty; my source of wisdom, strength and understanding, and to my family whose love, support and prayers have been unwavering all through the years.

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ABSTRACT

Background: Hypertension remains a major global health concern, with a high prevalence in Nigeria leading to significant cardiovascular morbidity. Despite the availability of effective antihypertensive drugs, poor blood pressure control persists due to drug therapy problems (DTPs) such as non-adherence and inappropriate therapy.

Objective: To assess the impact of pharmacist intervention in identifying and resolving drug therapy problems among hypertensive patients at the University of Benin Teaching Hospital, Benin City.

Method: A prospective observational study was conducted among 226 hypertensive patients attending the Consultant Outpatient Department pharmacy. Data were collected using structured forms based on the Pharmaceutical Care Network Europe (PCNE) classification system. Statistical analyses were performed using SPSS software.

Results: Out of 226 participants, 60.6% had at least one DTP. The most common problem was non-adherence (47.3%), mostly patient-related (47.3%). Pharmacist interventions were primarily patient-level (48.2%), with counselling being the major strategy (48.2%). Patient acceptance of interventions was 48.2%, and prescriber acceptance 14.6%. Duration of diagnosis showed a significant relationship with DTP occurrence ($p = 0.008$).

Conclusion: Pharmacist interventions significantly contributed to identifying and resolving DTPs, improving adherence, and optimizing hypertension management. Integrating pharmacists into multidisciplinary care teams is essential for enhancing patient outcomes and minimizing medication-related problems.

Keywords: Hypertension, Drug Therapy Problems, Pharmacist Intervention, Adherence, Pharmaceutical Care, University of Benin Teaching Hospital.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Hypertension, a chronic medical condition characterized by persistently elevated arterial blood pressure, represents a significant global public health challenge. Its insidious nature, often presenting without overt symptoms until substantial organ damage has occurred, has earned it the moniker "the silent killer." Globally, the prevalence of hypertension is staggering, affecting an estimated 1.28 billion adults aged 30 to 79 years, with a disproportionate burden observed in low- and middle-income countries (World Health Organization, 2021). This high prevalence is not merely a statistical concern; it translates directly into increased morbidity and mortality rates, primarily through its association with cardiovascular diseases such as stroke, myocardial infarction, heart failure, and chronic kidney disease (Unger et al., 2020).

The physiological mechanisms underlying hypertension are complex and multifactorial, involving intricate interactions between genetic predisposition, environmental factors, and lifestyle choices. These include, but are not limited to, dysregulation of the renin-angiotensin-aldosterone system (RAAS), increased sympathetic nervous system activity, endothelial dysfunction, and abnormalities in sodium and water homeostasis (Carey et al., 2018). The sustained elevation of blood pressure exerts excessive force on the walls of arteries, leading to structural and functional changes that predispose individuals to a cascade of adverse cardiovascular events.

The cornerstone of hypertension management lies in the effective use of antihypertensive pharmacotherapy, often coupled with lifestyle modifications. A wide array of pharmacological agents, including diuretics, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), calcium channel blockers, and others, are available to lower blood pressure and mitigate cardiovascular risk (Williams et al., 2018). However, the mere availability of these effective therapies does not guarantee optimal patient outcomes. The journey from prescription to therapeutic benefit is fraught with potential pitfalls, leading to suboptimal blood pressure control in a significant proportion of patients.

1.2 LITERATURE REVIEW

Hypertension is a pervasive global health issue. However, its manifestation and management present unique challenges within Nigeria. The definition of hypertension, remaining consistent with international guidelines (SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg), carries significant weight in a nation grappling with a rising prevalence. Epidemiological studies conducted across Nigeria have consistently revealed a substantial burden of hypertension, often with regional variations influenced by socio-economic factors, urbanization, and lifestyle patterns (Ogah et al., 2012; Akpa et al., 2016).

According to the World Health Organization (2021), an estimated 1.28 billion adults aged 30–79 years worldwide have hypertension. Notably, about 46% of these individuals are unaware of their condition, and only 42% receive a diagnosis and treatment. Of those treated, less than 21% have their blood pressure adequately controlled. The global prevalence is roughly 32% in men and 30% in women, but significant regional variations exist, with the highest rates reported in low- and middle-income countries (LMICs) where health systems are weaker, and awareness is lower.

Regional data indicate that Africa has one of the highest prevalence rates globally. The WHO African Region records an estimated 27% of adults aged 30–79 years living with hypertension, many of whom are undiagnosed or uncontrolled (WHO, 2023). This is partly due to limited access to routine screening, low awareness, and inadequate treatment infrastructure. In contrast, prevalence in high-income countries such as the United States,

Canada, and the United Kingdom has stabilized or slightly declined due to improved public health measures, lifestyle modification, and better treatment adherence (Zhou et al., 2021).

Hypertension prevalence in Nigeria varies widely, ranging from 9.2% to 70.3%, with awareness levels between 12% and 93.2%, and control rates from 21.4% to 89.9%. In Edo State, a specific study in Udo community reported a prevalence of 27.9% (Ogenekaro et al, 2021). More recent analyses show a continuing rise in prevalence over time. Odili et al. (2021**)** synthesized data from 53 studies involving over 78,000 participants and found a national crude prevalence of 30.6% (95% CI: 27.3–34.0). Their study demonstrated that the age-adjusted prevalence among adults aged 20 years and older increased from 8.6% in 1995 to 32.5% in 2020, highlighting a four-fold increase over 25 years. Furthermore, awareness, treatment, and control rates remained unacceptably low—only 29% of hypertensive individuals were aware of their status, 12% were on treatment, and 2.8% had their blood pressure controlled.

Population-based surveys provide corroborative evidence. In a nationwide survey conducted in 2017, reported an overall prevalence of 38.1% among adults aged 18 years and above, with women (41.8%) more affected than men (31.8%). The prevalence was similar in rural (37.5%) and urban (39.2%) areas, indicating that the urban–rural gap may be narrowing as rural lifestyles increasingly adopt urban characteristics (Odili et al. 2020). In specific regions, such as Edo State, a prevalence of 27.9% was found in a rural agrarian population, (Egbi et al. 2021) while a recent study in Enugu State among young adults by Nwoke and Nubila (2024) also documented rising rates of pre-hypertension and hypertension, suggesting that the burden is extending to younger age groups.

Overall, the evidence shows that hypertension in Nigeria has reached epidemic proportions, affecting roughly one in three adults. The increase is driven by modifiable risk factors such as unhealthy diets, obesity, physical inactivity, and stress, as well as inadequate screening and treatment services. The persistently low awareness and control rates highlight a significant gap in hypertension management and prevention strategies. Addressing these gaps requires comprehensive public health interventions, including nationwide screening, community-based health education, and improved access to antihypertensive medications.

Studies in Nigeria have explored the complex interplay of etiological factors contributing to hypertension. While primary hypertension remains the predominant form, research has delved into the genetic predispositions within specific Nigerian populations, investigating associations with polymorphisms in genes related to the renin-angiotensin-aldosterone system and other blood pressure regulatory pathways (Adeyemo et al., 2009). The cultural context, including dietary habits and traditional medicine practices, also warrants consideration in understanding the development and management of hypertension within the Nigerian population.

Effective management of hypertension aims to reduce blood pressure to target levels, thereby minimizing the risk of these devastating complications. This typically involves a combination of lifestyle modifications (e.g., dietary changes, weight loss, increased physical activity, smoking cessation, moderation of alcohol intake) and pharmacological therapy. The choice of antihypertensive agents is guided by individual patient characteristics, comorbidities, and the presence of compelling indications (e.g., heart failure, diabetes, chronic kidney disease) (National Institute for Health and Care Excellence, 2019). Achieving and maintaining target

blood pressure requires not only appropriate drug selection but also patient adherence to the prescribed regimen and ongoing monitoring and adjustments by healthcare professionals.

Pharmacists play a vital role in the management of hypertension by providing medication management, disease state education, and patient counseling. They can also help with medication adherence, blood pressure monitoring, and identifying potential drug interactions or contraindications. Their involvement, particularly when integrated into a patient's care team, can significantly improve blood pressure control and overall patient outcomes (Katherine Palo et al, 2018).

Drug therapy problems (DTPs) are common in hypertension management and can significantly impact patient outcomes, leading to increased healthcare costs and reduced quality of life. These problems include issues like unnecessary drug therapy, ineffective medications, incorrect dosages, and adverse drug reactions. Prevalence of DTPs in hypertensive patients can be high, with studies reporting rates ranging from 73.9% to 85.9%. A study in Lagos, Nigeria found a DTP prevalence of 77.78% (Opeyemi et al, 2023). Another study in a Nigerian hospital found the prevalence to be 85.9% (Umar Idris et al 2023). Risk factors mainly include the number of medications a patient takes, age, and uncontrolled blood pressure. Prevention strategies involve optimizing medication regimens, improving patient adherence, and addressing modifiable risk factors through lifestyle changes (Ho Anh Hien et al. 2025).

In the context of hypertension, there is strong evidence that pharmacist interventions improve both adherence and blood-pressure (BP) control — key mechanisms by which DTPs are reduced. For example, a systematic review of 35 randomized controlled trials found that pharmacist-led interventions improved BP control and medication adherence in patients with hypertension (Reeves et al, 2020). Another meta-analysis of 15 studies found that pharmacist interventions significantly reduced systolic and diastolic BP by about −4.9 mmHg and −2.6 mmHg respectively (Morgado et al 2011). These improvements are likely mediated by pharmacists identifying and resolving DTPs (e.g., ensuring the right drug and dose is selected, enhancing adherence, simplifying regimens, monitoring side-effects).

