ASSESSMENT OF POLYPHARMACY AND DEPRESCRIBING STRATEGIES IN GERIATRIC WITH CHRONIC DISEASES IN THE UNIVERSITY OF BENIN TEACHING HOSPTIAL

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CERTIFICATION

This is to certify that this project work, was carried out by **ETI AKPEVWE GODSWILL** with the matriculation number **PHA1908501** in the Department of Clinical Pharmacy Practice, Faculty of Pharmacy, University of Benin, Benin-city, in partial fulfillment of the requirements for the award of Doctor of Pharmacy (Pharm.D) Degree

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DEDICATION

I dedicate this work to GOD ALMIGHTY for seeing me through pharmacy school: to my lovely Mother, Mrs. ETI, whose prayers and massive support played a huge role in my scaling through pharmacy school, and to all my siblings and friends who made this journey easier one way or the other

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I begin by expressing my profound gratitude to GOD ALIMIGTHY for the gift of life, for strength, for wisdom for everything, words fail me to actually express how grateful I am looking back and see how far I have come I know with all my heart that it wasn't because of my strength or intellect but through divine intervention and for that I am forever grateful LORD.

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ABSTRACT

Background Polypharmacy—commonly understood as someone taking five or more medicines at the same time—has become a major concern in geriatric populations with chronic diseases, contributing to increased risks of adverse drug reactions, harmful drug interactions, poor medication adherence, and an overall decline in a person's quality of life. In Nigeria, where healthcare systems face challenges like reduced access to specialized geriatric care and increased rates of inappropriate prescribing, the prevalence of polypharmacy remains understudied. Deprescribing—the supervised withdrawal or dose reduction of unnecessary or potentially harmful medications—offers a promising strategy to optimize pharmacotherapy, but its implementation is influenced by patient attitudes, healthcare provider practices, and systemic barriers. This study evaluates the extent of polypharmacy and explores deprescribing opportunities among geriatric patients with chronic diseases at the University of Benin Teaching Hospital (UBTH), a tertiary care facility in southern Nigeria.

Objective: The primary aim was to determine the prevalence and associated factors of polypharmacy in geriatric patients with chronic conditions. Secondary objectives included assessing patients' attitudes toward deprescribing, identifying potentially inappropriate medications (PIMs) using established criteria (STOPP/START).

Method: A cross-sectional, observational study was conducted. Participants were geriatric greater than 60 years. Data were collected using structured questionnaires containing demographics information, medication use, patients' attitude towards deprescription and an investigator filled portion containing details on comorbidities, specific medication (including OTC), Patients diagnosis, PIMs. The PIMs were identified using the START/STOPP criterial. Statistics analysis used were descriptive (frequencies, means, percentage) with inferential statistics (chi square) to explore association between polypharmacy and factor like age, comorbidities etc

RESULTS: The results from the study shows of the 240 geriatric patients (mean age 70.38 ± 4.13 years; 56.3% male) at UBTH, Nigeria: Sociodemographic: Predominantly 60–79 years (96.6%), with primary/secondary education (75.4%). Comorbidity Count: 86.7% had ≥1 comorbidity (most common: 2–4); significant age variation (χ^2=27.487, p=0.025). Polypharmacy: 74.2% (178/240) on ≥5 medications; moderate positive correlation with comorbidities (r=0.517, p<0.01; χ^2=215.89, p<0.001). No gender difference. PIMs: 20% (48/240) had ≥1 PIM (72.9% inappropriate use, 27.1% drugs to avoid); increased with drug count (highest at 8 drugs: 69.2%; χ^2=46.091, p<0.001). Deprescribing Attitudes: Highly positive (mean score 3.70 ± 0.31); 98% trusted doctor, 93.3% willing to stop meds if advised, 65.5% felt over-medicated, 68.4% concerned about side effects.