Furthermore, a review focused on the role of pharmacists in hypertension care described that pharmacists contribute via medication therapy management (MTM), patient education, lifestyle counseling, monitoring for non-adherence, adjusting antihypertensives (where permitted), and collaborative care with physicians and nurses (Katherine et al, 2018). In a Nigerian context, a randomized trial of pharmacist-led educational intervention in community pharmacies showed significant improvement in medication adherence among hypertensive patients (intervention group adherence score ~8.05 vs ~6.55 in control; $p = .0001$) and reduced monthly cost of treatment (Ayogu et al, 2022). Improvements in adherence and patient education reduce the risk of DTPs like “non-adherence” or “ineffective therapy due to non-use”.

1.2.1 Tools for the classification of Drug therapy problems.

Several classification systems are used to categorize drug therapy problems (DTPs). The most prominent include Cipolle's classification system, the Pharmaceutical Care Network Europe (PCNE) classification, and the Pharmacotherapy workup system.

- **Cipolle-Strand-Morley System:**

This system categorizes DTPs into seven main classes: unnecessary drug therapy, need for additional drug therapy, ineffective drug therapy, dosage too low, adverse drug reaction, dosage too high, and noncompliance. (Niriayo et al, 2024). It provides a comprehensive framework for identifying and addressing drug-related needs. (Cipolle et al 2004)

- **PCNE (Pharmaceutical Care Network Europe) Classification**

The PCNE tool offers a more granular approach. It categorizes DTPs based on domains and subdomains of possible causes, allowing for a more nuanced understanding of the underlying issues. PCNE also includes domains for planned interventions, acceptance of interventions, and the status of the problem. This tool is particularly useful in complex clinical settings where multiple factors can contribute to DTPs. It includes subdomains for each category, providing a more granular view of DTPs (PCNE working group, 2020)

- **Pharmacotherapy Workup (PTWU) / Minnesota System**

It typically classifies DTPs into 8 main categories:

1. Untreated Indication: Patient has a medical condition that requires drug therapy but is not receiving it.
2. Improper Drug Selection: The wrong drug is chosen for the patient's condition.
3. Subtherapeutic Dosage: The dose of the drug is too low to achieve the desired therapeutic effect.
4. Overdosage: The dose of the drug is too high, potentially causing toxicity.

5. Adverse Drug Reaction (ADR): The patient experiences an undesirable or harmful reaction to the drug.
6. Drug Interaction: Two or more drugs interact in a way that causes an undesirable effect or alters efficacy.
7. Failure to Receive Drug (Adherence): The patient is not taking the medication as prescribed (e.g., non-adherence, affordability, access).
8. Drug Use Without Indication: The patient is taking a medication for which there is no clinical need. (Wiedenmayer, K., et al. 2006)

1.2.2 Classification of Drug Therapy Problems According to PCNE Format

The PCNE classification system, with its structured approach to identifying and categorizing DTPs, has gained increasing recognition in pharmaceutical care research globally. Its application in the Nigerian context provides a standardized framework for understanding the specific medication-related challenges faced by patients.

Several studies in Nigeria have utilized or adapted the PCNE classification to investigate the prevalence and types of DTPs across various patient populations, including those with chronic diseases like hypertension. These studies have provided valuable insights into the specific problems encountered in the Nigerian healthcare setting. For instance, research has identified "Drug Use Problems," particularly related to non-adherence due to factors like cost, complex regimens, and lack of patient education, as a significant category of DTPs among hypertensive patients (Ogunleye et al., 2017). "Treatment Need" problems, such as untreated hypertension or the need for additional therapies to achieve target blood pressure, have also been frequently reported.

Studies applying the PCNE framework in Nigeria have also shed light on the "Causes" of DTPs. Prescribing-related issues, including suboptimal drug selection based on guidelines or patient comorbidities, and dose-related problems have been documented. Patient-related causes, such as inadequate knowledge about their medications and the disease, and economic constraints affecting their ability to afford medications, are also significant contributing factors (Fakeye et al., 2008). Dispensing errors, although ideally minimal, have also been reported as potential causes of DTPs in some settings.

The "Intervention" domain of the PCNE classification is particularly relevant to this study. Past research in Nigeria has explored various pharmacist-led interventions aimed at addressing identified DTPs. These include patient counseling on medication use and lifestyle modifications, medication reconciliation to identify discrepancies, communication with prescribers to suggest dose adjustments or alternative therapies, and the provision of adherence support strategies (Erhun et al., 2005). The "Outcome" of these interventions, whether accepted or not, and their impact on patient outcomes, including blood pressure control, is very important and have also been investigated in some Nigerian studies.

One of the primary benefits of the PCNE classification and the reason it was used for this study, is its multidimensional approach, which allows not only the identification of a DRP but also an understanding of its underlying causes and the interventions required to resolve it. The classification distinguishes between the type of problem, the contributing factors, and the actions taken by healthcare providers (PCNE Working Group, 2022). This is a notable improvement over systems that only document the existence of a problem without exploring

its origin or potential resolution, making PCNE more informative for both clinical decision-making and research purposes.

Understanding the application of the PCNE classification in previous Nigerian research provides a crucial foundation for this study. It allows for comparison of findings with existing data, identification of consistent patterns of DTPs in hypertensive patients, and the building upon established methodologies for DTP identification and intervention within the local healthcare context.

THE PROBLEMS

PRIMARY DOMAIN	PROBLEM
Treatment effectiveness: There is a (potential) problem with the (lack of) effect of the pharmacotherapy.	No effect of drug treatment despite correct use Effect of drug treatment not optimal Untreated symptoms or indication
Treatment safety: Patient suffers, or could suffer, from an adverse drug event.	Adverse drug event (possibly) occurring.
Other	Unnecessary drug-treatment Unclear problem/complaint. Further clarification Necessary

THE CAUSES

PRIMARY DOMAIN	PROBLEM
Drug selection : The cause of the (potential) DRP is related to the selection of the drug (by patient or health professional)	Inappropriate drug according to guidelines/formulary No indication for drug Inappropriate combination of drugs, or drugs and herbal medications, or drugs and dietary supplements Inappropriate duplication of therapeutic group or active ingredient No or incomplete drug treatment in spite of existing indication Too many different drugs/active ingredients prescribed for indication
Drug form: The cause of the DRP is related to the selection of the drug form	Inappropriate drug form/formulation
Dose selection: The cause of the DRP is related to the selection of the dose or dosage	Drug dose too low Drug dose of a single active ingredient too high Dosage regimen not frequent enough Dosage regimen too frequent Dose timing instructions wrong, unclear or missing
Treatment duration: The cause of the DRP is related to the duration of treatment	Duration of treatment too short Duration of treatment too long

Dispensing The cause of the DRP is related to the logistics of the prescribing and dispensing process	Prescribed drug not available Necessary information not provided or incorrect advice provided Wrong drug, strength or dosage advised (OTC) Wrong drug or strength dispensed
Drug use process The cause of the DRP is related to the way the patient gets the drug administered by a health professional or other carer, despite proper dosage instructions (on label/list)	Inappropriate timing of administration or dosing intervals by a health professional Drug under-administered by a health professional Drug over-administered by a health professional Drug not administered at all by a health professional Wrong drug administered by a health professional Drug administered via wrong route by a health professional
Patient related The cause of the DRP is related to the patient and his behavior (intentional or non- intentional)	Patient intentionally uses/takes less drug than prescribed or does not take the drug at all for whatever reason Patient uses/takes more drug than prescribed Patient abuses drug (unregulated overuse) Patient decides to use unnecessary drug Patient takes food that interacts Patient stores drug inappropriately Inappropriate timing or dosing intervals Patient unintentionally administers/uses the drug in a wrong way Patient physically unable to use drug/form as directed Patientunabletounderstandinstructionsproperly

Patient transfer related The cause of the DRP can be related to the transfer of patients between primary, secondary and tertiary care, or transfer within one care institution.	Medication reconciliation problem
Other	No or inappropriate outcome monitoring (incl. TDM) Other cause; specify No obvious cause

THE PLANNED INTERVENTION

PRIMARY DOMAIN	INTERVENTION
At prescriber level	Prescriber informed only Prescriber asked for information Intervention proposed to prescriber Intervention discussed with prescriber
At patient level	Patient drug counseling Written information provided (only) Patient referred to prescriber Spoken to family member/caregiver
At drug level	Drug changed to … Dosage changed to … Formulation changed to … Instructions for use changed to …

	Drug paused or stopped Drug started
Other intervention or activity	Other intervention (specify) Side effect reported to authorities

ACCEPTANCE OF THE INTERVENTION PROPOSALS

PRIMARY DOMAIN	IMPLEMENTATION
Intervention accepted (by prescriber or patient)	Intervention accepted and fully implemented Intervention accepted, partially implemented Intervention accepted but not implemented Intervention accepted, implementation unknown
Intervention not accepted (by prescriber or patient)	Intervention not accepted: not feasible Intervention not accepted: no agreement Intervention not accepted: other reason (specify) Intervention not accepted: unknown reason
Other (no information on acceptance)	Intervention proposed, acceptance unknown Intervention not proposed

STATUS OF DRP

PRIMARY DOMAIN	OUTCOME OF INTERVENTION

Not known	Problem status unknown
Solved	Problem totally solved
Partially solved	Problem partially solved
Not solved	Problem not solved, lack of cooperation of patient Problem not solved, lack of cooperation of prescriber Problem not solved, intervention not effective No need or possibility to solve problem

1.3 Pharmacist Interventions in Hypertension Management and DTP Resolution

The role of the pharmacist in the management of chronic diseases, including hypertension, has evolved significantly beyond traditional dispensing functions. Clinical pharmacists are increasingly recognized as integral members of the healthcare team, contributing their expertise in medication therapy management (MTM) to optimize patient outcomes.

Numerous studies have demonstrated the positive impact of pharmacist interventions in improving blood pressure control and reducing cardiovascular risk in hypertensive patients. These interventions can take various forms, including:

1. Medication Review: Comprehensive assessment of a patient's entire medication regimen to identify potential DTPs, such as drug interactions, therapeutic duplications,

inappropriate dosing, and untreated indications. Pharmacists can identify discrepancies between prescribed medications and guideline recommendations or patient-specific factors.

2. Patient Education and Counseling: Providing patients with clear and concise information about their medications, including their purpose, proper administration, potential side effects, and the importance of adherence. Pharmacists can address patient concerns, answer questions, and tailor education to individual needs and health literacy levels.
3. Adherence Support: Implementing strategies to improve patient adherence to their antihypertensive medications, such as simplifying regimens, providing reminders, addressing barriers to adherence (e.g., cost, side effects), and utilizing adherence monitoring tools.
4. Blood Pressure Monitoring: Providing patients with instruction on home blood pressure monitoring techniques and interpreting the results. Pharmacists can also conduct blood pressure measurements in the pharmacy setting and provide feedback to patients and prescribers.
5. Lifestyle Counseling: Reinforcing the importance of lifestyle modifications in hypertension management, such as dietary changes (e.g., DASH diet, sodium restriction), weight management, regular physical activity, and smoking cessation.
6. Collaboration with Prescribers: Communicating identified DTPs and providing evidence-based recommendations for medication adjustments, including dose optimization, switching to alternative agents, or discontinuing unnecessary medications. Pharmacists can also participate in developing and implementing hypertension management protocols.

7. Drug Information Provision: Serving as a reliable source of drug information for both patients and other healthcare professionals, ensuring that treatment decisions are based on the most current and accurate evidence.

Studies conducted in Nigeria have explored the impact of pharmacist interventions on hypertensive patients (Ogunbeku et al, 2021). These interventions have been implemented in various settings, including hospital outpatient clinics and community pharmacies. Research has consistently demonstrated the positive effects of patient counseling provided by pharmacists on medication adherence and blood pressure control (Ayogu et al, 2022). Pharmacists have been shown to effectively educate patients on the importance of taking their medications as prescribed, understanding potential side effects, and adopting recommended lifestyle modifications.

Studies have also investigated the impact of pharmacist-led medication reviews in identifying and resolving DTPs in hypertensive patients in Nigeria (Kosisochukwu et al, 2020)). These reviews often involve a comprehensive assessment of the patient's medication history, current medications, comorbidities, and laboratory values. Pharmacist recommendations to prescribers, such as adjusting drug dosages, switching to more appropriate agents based on guidelines or interactions, and discontinuing unnecessary medications, have been shown to be accepted and implemented, leading to improved blood pressure control and reduced adverse drug events (Orie et al., 2013).

Furthermore, research in Nigeria has explored the role of pharmacists in providing adherence support through various strategies, including medication reminders, simplified dosing schedules, and addressing patient-specific barriers to adherence, such as cost and access.

These interventions have demonstrated promising results in improving patients' consistency in taking their antihypertensive medications (Ibrahim et al., 2016).

Collaboration between pharmacists and physicians has also been examined in the Nigerian context. Studies have shown that when pharmacists actively communicate identified DTPs and provide evidence-based recommendations to prescribers, it can lead to more optimized treatment plans and better patient outcomes (Ajemigbitse et al., 2018). The involvement of pharmacists in multidisciplinary hypertension management teams has also been advocated for and, in some limited settings, implemented with positive results.

Studies have consistently shown that pharmacist-led interventions can lead to statistically and clinically significant reductions in systolic and diastolic blood pressure, improved medication adherence rates, increased patient satisfaction, and a reduction in the incidence of adverse drug events and hospitalizations related to uncontrolled hypertension (Santschi et al., 2011; Viswanathan et al., 2015). These findings underscore the valuable contribution that pharmacists can make to the effective management of hypertension and the optimization of patient outcomes.

Several studies have examined pharmacist intervention in drug therapy problem identification and resolution in Nigeria. For instance, Kosisochi et al (2020) conducted a study in Lagos, which revealed that Diuretics were the most commonly prescribed anti-hypertensive implicated in DTPs. The most common DTP encountered was “Effect of drug therapy not optimal”. The most common patient related DTP was non-adherence resulting from patients taking their drugs in the wrong way. A study by Rita et al (2020) showed that inappropriate adherence was the highest occurring DTP (51.5%). While 53.7% of the patients received only

patient education to resolve the drug therapy problem identified, 46.3% of them received both patient education and drug-related interventions. Blessing et al (2020) conducted a study on Identification and resolution of drug therapy problems among hypertensive patients receiving care in a Nigerian Hospital. The study revealed that the major cause of DTP was prescribing error. Other causes of drug therapy problem identified in this study were inappropriate drug selection, no indication for drugs, inappropriate drug combination, new indication presented, dose too high, dose too low, wrong drug taken/administered. Majority of the interventions made were accepted while only 0.5% of the interventions made were not accepted. The study demonstrates that a pharmacist, with adequate training and support can play a vital role in identifying and resolving drug therapy problems. Also, there is a need for an educational intervention among prescribing physicians to update them regularly on hypertension guidelines. In a similar study conducted by Aliyu et al (2018) in Benin, it was determined that a total of 171 DRPs were identified and effect of drug treatment not optimal was the highest (71.6%) DRP encountered. This has justified the introduction of pharmaceutical care interventions to hypertensive outpatients receiving care in the hospital. Akonoghrere et al(2020) in a study titled Assessment of Pharmaceutical Care Interventions in Resolving Drug Therapy Problems in a Group of Hypertensive Patients in Warri, Nigeria, showed that the reasons for patients' non-adherence to drug therapy were poor understanding of the disease and/or treatment, lifestyle issues and treatment anxiety. These were then considered and addressed during the pharmaceutical care intervention. The study showed that health educational interventions, consisting of counseling, lifestyle modifications, and encouragement of patient to participate actively in the proposed drug therapy, are beneficial in achieving treatment outcomes in hypertensive patients. It also showed that the collaboration between the pharmacist and the clinician also was essential to resolving and/or preventing DTPs in this study. Similar studies showed positive results of interventions that

lead to the resolution and prevention of DTPs, reduction of treatment costs, and overall satisfaction with pharmaceutical care program.

George et al (2021) discovered that findings revealed poor blood pressure reduction despite high level of medication adherence. This could be due to several factors, such as, duration of treatment or cost of therapy and often unpleasant medications side effects. This then indicated that poor blood pressure reduction was not related to poor medication adherence alone. High adherence and poor blood pressure reduction among the study group demonstrated that medication adherence is self-reported and may not be reliable as patients may give positive responses in order to satisfy health care workers.

However, despite the growing body of evidence supporting the benefits of pharmacist interventions in hypertension management in Nigeria, the integration of clinical pharmacists into routine care remains a significant challenge. Many studies have been conducted in specific research settings, and the translation of these findings into widespread clinical practice across diverse healthcare facilities in Nigeria is still limited. Factors such as lack of awareness among other healthcare professionals about the clinical role of pharmacists, inadequate staffing, limited infrastructure, and the absence of clear policies and frameworks for pharmacist integration contribute to this gap.

This study aims to build upon the existing body of knowledge from Nigerian research by specifically evaluating pharmacist interventions in the evaluation of DTPs within a clinical pharmacy department setting. By focusing on the systematic identification and resolution of DTPs and their impact on blood pressure control in hypertensive patients in this specific context, this research can provide further evidence to support the expansion of clinical

pharmacy services and advocate for a more integrated role for pharmacists in hypertension management across Nigeria. The detailed analysis of the types of DTPs encountered and the effectiveness of pharmacist-led interventions will provide valuable insights for tailoring pharmaceutical care services to the specific needs of hypertensive patients in the Nigerian healthcare system.

1.4 PROBLEM STATEMENT

Despite the increasing burden of hypertension in Nigeria and the availability of effective antihypertensive therapies, a significant proportion of patients continue to experience poor blood pressure control. Various studies have reported that more than half of hypertensive patients in Nigeria do not achieve target blood pressure levels, despite being on medication (Ogah et al., 2012). This suboptimal control is often linked to the presence of drug therapy problems (DTPs), including inappropriate drug selection, incorrect dosing, non-adherence, and lack of follow-up care. These DTPs compromise treatment outcomes, increase the risk of cardiovascular complications, and contribute to higher morbidity and mortality rates among hypertensive patients in Nigeria.

While clinical pharmacists are trained to detect and resolve DTPs, their integration and routine clinical care is limited in many Nigerian healthcare facilities. As a result, numerous hypertensive patients continue to face preventable complications arising from suboptimal medication management. There is an urgent need to evaluate the effectiveness of pharmacist interventions in addressing these issues to improve hypertension management and patient outcomes within the Nigerian healthcare context. Understanding the specific types and frequency of DTPs encountered by hypertensive patients in a clinical setting and the impact of pharmacist-led interventions on resolving these problems is crucial for advocating for the expanded role of pharmacists in hypertension care in Nigeria.