CONCLUSION: Polypharmacy is alarmingly prevalent (74.2%) among elderly Nigerian patients with chronic multimorbidity, strongly linked to comorbidity burden and associated with a high rate of PIMs (20%). Patients exhibit strongly positive attitudes toward deprescribing, driven by trust in physicians. Routine PIM screening (STOPP criteria) and physician-led deprescribing interventions are urgently needed to reduce pill burden, minimize risks, and increase quality of life in this vulnerable population.

CHAPTER ONE

1.1 BACKGROUND

Polypharmacy has become a global issue and an upsurge in public health concern (Schenker et al., 2019). It is the concurrent use of greater than or equal to 5 medications by a single patient, most commonly among older adults. While it is commonly described as taking five or more medications at the same time, there is no universally accepted definition (Masnoon et al., 2017). Some authors describe it as the using of medications that are not warranted for the patient's medical conditions (Zarowitz et al., 2005). In developing nations such as Nigeria, the incident of polypharmacy is increasing due to the growing elderly population (Tanyi et al., 2018). Estimates suggest that between 25% and 35% of older Nigerians use five or more prescribed or over-the-counter medicines (Akande-Sholabi et al., 2018a)

Potentially inappropriate medications (PIMs) are those that potential risks outweigh the benefits, especially when safer alternatives are available (Renom-Guiteras et al., 2015). Both polypharmacy and PIMs have been associated to an elevated chances of adverse drug reactions, hospital admissions, and increased morbidity and mortality (Reeve, 2020). To address these risks, the concept of deprescribing has gained attention. Deprescribing involves the systematic discontinuation of unnecessary drugs to work with a healthcare professional to cut down on unnecessary medications and help the patient achieve better overall health outcomes. (Reeve, 2020). This typically includes obtaining a detailed medication history, identifying nonessential drugs, recognizing the usefulness of withdrawal, safely discontinuing the medication, and monitoring the patient's response during and after the process (Reeve, 2020).

Emerging evidence supports the safety and effectiveness of deprescribing; however, implementing it in routine clinical care remains difficult (Reeve, 2020; Reeve et al., 2017). Barriers have been reported from both healthcare providers and patients, including inadequate resources and support systems for deprescribing (Zechmann et al., 2019; Conklin et al., 2018). Consequently, quite a number of criteria have been developed to guide in incorporation of deprescribing into practice (Reeve, 2020). Although polypharmacy and the use of potentially inappropriate medications are increasing in Nigeria, deprescribing practices are still not routinely or systematically applied

Nigeria, a West African developing nation, faces persistent challenges in its healthcare sector (Muanya & Onyenuchaya, 2021). With a population of roughly 200 million and a doctor-to-patient ratio of 1:5,000—far exceeding the World Health Organization's recommendation of 1:600—the healthcare system is under significant strain (Muanya & Onyenuchaya, 2021). Additional obstacles include a disorganized drug distribution network, poor adherence to medical advice, and lapses in professional ethics among healthcare workers (Boluwaduro, 2021; Muhibi, 2010).

In Nigeria's clinical settings, polypharmacy is quite common. Individuals who take six to twelve medications face a much greater likelihood of experiencing adverse drug events compared to those using fewer medications (Steinman et al., 2006). A study by Akande and Ologe (2007) revealed that polypharmacy—particularly when injectable drugs were involved and the underutilization of essential, life-saving medications were prevalent in a secondary healthcare facility located in the North-Central region of the country. According to Igbinomwanhia et al. (2017), the main determinants of polypharmacy include patients' age, educational attainment, and medical diagnosis. The consequences of polypharmacy are diverse, encompassing issues such as poor adherence to treatment, drug dependence, and harmful drug–drug interactions (Igbinomwanhia et al., 2017).