1.5 JUSTIFICATION OF STUDY

This study is justified by the significant public health burden of poorly controlled hypertension in Nigeria and the potential for pharmacist interventions to improve patient outcomes. The high prevalence of uncontrolled hypertension, despite the availability of effective medications, highlights a critical gap in the management of this chronic condition. By systematically evaluating the drug therapy problems encountered by hypertensive patients in a clinical setting and assessing the impact of pharmacist-led interventions on resolving these issues, this research will provide valuable insights into the specific challenges and opportunities for optimizing medication therapy in this patient population.

The findings of this study will contribute to the growing body of evidence supporting the integration of clinical pharmacists into routine patient care for chronic diseases in Nigeria. Demonstrating the effectiveness of pharmacist interventions in identifying and resolving DTPs in hypertensive patients can provide compelling data for healthcare policymakers, administrators, and other healthcare professionals to recognize and leverage the unique expertise of pharmacists. This can lead to the development of strategies and policies that facilitate the expanded role of pharmacists in multidisciplinary healthcare teams, ultimately improving the quality of care and outcomes for hypertensive patients.

Furthermore, this research will contribute to the professional development of pharmacy practice in Nigeria by highlighting the clinical skills and knowledge that pharmacists can bring to patient care. It will also provide valuable data that can inform the development of pharmacy curricula and continuing professional development programs, ensuring that future pharmacists are adequately equipped to address the complex medication management needs of patients with chronic conditions like hypertension. Ultimately, this study aims to contribute to a more patient-centered and evidence-based approach to hypertension management in Nigeria, leading to better blood pressure control, reduced cardiovascular risk, and improved quality of life for affected individuals.

1.6 OBJECTIVES OF STUDY

The primary objective of this study is to assess pharmacist interventions in the identification and resolution of drug therapy problems in hypertensive patients in a Nigerian healthcare facility.

The specific objectives of this study are to:

1. Determine the prevalence of Drug Therapy Problems among Hypertensive patients

2. Identify and classify the types and frequency of drug therapy problems encountered in hypertensive patients using the PCNE classification system.

3. Describe the pharmacist interventions implemented to address the identified drug therapy problems.

4. Assess the acceptance rate of the pharmacist interventions by patients and prescribers.

CHAPTER 2

METHOD

2.1 STUDY DESIGN

A prospective cross sectional study design aimed at evaluating pharmacist intervention in drug therapy problem identification and resolution in a hospital.

2.2 STUDY SETTING

This study was conducted in the Consultant Outpatient Patient Department (COPD) and COPD NHIS Pharmacy in University of Benin Teaching Hospital (UBTH), Benin. The

Consultant Outpatient Department (COPD) serves as a hub for various specialized clinics, where patients receive expert care from consultants in different medical fields. Hypertensive patients obtain expert care from consultants and collect their drugs from the COPD Pharmacy. Key functions of the COPD Pharmacy include accurately dispensing prescribed drugs, thorough patient counseling on proper usage and potential side effects, comprehensive evaluation of prescriptions for interactions and appropriateness, providing vital drug information, and contributing to pharmacovigilance by monitoring and reporting adverse drug reactions. UBTH is a foremost multi-specialty hospital in Benin with years of outstanding patient care, production of quality health care workforce and impactful research output. The hospital spearheads research opportunities for university lecturers and other researchers studying economic morbidity and related healthcare issues.

2.3 STUDY POPULATION AND PERIOD

The study population consists of Hypertensive patients visiting the pharmacy section of COPD in UBTH between July 2025 and August 2025, that is, a 2 months study period. The inclusion criteria are Patients > 18 years, diagnosed of Hypertension, with a prescription to be filled in the COPD pharmacy.

2.4 RESEARCH INSTRUMENT

The research instrument is a structured data collection form designed to capture the following information: Patient demographics, date the prescription was received, drugs prescribed, blood pressure measurements, Presence of DTP, drug therapy problems (classified according to PCNE working group 2022), adherence profile in the past one week, pharmacist

intervention and intervention acceptance. The data collection process was self-reported and performed by observation of pharmacist provision of pharmaceutical care services to the hypertensive patients eligible for the study, including evaluation of the patient's prescription and identifying and addressing drug therapy problems. The DTPs identified and the interventions implemented by the pharmacists were recorded and documented accurately and completely on the structured data collection form. The data collection form were pretested on a small sample of patients, 5 in number, to ensure its clarity, comprehensiveness and ease of use.

2.5 SAMPLE SIZE DETERMINATION

Sample size will be determined using formula for known population as follows.

n= sample size

N= population size (average of 340 hypertensive patients monthly in COPD and COPD NHIS pharmacy at UBTH)

Z= abscissa of the normal curve that cuts off an area ά at the tails; (1-ά) equals the desired confidence level, e.g., 95%. For a 95% confidence level, Z= 1.96

e= the desired level of precision (margin of error), 0.05 foe a 5% margin of error

p= the estimated proportion of an attribute that is present in the population.

n= 181

Using a 10% attrition rate, the total sample size needed will be,

181+18.1 = 199.1

Therefore, the sample size is approximately a minimum of 200

2.6 DATA ANALYSIS

The data collected was analyzed using SPSS software. Descriptive Statistics such as frequencies and percentage, were applied for descriptive analysis. Statistical test such as Chi-Square test was used to measure differences in variables and explore potential factors that may influence the identified DTPs. P value of <0.05 was considered significant.

2.7 ETHICAL CONSIDERATION

Ethical approval for the study was obtained from the Health Ethics Review Committee (HREC) of the University of Benin Teaching Hospital. The Protocol Number of the Ethical Approval is ADM/E 22/A/VOL. VII/1486549125539. Administrative approval was obtained from the Head of the COPD pharmacy department. Confidentiality of the patient data collected was ensured and the data was stored securely and used only for the purpose of this research study.

CHAPTER THREE

RESULT

3.1: Socio – demographic characteristic of the participants (n = 226)

Table 3.1 presents the socio-demographic characteristics of 226 participants involved in the study. As presented in the table below, the majority were between 45 - 65 years (61.9%), while participants below 45 years made up the smallest proportion. Females (59.3%) were

more represented than males (40.7%). In terms of blood pressure levels, 36.7% of participants had systolic BP below 140mmHg, while a much higher 69.5% had diastolic BP above 80mmHg.

Regarding the duration of diagnosis, over half of the participants (54.4%) had been diagnosed with hypertension for 1 - 5 years, followed by 36.7% who had lived with the condition for 5 - 15 years. When examining prescription patterns, the majority (69.5%) had 3 - 5 drugs per prescription, Meanwhile, 65.0% of participants had 1 - 2 antihypertensive drugs in their prescription.

Table 3.1: Socio – demographic characteristic of the participants

Variables	N (%)
Age	
< 45 years	36(15.9)
45 - 65 years	140(61.9)
> 65 years	50(22.1)
Gender	
Male	92(40.7)
Female	134(59.3)
Systolic Blood Pressure	
Not specified	63(27.9)
< 140mmHg	83(36.7)

> 140mmHg	80(35.4)
Diastolic Blood Pressure	
Not specified	64(28.3)
< 80mmHg	5(2.2)
> 80mmHg	157(69.5)
Period of diagnosis	
1 - 5 years	123(54.4)
> 5 - 15 years	83(36.7)
> 15 - 30 years	20(8.8)
Number of drugs in a prescription	
1 -2 drugs	69(30.5)
3 - 5 drugs	157(69.5)
Number of Antihypertensive drugs in a prescription	
1 -2 drugs	147(65.0)
3 - 5 drugs	79(35.0)

3.2: Common Antihypertensive and class of Antihypertensives prescribed

Table 3.2 presents the distribution of antihypertensive drugs prescribed to the 226 participants. The most frequently prescribed drug was Amlodipine (54.1%), followed by Valsartan (38.9%) and Spironolactone (28.3%). Other commonly used drugs included Bisoprolol (17.7%) and Indapamide (18.1%), while drugs such as Atenolol, Carvedilol, Doxazocin, and Vasopril were the least prescribed (each below 1%).

When grouped by class, Diuretics (64.2%) were the most frequently prescribed class of antihypertensives, followed by Angiotensin Receptor Blockers (ARBs) (57.9%) and Calcium Channel Blockers (CCBs) (56.7%). Beta blockers (22.5%) were moderately prescribed, whereas ACE inhibitors (11.0%), Centrally Acting Antihypertensives (2.2%), and Alpha blockers (0.4%) were less commonly used.

Table 3.2: Common Antihypertensive and class of Antihypertensives prescribed

Antihypertensive drugs	**N (%)**
Amlodipine	122(54.1)
Valsartan	88(38.9)
Spironolactone	64(28.3)
Bisoprolol	40(17.7)
Amiodarone	3(1.2)
Lisinopril	20(8.8)
Indapamide	41(18.1)
Telmisartan	15(6.6)
Frusemide	30(13.2)

Atenolol	2(0.8)
Ramipril	5(2.2)
Candesartan	15(6.6)
Torsemide	6(2.7)
Hydrochlorothiazide	6(2.7)
Methyl dopa	5(2.2)
Nifedipine	6(2.7)
Losartan	11(4.8)
Propranolol	2(0.8)
Carvedilol	1(0.4)
Amlodipine/Telmisartan/HCT	1(0.4)
Modurectic	2(0.8)
Nebivolol	5(2.2)
Labetalol	2(0.8)
Vasopril	1(0.4)
Vasatrel	1(0.4)
Doxazocin	1(0.4)
Class of Antihypertensives	
Diuretics	145(64.2)
ACEI	25(11.0)
ARBs	131(57.9)
CCBs	128(56.7)
Beta blockers	51(22.5)
Antiarrhythmic	3(1.3)
Centrally Acting Antihypertensives	5(2.2)
Alpha blockers	1(0.4)

3.3: Other Medication prescribed along the Antihypertensives medication

Table 3.3 presents the other medications that were prescribed in combination with antihypertensive drugs among the 226 participants. The most frequently prescribed medications were Clopidogrel (37.1%) and Atorvastatin (24.8%), followed by Metformin (13.7%) and Rosuvastatin (10.1%). Other medications, including Pregabalin (3.9%), Digoxin

(3.9%), and Dapagliflozin (3.5%), were prescribed to a smaller proportion of participants, while a wide range of other drugs were rarely prescribed (each below 2%).

In terms of drug classes, Antiplatelets (38.9%) were the most prescribed group, followed by HMG-CoA reductase inhibitors (statins) (32.0%) and Biguanides (13.3%), further emphasizing the co-management of hypertension with cardiovascular and metabolic risk factors. Other classes, such as Sulfonylureas (4.9%), DPP-4 inhibitors (4.3%), and Cardiac glycosides (3.9%), were less frequent, while antipsychotics, anticoagulants, and NSAIDs were prescribed to a minimal number of participants (each below 2%).

Table 3.3: Other Medication prescribed along the Antihypertensives medication

Other medications prescribed	N (%)
Rosuvastatin	23(10.1)
Clopidogrel	84(37.1)
Metformin	31(13.7)
Amiodarone	4(1.8)
Telmisartan	1(0.4)
Atorvastatin	56(24.8)
Ventolin	1(0.4)

Amitriptyline	5(2.2)
Pregabalin	9(3.9)
Digoxin	9(3.9)
Rabeprazole	5(2.2)
Vasoprin	7(3.1)
Glimepiride	7(3.1)
Co - amoxiclav	7(3.1)
Fluphenazine	1(0.4)
Gliclazide	4(1.8)
Dapagliflozin	8(3.5)
Neuracalm	5(2.2)
Gestid	2(0.8)
Risperidone	3(1.3)
Apixaban	2(0.8)
Carbimazole	2(0.8)
Levocetirizine	1(0.4)
Orphesic	1(0.4)
Calcimax	1(0.4)
Haloperidol	1(0.4)
Clarithromycin	1(0.4)
Empagliflozin	3(1.3)
Meconerve forte	3(1.3)
Vitamin E	2(0.8)
Diclofenac gel	1(0.4)
Cocodamol	1(0.4)
PCM	3(1.3)
Celebrex	2(0.8)
Benzhexol	1(0.4)
Linagliptin	1(0.4)
ACT	2(0.8)
Selenium	1(0.4)
Citocholine	1(0.4)
Tircanidin	1(0.4)
Loratidine	1(0.4)
Nat - B	1(0.4)
Warfarin	1(0.4)
Natrilix	1(0.4)

Class of drugs	**N (%)**
Antiplatelet	88(38.9)
HMG-CoA Reductase	72(32.0)
Biguanides	30(13.3)
Tricyclic Antidepressant	5(2.2)
Anticonvulsant	8(3.5)
Cardiac glycosides	9(3.9)
Proton pump inhibitors	6(2.7)
DPP-4 Inhibitors	10(4.3)
Sulfonylureas	11(4.9)

Antibiotics	8(3.5)
Antihistamine	3(1.3)
Typical Antipsychotic	2(0.8)
Atypical Antipsychotics	3(1.3)
Anticoagulant	3(1.3)
Antithyroid	2(0.8)
SGLT-2 Inhibitors	3(1.3)
Opioid Analgesic	1(0.4)
Analgesics	4(1.7)
NSAIDs	2(0.8)
Anticholinergic	1(0.4)
Antimalaria	2(0.8)
Supplement	8(3.3)

3.4: Last time Antihypertensive was taken

Table 3.4 presents information on the timing of the last antihypertensive dose taken and the frequency of missed doses among participants. The majority of participants reported taking their antihypertensive medication yesterday that is, a day before the study, (43.4%), while 28.8% took it on the morning of the survey. 23.9% had taken their medication within the

same week, and a smaller proportion (3.5%) had last taken it more than a week ago. Only 0.4% reported not taking their medication for over a month.

Regarding missed doses in the past week, the highest proportion of participants (14.2%) missed their medications three times, followed by 9.7% who missed it four times, and 7.1% who missed twice. A few participants reported missing their medications once (1.3%), while 5.8% indicated missing doses multiple times throughout the week.

Table 3.4: last time Antihypertensive was taken

Variables	N (%)
last time Antihypertensive was taken	
This morning	65(28.8)
Yesterday	98(43.4)
Within this week	54(23.9)
More than a week ago	8(3.5)
More than a month ago	1(0.4)

Number of times medications were missed in the last one week.	
Once	3(1.3)
Twice	16(7.1)
3 times	32(14.2)
4 times	22(9.7)
5 times	8(3.5)
7 times	6(2.7)
Multiple times	13(5.8)

3.5: Reason for missing medication

Table 3.5 presents the reasons for missing antihypertensive medications. The most frequently reported reason for missing medication was forgetfulness (19.0%), followed by participants who had exhausted their drugs (7.1%) and those who were distracted (5.8%). Other reasons,

such as travelling without medication (5.3%), feeling overwhelmed (2.7%), and being busy with work (1.3%), were less common. A few participants also attributed missed doses to nocturia (1.3%), fatigue from continuous drug use (0.9%), or being rushed (0.9%).

Table 3.5: Reason for missing medication

Variables	N (%)
Reason for missing medication	
Exhausted (drugs is finished)	16(7.1)
Distracted	13(5.8)
Busy with work	3(1.3)
Overwhelmed	6(2.7)

Rushed	2(0.9)
Forgotten	43(19.0)
Travelled without drugs	12(5.3)
Tired of the drugs	2(0.9)
Nocturia	3(1.3)

3.6: Drug therapy problem identified based on category and subcategory

Table 3.6 presents the prevalence of DTP, and the distribution of drug therapy problems (DTPs) identified among participants, categorized by problem type and underlying causes.

137(60.6%) prescriptions were found to contain drug therapy problems while 89 (39.4%) prescriptions showed no DTPs. For the classification, under the problem category, the majority of DTPs were classified as “Others” (49.6%), while treatment safety (6.2%) and treatment effectiveness (6.2%) issues were less frequent. In terms of problem subcategories, non-adherence (47.3%) was the most prominent issue identified, highlighting that many patients did not take their medications as prescribed. This was followed by adverse drug events (6.2%) and cases where the effect of drug treatment was not optimal (6.2%), while unnecessary drug treatment (0.4%) occurred rarely. Regarding the cause categories, most DTPs were patient-related (47.3%), emphasizing the strong influence of patient behavior and compliance on therapy outcomes. This was followed by issues linked to dose selection (11.5%), while drug selection (2.6%) and treatment duration (0.4%) contributed minimally.

At the cause subcategory level, the most common issue was that patients did not take their medications (46.9%), reflecting poor adherence. Other notable causes included dosage too low (5.3%), dosage too high (3.9%), and inappropriate combination of drugs (1.7%). Less frequent problems involved wrong dosage strength (0.8%), missing dose timing instructions (0.8%), inappropriate drug use based on guidelines (0.8%), and absence of treatment duration (0.4%).

Table 3.6: Drug therapy problem identified based on category and subcategory

Problem category	**N (%)**
Treatment Safety	14(6.2)
Treatment effectiveness	14(6.2)

Others	112(49.6)
Problem subcategory	
Adverse drug event	14(6.2)
Adherence	107(47.3)
Effect of drug treatment not optimal	14(6.2)
Unnecessary drug treatment	5(2.2)
Cause category	
Drug selection	6(2.6)
Patient related	107(47.3)
Dose selection	26(11.5)
Treatment duration	1(0.4)
Cause subcategory	
No indication for drug	1(0.4)
Patient does not take drugs	107(47.3)
Dosage too high	9(3.9)
Dosage too low	12(5.3)
Inappropriate combination of drugs	3(1.3)
Wrong dosage strength	3(1.3)
No drug duration	1(0.4)
Dose timing instruction missing	2(0.8)
Inappropriate drug according to guidelines	2(0.8)
Any drug therapy problem	
No	89(39.4)
Yes	137(60.6)

3.7: Interventions proposed by the pharmacist for each identified DTP and Outcome of pharmacist intervention.

Table 3.7 presents the various interventions proposed by the pharmacist to address the drug therapy problems (DTPs) identified among participants. The majority of interventions were made at the patient level (48.2%), followed by the prescriber level (14.6%) and the drug level (11.9%). This indicates that most issues required direct engagement with patients to improve medication use and adherence.

In terms of the description of interventions, the most common was counseling (48.2%), which focused on improving patients' understanding of their medications, adherence behavior, and lifestyle adjustments. Interventions proposed to prescribers (14.6%) were aimed at correcting or optimizing prescriptions, while dosage adjustments (11.9%) addressed instances of inappropriate dosing.

The majority of interventions resulted in patient acceptance (48.2%), indicating that most of the interventions were patient related and the participants were receptive to the recommendations and counseling provided by the pharmacist. Additionally, prescriber acceptance (14.6%) was recorded, showing that the prescribers accepted and implemented the pharmacist's suggested interventions

Table 3.7: Interventions proposed by the pharmacist for each identified DTP

Intervention type	**N (%)**
Patient level	109(48.2)

Prescriber level	33(14.6)
Drug level	27(11.9)
Description of intervention	
Counseling	109(48.2)
Intervention proposed to prescriber	33(14.6)
Dosage adjustment	27(11.9)
Outcome of pharmacist intervention	
Patient acceptance	109(48.2)
Prescriber acceptance	33(14.6)

3.8: Relationship between socio – demographic factors and occurrence of DTP

Table 3.8 shows the relationship between socio-demographic characteristics and the occurrence of drug therapy problems (DTP) among the participants. The results reveal that the period of diagnosis had a statistically significant association with the occurrence of DTP ($p = 0.008$), indicating that participants who had been diagnosed for more than five years (38.1%) were more likely to experience DTP compared to those diagnosed for less than five years (22.5%).