The concept of poly-pharmacy, first noted over 150 years ago, originally described problems associated with the use of multiple medication and excessive drug consumption. Over time, its meaning has shifted to encompass various issues, including unnecessary medication use and drugs taken without medications justification. Recent studies suggest that polypharmacy is commonly defined as the use of five or more medications. This threshold is linked to an increased risk of negative outcome in older adult. (Varghese and Isihda and Haseer)

The WHO notes that although polypharmacy is often defined by numbers, the real focus should be on evidence-based care and minimizing inappropriate medication use. The United States remains one of the countries with the highest per-capita medication use.

Traditionally, polypharmacy has been viewed as something to avoid due to its association with inappropriate prescribing. However, emerging research indicates that when medication is carefully selected and managed to meet specific therapeutic goals polypharmacy can help reduced unplanned hospital admission. For instance, patient with six or more comorbidities taking four or more correct medication are just as at much risk of hospitalization as one taking just two or three drugs.

Polypharmacy, sometimes referred to as polytherapy, has become significant public health personal health, gather reliance on healthcare service, risking expenses (Fried et al. 2104). It increases the likelihood of adverse drug reaction, harmful drug leading to negative impact on health outcome and increases chances of developing, condition like frequent hospitalization, institutional placements, and elevated healthcare costs (Maher et al.2014). Consequently, polypharmacy is recognized as "one of the most significant challenges in prescribing" (Payne and Avery, 2011).

Even though the elderly population makes up a small percentage of the population they are the most prone to polypharmacy due to many reasons the major of which will be co morbidity which is the occurrence of more than one disease at the same time. This often results in multiple medications being prescribed to manage various conditions, which contributes to polypharmacy.

Deprescribing is a deliberate and structured process designed to manage polypharmacy, eliminate potentially inappropriate medications (PIMs), and improve patient health outcomes (Page et al., 2016, 2018a). Unlike the unintentional omission of necessary prescriptions by healthcare providers or the non-adherence of patients to treatment plans, deprescribing is characterized by its goal of achieving a positive therapeutic outcome (Page et al., 2018b). When multiple medications are candidates for discontinuation, it is generally recommended that each drug be withdrawn one at a time—typically at monthly intervals—to allow clinicians to attribute any emerging symptoms or clinical changes to a specific medication (Page et al., 2018b). However, in cases involving adverse drug reactions or when the risk of withdrawal effects is minimal (such as with dietary supplements), two or more medications may be stopped simultaneously.

Polypharmacy highlights the importance of regular medication reviews by prescribers, which often lead to deprescribing interventions. Multimorbidity further explains this trend, since

patients with multiple chronic conditions face a higher risk of drug–disease interactions, where a medication for one illness may aggravate another (Schuling et al., 2012). Additionally, unnecessary medication use often increases when patients see multiple prescribers or attend several healthcare facilities. This situation can lead to poor communication between healthcare providers, resulting in the continued use of medications that should have been deprescribed to prevent adverse outcomes (Ailabouni et al., 2016). Improving coordination among prescribers and healthcare institutions can help reduce medication errors and enhance adherence to deprescribing protocols (Reeve & Wiese, 2014).

Medication discontinuation should particularly prioritize older adults, as they are more susceptible to polypharmacy, experience frequent transitions of care, and often receive prescriptions from multiple healthcare providers (Reeve et al., 2015). Given Nigeria's growing elderly population, there is a pressing need to strengthen deprescribing practices across the nation.

However, there is limited information on Nigerian prescribers' familiarity with appropriate prescribing guidelines and the use of screening tools for older patients. Fadare et al. (2019) examined physicians' knowledge of potentially inappropriate medication (PIM) screening tools and found that, while 85% of the 105 respondents felt confident in their ability to prescribe appropriately for older adults, only 20% and 15.6% were aware of the Beers and STOPP criteria, respectively. This finding highlights a substantial knowledge gap among Nigerian physicians concerning tools used to identify PIMs, which may hinder the effective implementation of deprescribing practices in healthcare settings. Addressing this deficiency through education and policy initiatives is essential to promote safer medication use in the elderly population.