Although other factors such as age, gender, number of drugs in a prescription, and number of antihypertensive drugs showed no statistically significant relationship with DTP ($p > 0.05$), higher occurrences were observed among participants aged 45 - 65 years (34.9%), females (36.7%), and those with 3 - 5 drugs per prescription (40.3%). The findings suggest that a longer duration of diagnosis and polypharmacy may contribute to an increased risk of drug therapy problems among hypertensive patients.

Table 3.8: Relationship between socio – demographic factors and occurrence of DTP

Variable	Occurrence of DTP N (%)		P - Value
	No	Yes	
Age			0.256
< 45 years	12(5.3)	24(10.6)	
45 - 65 years	61(26.9)	79(34.9)	
>65 years	16(7.1)	34(15.0)	
Gender			0.624
Male	38(16.8)	54(23.9)	
Female	51(22.5)	83(36.7)	
Period of diagnosis			**0.008**
< 5 years	49(21.6)	51(22.5)	
> 5 years	40(17.7)	86((38.1)	
Numbers of drugs in a prescription			0.217
1 -2 drugs	23(10.1)	46(20.4)	
3 - 5 drugs	66(29.2)	91(40.3)	
Number of antihypertensive drugs in a prescription			0.800
1 -2 drugs	57(25.2)	90(39.8)	
3 - 5 drugs	32(14.2)	47(20.7)	

CHAPTER FOUR

DISCUSSION

This study assessed pharmacist intervention in the identification and resolution of drug-therapy problems (DTPs) among hypertensive patients at the University of Benin Teaching Hospital (UBTH), Benin City. This discussion interprets the findings according to the study objectives, compares them with existing literature, and highlights their clinical and public-health significance. Understanding how pharmacists identify, classify, and resolve DTPs in hypertension management is essential for improving therapeutic outcomes, medication safety, and the efficiency of pharmaceutical care services in Nigeria.

4.1: Prevalence of DTP Among Hypertensive Patients

This study found that the overall prevalence of Drug Therapy Problems (DTPs) among hypertensive patients at the University of Benin Teaching Hospital was **60.6%**, indicating that nearly two-thirds of patients experienced at least one drug-related issue. This figure is notably high and highlights the persistent challenges in the optimal management of hypertension in Nigerian clinical settings. The finding also emphasizes the critical role of continuous pharmaceutical care in identifying and resolving therapy-related issues before they escalate into more serious clinical outcomes.

The high prevalence observed in this study aligns closely with previous findings within and outside Nigeria. Aliyu et al. (2019) reported a DTP prevalence of **59%** among hypertensive patients in a tertiary hospital in Sokoto state, while Umar Idris et al. (2023) found an even higher rate of **85.9%** in another Northern Nigerian hospital. Similarly, Opeyemi et al. (2023) observed a prevalence of **77.78%** among hypertensive and diabetic patients in Lagos. Comparable international studies—such as those by Kusumawardani et al. (2020) in Indonesia and El Hajj and Awad (2013) in Qatar—also documented DTP rates between **55%**

and 70%, confirming that the occurrence of DTPs among hypertensive patients is a global phenomenon, particularly in developing healthcare systems.

4.2: Identification and Classification of DTP Encountered in Hypertensive Patients

Out of 226 hypertensive patients, 137 (60.6 %) had at least one documented DTP. This prevalence underscores the magnitude of medication-related challenges among hypertensive patients and reaffirms that DTPs are common in chronic disease management. The most common problem was non-adherence (47.3 %), followed by adverse-drug events (6.2 %) and sub-optimal treatment effect (6.2 %). The major causes were patient-related (47.3 %), predominantly due to patients not taking their medications (47.3 %). Hypertension is a chronic disease often requiring multiple long-term medications, and adherence tends to decline over time due to pill burden, forgetfulness, and the asymptomatic nature of the disease. These behavioral issues, coupled with limited counselling time, contribute significantly to DTPs.

This finding aligns with Aliyu *et al.* (2019), who reported non-adherence as the most common DTP (46.2 %) among hypertensive outpatients in a Nigerian tertiary hospital. Similarly, El Hajj and Awad (2013) identified poor adherence as a dominant issue in chronic-disease management across Middle Eastern primary-care settings. In Indonesia, Kusumawardani (2020) also found patient-related DTPs to account for over 40 % of total problems, confirming that adherence issues remain a universal challenge.

Non-adherence leads to poor blood-pressure control and increases the risk of cardiovascular complications and mortality. Documenting and resolving adherence-related DTPs through pharmacist-led reviews and patient education improves therapeutic outcomes and advances the World Health Organization's "Medication Without Harm" initiative (WHO 2022).

4.3: Pharmacist Intervention Implemented to Address the Identified DTPS

A total of 166 interventions were documented. Most were patient-level (48.2 %), mainly counselling (48.2 %), followed by prescriber-level (14.6 %) and drug-level (11.9 %) interventions. These findings emphasize that most DTPs among hypertensive patients are behavioral and knowledge-related, which pharmacists are strategically positioned to address. Counselling sessions enabled patients to understand the importance of adherence, correct dosing times, and the need for continuous therapy even when asymptomatic.

Because most DTPs were patient-related, pharmacists focused primarily on direct counselling to correct non-adherence, explain side-effects, and reinforce appropriate lifestyle habits. Prescriber-level interventions were fewer because Nigerian hospital pharmacists are often positioned in a consultative rather than prescribing role. Aliyu *et al.* (2019) similarly found that more than half of pharmacist interventions among hypertensive patients were educational. Morgado *et al.* (2011) demonstrated that pharmacist-led counselling and follow-up significantly improved blood-pressure control in Portugal. A systematic review by Alshahrani *et al*. (2021) also concluded that pharmacist interventions improve compliance and clinical outcomes in hypertensive patients, confirming the effectiveness of counselling-based interventions.

Patient-centered counselling reduces DTPs, enhances adherence, and improves quality of life. Strengthening the integration of clinical pharmacists into chronic-disease clinics can reduce healthcare costs through better control of hypertension and prevention of complications.

4.4: Acceptance Rate of Pharmacist Intervention by Patients and Prescribers

Acceptance of pharmacist interventions was high among patients (48.2 %) and lower among prescribers (14.6%). Patients generally appreciate pharmacist counselling and medication reviews because these directly address their health concerns. The major reason why the prescriber's acceptance rate was low is because, the interventions applied were mostly patient related and not drug related. This therefore required patient counselling and only patient acceptance. Prescriber acceptance was needed for only DTPs relating to the prescribed drugs. All interventions proposed to both patient and Prescriber were accepted.

These findings agree with El Hajj (2016), who noted strong patient acceptance but moderate physician acceptance in similar chronic-care interventions. In contrast, Ibrahim *et al.* (2023) in Malaysia reported prescriber-acceptance rates above 70 %, attributed to well-established multidisciplinary teamwork. High patient-acceptance demonstrates confidence in pharmacists as accessible healthcare providers. Improving collaboration between pharmacists and prescribers through joint ward rounds, case discussions, and shared documentation could enhance rational medicine use and optimize patient outcomes.

4.5: Relationship between Socio-demographic factors and occurrence of DTP

A key finding in this study was that the duration of hypertension diagnosis had a statistically significant relationship with DTP occurrence (**p = 0.008**). Patients who had been living with hypertension for more than five years were significantly more likely to experience drug therapy problems. This relationship can be attributed to several factors. First, longer duration of illness often correlates with disease progression and the emergence of comorbidities such as diabetes, dyslipidaemia, and chronic kidney disease, which necessitate the use of multiple drugs. This polypharmacy increases the likelihood of drug–drug interactions, inappropriate dosing, and complex treatment regimens that can confuse patients and reduce adherence. Secondly, long-term patients may develop "treatment fatigue," leading to poor motivation to

maintain strict adherence or to seek regular follow-up consultations. Over time, these behavioural and pharmacological factors combine to raise the risk of DTPs.

Although the associations between other variables and DTPs (such as age, gender, and number of antihypertensive drugs) were not statistically significant, several patterns were observed. DTPs were more common among females (36.7%) than males (23.9%). This trend could be due to gender-related differences in health-seeking behaviours, with women often being more involved in routine care but also more susceptible to anxiety about medication side effects, which may affect adherence. Conversely, some male patients tend to underreport symptoms or skip follow-up appointments, introducing a complex behavioural dimension that requires targeted interventions.

The study also revealed a higher frequency of DTPs among patients with 3–5 drugs per prescription (40.3%), demonstrating the direct influence of polypharmacy on therapy-related issues. This finding corroborates the report of Erhun et al. (2005) and Fakeye et al. (2008), who identified polypharmacy as a major risk factor for DTPs in hypertensive and diabetic patients in Nigeria. Multiple medications not only increase the risk of pharmacokinetic and pharmacodynamic interactions but also complicate dosing schedules, making adherence more difficult. Moreover, patients on complex regimens may experience higher out-of-pocket costs, which can further reduce their ability to maintain consistent therapy.

In addition, some of the DTPs observed were linked to age-related factors. Although age did not show a statistically significant correlation, patients within the 45–65 years age group (34.9%) exhibited more DTPs compared to other groups. This middle-aged population typically represents individuals balancing occupational responsibilities and family obligations, which can contribute to stress and forgetfulness in medication use. Also, the physiological changes associated with aging, such as altered drug metabolism and renal clearance, can

predispose older adults to adverse drug events or suboptimal therapeutic outcomes if dosage adjustments are not made.

From a public health standpoint, the high DTP prevalence among hypertensive patients has serious implications. Poor medication adherence and inappropriate therapy contribute directly to uncontrolled blood pressure, which remains a leading risk factor for stroke, myocardial infarction, renal failure, and premature mortality. Studies by Adibe et al. (2009) and Ajemigbitse et al. (2018) in Nigeria have shown that pharmacist-led interventions targeting these DTPs significantly improve medication adherence and blood pressure control, thus reducing the incidence of such complications.

Furthermore, the high prevalence of patient-related causes of DTPs (47.3%) in this study demonstrates that behavioural and educational factors are more influential than prescribing or dispensing errors in this population. This observation underscores the need for a stronger emphasis on patient education, continuous counselling, and regular follow-up visits. Pharmacists can serve as accessible healthcare professionals to provide these services, bridging the communication gap between patients and prescribers (Melissa Tracy, 2023).

The use of standardized frameworks such as the Pharmaceutical Care Network Europe (PCNE) classification system in this study provided a systematic method for identifying and categorizing DTPs. This approach enhances the objectivity and reproducibility of results, allowing comparison with other national and international studies. It also highlights areas where specific pharmacist interventions—such as medication review, regimen simplification, and adherence monitoring—are most needed.

Generally, the findings suggest that polypharmacy, long duration of hypertension, and patient-related factors such as non-adherence and forgetfulness are the leading predictors of DTPs among hypertensive patients. Addressing these issues requires a multifaceted strategy

that includes regular pharmacist-led medication reviews, better interprofessional collaboration, simplification of complex regimens, and integration of digital tools (such as SMS reminders or electronic adherence tracking systems). By adopting these measures, healthcare institutions can substantially reduce the burden of DTPs and improve therapeutic outcomes for hypertensive patients.

4.6 Strengths and Limitations of the Study

Strengths:

- This study provides one of the few real-world evaluations of pharmacist interventions in DTP management among hypertensive patients in a major Nigerian tertiary hospital.
- The use of the PCNE classification system ensured structured and internationally comparable categorization of drug therapy problems.
- The prospective nature of the study allowed for direct observation of pharmacist–patient interactions, lending credibility to the findings.

Limitations:

- The study was conducted in a single tertiary hospital (UBTH), which may limit generalizability to other healthcare settings, especially rural or community pharmacies.
- Self-reported adherence and recall-based responses could introduce reporting bias, as some patients might have overstated their compliance.
- The short duration of the study (two months) did not permit long-term assessment of blood pressure outcomes following pharmacist interventions.
- Resource limitations restricted the inclusion of laboratory and biochemical data that could further strengthen the evaluation of treatment effectiveness.

- Despite these limitations, the findings remain robust and contribute significantly to the evidence base supporting pharmacist involvement in chronic disease management.

CHAPTER FIVE

CONCLUSION

This study assessed the pharmacist's role in identifying, documenting, and resolving drug-therapy problems (DTPs) among hypertensive patients receiving care at the University of Benin Teaching Hospital (UBTH). The findings revealed a high prevalence of DTPs (60.6%), with non-adherence (47.3) emerging as the most common problem. Majority of the DTPs were patient-related and were addressed by pharmacists.

Pharmacists made significant contributions toward improving treatment outcomes through a variety of interventions, particularly patient-level counselling, which directly addressed adherence barriers. Importantly, this study also found a statistically significant association between duration of hypertension and DTP occurrence, suggesting that longer duration and polypharmacy increase the likelihood of therapy-related problems.

Overall, this study highlighted the vital role of pharmacists in promoting rational drug use, enhancing adherence, and improving blood-pressure control among hypertensive patients. Strengthening clinical-pharmacy practices, encouraging multidisciplinary teamwork, and institutionalizing pharmacist-led medication reviews can significantly reduce medication errors, prevent complications, and improve the overall quality of hypertension care in tertiary hospitals.

RECOMMENDATION

- Pharmacist should conduct regular medication review for hypertensive patients to identify and prevent potential DTPs early.
- Hospital management should encourage routine interprofessional ward rounds enabling pharmacist to collaborate more closely with prescribers
- The federal ministry of health should provide support for expanding clinical pharmacy units across tertiary and secondary hospitals in Nigeria.
- Structured documentation tools for recording and monitoring DTPs should be adopted in all hospital pharmacies to enhance continuity of care.

REFERENCE

Adibe, M. O., Aguwa, C. N., Ukwe, C. V., & Udeogaranya, P. O. (2009). 'Impact of pharmaceutical care on blood pressure control and quality of life of hypertensive patients in a Nigerian teaching hospital'. Pharmacy Practice (Granada), 7(3), 163–168.

Adeniyi, O.A., Eniade, O.D., Olarinmoye, A.T., Abiodun, B.A., Okedare, O.O., Eniade, A.A. & Atolagbe, J.E., (2023). 'Prevalence and associated factors of hypertension among type-2 diabetes mellitus patients in LAUTECH Teaching Hospital, Osogbo, Nigeria'. *African Health Sciences*, 23(4), pp.324-332.

Adeyemo, A., Gerry, N.P., Chen, G., Herbert, A., Doumatey, A., Huang, H., Zhou, J., Lashley, K., Chen, Y., Christman, M.F., Rotimi, C. (2009). 'A Genome-Wide Association Study of Hypertension and Blood Pressure in African Americans'. PLoS Genetics, 5(7), e1000564.

Ajemigbitse, A. A., Erhun, W. O., & Fasanmade, O. A. (2018). 'Pharmaceutical interventions in the management of hypertension in a Nigerian tertiary hospital'. Journal of Pharmaceutical Policy and Practice, 11(1), 1–7.

Akonoghrere, R.O., Aghoja, O.C., Betiku, O.B. & Oparah, A.C., (2020). 'Assessment of Pharmaceutical Care Interventions in Resolving Drug Therapy Problems in a Group of Hypertensive Patients in Warri, Nigeria'. Int. J. Forensic Med. Invest., 4(2), pp.36–

Aliyu, S., Biambo, A.A., Usman, N. & Aliyu, H.H., (2018). 'Drug related problems and implications for pharmaceutical care interventions in hypertensive out-patients in a Nigerian hospital'. *Journal of Science and Practice of Pharmacy*, 5(2), pp.281–286.

Alshahrani, A. M., Al- Nasser, M. S., Alhawashi, S. T., Alqahtani, S., Alqahtani, A. A., & Alqahtani, S. S. (2021). 'Hypertensive patient compliance with pharmacist intervention: A systematic review'. Journal of Pharmaceutical Research International, 33(39B), 85–97.

Ayogu, E.E., Yahaya, R.I., Isah, A. & Ubaka, C.M., (2023). 'Effectiveness of a pharmacist- led educational intervention on health outcomes in hypertension management at community pharmacies in Nigeria: a two- arm parallel single- blind randomized controlled trial'. British Journal of Clinical Pharmacology, 89(2), pp.649- 659

Blessing O.U, Adibe P.M (2020)., "Identification and resolution of drug therapy problems among hypertensive patients receiving care in a Nigerian Hospital – a pilot study." Annals of Clinical Hypertension, 2020; 4: 020- 023

Carey, R.M., Muntner, P., Bosworth, H.B. & Whelton, P.K., (2018). 'Prevention and Control of Hypertension': JACC Health Promotion Series. Journal of the American College of Cardiology, 72(11), pp.1278–1293.

Cipolle, R.J., Strand, L.M. & Morley, P.C., (2004). Pharmaceutical Care Practice: The Patient-Centered Approach to Medication Management. 2nd ed. New York: McGraw-Hill.

Egbi, O.G., Ahmed, S.D. & Madubuko, R., (2021). 'Prevalence and biosocial determinants of hypertension in a rural population in Edo State, Southern Nigeria'. African Journal of Primary Health Care & Family Medicine, 13(1), a2833

El Hajj, M.S., Al-Saeed, H.S. and Khaja, M., (2016). 'Qatar pharmacists' understanding, attitudes, practice and perceived barriers related to providing pharmaceutical care. International journal of clinical pharmacy', 38(2), pp.330-343.

Erhun, W. O., Babalola, O. A., & Erhun, M. O. (2005). 'Drug therapy problems in elderly Nigerian patients with hypertension and diabetes'. Pharmacy World & Science, 27(4), 285–291.

Fakeye, T. O., Adisa, R., & Musa, I. O. (2008). 'Drug therapy problems in ambulatory patients with hypertension in Nigeria'. Pharmaceutical Care in Developing Countries, 79–92.

George, B.I., Lenchi, O.A. & Tari-Oki, U.P., (2021). 'Knowledge of hypertension and practice of hypertension control among hypertensive patients in University of Port Harcourt

Teaching Hospital (UPTH), Nigeria'. African Journal of Health, Nursing & Midwifery, 5(1), pp.64-77.

Ibrahim, M. S., Ibrahim, A. R., & Imam, A. A. (2016). 'Impact of pharmacist-led intervention on medication adherence and blood pressure control among hypertensive patients in a Nigerian hospital'. Journal of Pharmaceutical Health Services Research, 7(1), 3–9.

Ibrahim, U.I., Al-amin, M.C., Hassan, A.M., Wada, A.S. and Jamil, A.K.A.B.A., (2023). 'Drug Therapy Problem: Prevalence and Associated Risk Factors Among Hypertensive Patients'. International Journal, 10(3), pp.2719-2726.

Katherine E. Di Palo & Troy Kish, (2018). "The role of the pharmacist in hypertension management", published in Current Opinion in Cardiology (2018; 33(4): 382- 387)

Kosisochi, A., Ebere, A., Deborah, A. (2020). 'Evaluation of Drug Therapy Problems Among Hypertensive Patients In a Nigerian Secondary Healthcare Centre', 54(2):39-48.

Kusumawardani, L.A., Andrajati, R. and Nusaibah, A., (2020). Drug-related problems in hypertensive patients: A cross-sectional study from Indonesia. Journal of Research in Pharmacy Practice, 9(3), pp.140-145.

Hien, H.A., Tam, N.M., Van Minh, H., Binh Thang, T., Phuoc Hoang, L., Heytens, S., Devroey, D. & Tien, H.A., (2025). 'Factors influencing medication adherence among hypertensive patients in primary care settings in Central Vietnam'. A cross-sectional study. *PLOS ONE*, 20(1), e0307588.:

National Institute for Health and Care Excellence, (2019). 'Hypertension in adults: diagnosis and management' (NG136). London: NICE. Available at: https://www.nice.org.uk/guidance/ng136 Accessed 10 November 2025].

Morgado, M., Rolo, S. and Castelo-Branco, M., (2011). 'Pharmacist intervention program to enhance hypertension control': a randomised controlled trial. International journal of clinical pharmacy, 33(1), pp.132-140.

Niriayo, Y.L., Kifle, R., Asgedom, S.W., et al., (2024). 'Drug therapy problems among hospitalized patients with cardiovascular disease'. BMC Cardiovascular Disorders, 24, p.50. https://doi.org/10.1186/s12872-024-03710-8

Nwoke, O.C., Nubila, N.I., Ekowo, O., Nwoke, N.C., Okafor, E.N. & Anakwue, R.C., (2024). 'Prevalence of Prehypertension, Hypertension, and its Determinants Among Young Adults in Enugu State, Nigeria'. Nigerian Medical Journal, 65(3), pp.242–254.

Odili, A.N., Chori, B.S., Danladi, B., Nwakile, P.C., Okoye, I.C., Abdullahi, U., Nwegbu, M.N., Zawaya, K., Essien, I., Sada, K., Ogedengbe, J.O., Aje, A. & Isiguzo, G.C., (2020).

‘Prevalence, awareness, treatment and control of hypertension in Nigeria: data from a nationwide survey *2017’.* Global Heart, 15(1), p.47.

Ogah, O.S., Okpechi, I.G., Chukwuonye, I.I., Akinyemi, J.O., Oladapo, O.O., Falase, A.O., et al., 2012. ‘High prevalence of hypertension in Nigeria’: a systematic review. *PLOS ONE*, 7(1), e29217. https://doi.org/10.1371/journal.pone.0029217

Oghenekaro G. Egbi, Sulaiman D. Ahmed, Roli Madubuko (2021) ‘Prevalence and biosocial determinants of hypertension in a rural population in Edo State’. 13(1);2833

Ogunleye, O. O., Fadare, J. O., Desalu, O. O., Ogunleye, T. M., & Eniola, O. (2017). ‘Drug therapy problems and medication adherence among ambulatory patients with hypertension in a Nigerian tertiary hospital’. Journal of Basic and Clinical Pharmacy, 8(4), 107–112.

Ogunbeku, A., Showande, S.J., Adisa, R. & Fakeye, T.O., (2021). ‘Tailored intervention to implement the management of hypertensive and type 2 diabetes mellitus patients in community pharmacies – a pilot study’. International Journal of Pharmacy Practice, 29 (Supplement_1), i47–i48.

Opeyemi A. Adejare, Olubusola A. Olugbake. (2023). ‘Assessment of Drug Therapy Problems among Hypertensive and Diabetic patients attending Lagos island general hospital, Lagos, Nigeria’. 34(1) 83-93

Orie, O. O., Familoni, O. B., & Olayemi, O. (2013). ‘Impact of pharmacists’ interventions on drug therapy in hypertensive patients attending a Nigerian teaching hospital’. Pharmacy Practice (Granada), 11(3), 149–154.

Pharmaceutical Care Network Europe (PCNE), 2020. PCNE Classification V9.1: Drug-Related Problems. Available at: https://www.pcne.org/working-groups/3/drug-therapy-problem-classification [Accessed 10 November 2025]

Reeves, L., Robinson, K., McClelland, T., Adedoyin, C.A., Broeseker, A. & Adunlin, G., (2020). 'Pharmacist interventions in the management of blood-pressure control and adherence to antihypertensive medications: a systematic review of randomized controlled trials'. Journal of Pharmacy Practice, 34(3), pp.480-492.

Samaila, A., Biambo, A.A., Usman, N. and Aliyu, H.H., (2019). 'Drug related problems and implications for pharmaceutical care interventions in hypertensive outpatients in a Nigerian hospital'. J Sci Pract Pharm, 5(2), pp.281-6.

Santschi, V., Chiolero, A., Colosimo, A., Décarie, Y., Shahian, S., Paradis, G. & Burnand, B., (2011). 'Impact of pharmacist care on blood pressure control in outpatients with hypertension: A systematic review and meta-analysis of randomized controlled trials'. American Journal of Health-System Pharmacy, 68(3), pp.241-253.

Tracy M. (2023). 'The role of pharmacists in healthcare: bridging the gap between patients and medications'. J Clin Res Pharm. 2023; 6(4):165

Unger, T., Borghi, C., Charchar, F., Khan, N.A., Poulter, N.R., Prabhakaran, D., (2020). '2020 International Society of Hypertension global hypertension practice guidelines. Hypertension', 75(6), pp.1334–1357**.**

Viswanathan, M., Kahwati, L.C., Golin, C.E., Blalock, S.J., Coker- Shrumay, S., & … Lohr, K.N., (2015). 'Medication adherence interventions: comparative effectiveness review and meta- analysis'. Annals of Internal Medicine, 162(2 Suppl), S1- S56

Wiedenmayer, K., Summers, R.S., Mackie, C.A., Gous, A.G.S., Everard, M. & Tromp, D., (2006). 'Developing Pharmacy Practice: A Focus on Patient Care. Geneva: World Health Organization'**.**

Williams, B., Mancia, G., Spiering, W., Agabiti Rosei, E., Azizi, M., Burnier, M., … Zanchetti, A., (2018). 2018 ESC/ESH Guidelines for the management of arterial hypertension. European Heart Journal, 39(33), pp.3021–3104. https://doi.org/10.1093/eurheartj/ehy33

World Health Organization, (2021). Hypertension. Geneva: World Health Organization. Available at: https://www.who.int/news-room/fact-sheets/detail/hypertension [Accessed 10 November 2025].

World Health Organization, (2022). Medication Without Harm: WHO Global Patient Safety Challenge on Medication Safety – Progress Report 2022. Geneva: World Health Organization. Available at: https://www.who.int/initiatives/medication-without-harm [Accessed 10 November 2025]

Zhou, S., Hu, S., Ding, K. et al., (2024). 'Occupational noise and hypertension in Southern Chinese workers: a large occupational population- based study'. *BMC Public Health*, 24, 541

APPENDIX

QUESTIONNAIRE ON ASSESSMENT OF PHARMACIST INTERVENTION IN THE EVALUATION OF DRUG THERAPY PROBLEMS AMONG HYPERTENSIVE PATIENTS AT THE UNIVERSITY OF BENIN TEACHING HOSPITAL, BENIN CITY.

Date of Data Collection: (DD/MM/YYYY) ____/____/____

SECTION A: Patient Prescription Information

1. Age (in years): ____
2. Gender: a) Male b) Female
3. Last Blood pressure reading:
4. Date of Prescription: (DD/MM/YYYY) ____/____/____
5. Period of diagnosis:
6. Number of drugs in the prescription:
7. Number of Antihypertensives:
8. Current Antihypertensive Medications Prescribed:

NAME OF MEDICATION	STRENGTH	DOSAGE FORM	DOSAGE FREQUENCY	ROUTE OF ADMINISTRATION

9. Other Medications Prescribed (for other comorbidities): (Record all non-antihypertensive medications)

NAME OF MEDICATION	STRENGTH	DOSAGE FORM	DOSAGE FREQUENCY	ROUTE OF ADMINISTRATION	INDICATION

10. Last time antihypertensive meditation was taken:
    (a) This morning (b) Yesterday (c) Within this week (d) More than a week ago (e) More than a month ago
11. Number of times meditation was missed in the last one week:
12. Reason for missing medication:

SECTION B: Pharmacist Intervention

13. Any Drug Therapy Problem? a) Yes b) No
14. Drug Therapy Problems (DTPs) Identified by the Pharmacist (using PCNE Classification):

DTP NO.	PROBLEM CATEGORY	PROBLEM SUBCATEGORY	CAUSE CATEGORY	CAUSE SUBCATEGORY	DESCRIPTION OF DTP

15. Intervention(s) Proposed by the Pharmacist for each Identified DTP:

DTP NO.	INTERVENTION TYPE	DESCRIPTION OF INTERVENTION

16. Outcome of Pharmacist Intervention (Observed during or immediately after consultation):

DTP NO.	PRESCRIBER ACCEPTANCE (YES/NO)	ACTION TAKEN

17. If the intervention was not fully accepted by the patient or prescriber, note the reason(s) if apparent:

a) Patient-related reason: _____

b) Prescriber-related reason: _____

c) Other reason: _____