1.2 LITERATURE REVIEW

ASSESSMENT OF POLYPHARMACY AND DEPRESCRITION STRIATEGIES IN GERIATIC PATIENTS

Several studies have carried out on the assessment of poly pharmacy and deprescription strategies in geriatric patients a few will be highlighted below

Polypharmacy is a common concern in Nigerian healthcare, with patients taking six to twelve medications facing a higher likelihood of adverse drug events than those on fewer drugs (Steinman et al., 2006). Research by Akande and Ologe highlighted that polypharmacy—especially involving injectable medications—alongside the underuse of essential drugs, was widespread in a secondary healthcare facility in Nigeria's North-central region (Akande and Ologe, 2007). Factors such as age, educational level, and specific medical diagnoses were identified as significant contributors to polypharmacy (Igbinomwanhia et al., 2017). These patterns are associated with multiple clinical challenges, including medication non-adherence, dependency, and harmful drug interactions (Igbinomwanhia et al., 2017).

Fadare et al. (2018) investigated the prevalence of potentially inappropriate medications (PIMs) among elderly outpatients (aged 65 and above) at a rural hospital in south-west Nigeria using Beers' criteria. In their prospective cross-sectional study of 220 patients, WHO guidelines were applied to assess drug-use patterns. The results showed a total of 837 medications prescribed, averaging 3.8 ± 1.3 drugs per patient, with 56 patients (25.5%) receiving at least one PIM, including antihistamines, NSAIDs, and amitriptyline (Fadare et al., 2013). A later study by Fadare et al. (2015a) extended this work to two tertiary healthcare centers in South-Western Nigeria, evaluating PIM prevalence using both Beers' and STOPP (Screening Tools of Older Person's Prescriptions) criteria. According to Beers' criteria, 30.3% of 350 patients had received at least one PIM, whereas the STOPP criteria identified 15.7% of patients with a potential PIM (Fadare et al., 2015a).

Saka et al. (2018) utilized the 2015 updated Beers' criteria to evaluate potentially inappropriate medications (PIMs), drug–drug interactions, and their association with polypharmacy among elderly Nigerian patients (aged 60 years and above) with chronic conditions. Conducted at Olabisi Onabanjo University Teaching Hospital, the study involved a retrospective review of 352 patient prescriptions. Findings revealed that 35.2% of patients received at least one PIM, 5.7% experienced drug–drug interactions, and more than half (54.5%) were subject to polypharmacy. Importantly, the presence of PIMs was strongly associated with both drug–drug interactions and polypharmacy (Saka et al., 2018).

In a similar study, Akande-Sholabi et al. (2018b) examined PIM prevalence among 400 elderly patients with multiple comorbidities at University College Hospital, Ibadan, using the same Beers' 2015 criteria. Their results showed that 81.5% of participants were prescribed one PIM, 17.7% received two, and 0.8% were prescribed three, with NSAIDs and benzodiazepines being the most frequently prescribed PIMs (Akande-Sholabi et al., 2018b).

Saka et al. (2019) carried out a comparative study examining the prevalence of potentially inappropriate prescribing (PIP) and its contributing factors among older adults at university teaching hospitals in Nigeria and South Africa. Using the 2015 American Geriatrics Society (AGS) Beers Criteria, the study assessed 680 participants and found that PIP affected 35.2% (124 of 352) of Nigerian patients and 29.6% (97 of 328) of South African patients. The analysis also identified a significant link between hypertension and the risk of PIP. These results highlight the need for deprescribing strategies to optimize medication use in elderly populations.

In a related study, Akande-Sholabi et al. (2020) investigated potentially inappropriate prescribing (PIP) among ambulatory elderly patients and compared the performance of different prescribing assessment tools, including the Beers Criteria, and the STOPP/START tools. Using the 2015 AGS Beers Criteria and version 2 of the STOPP/START tools, the researchers assessed both PIP and potential prescribing omissions (PPOs). They reported an average of 4.2 medications per patient. The Beers Criteria identified PIP in 26.5% of prescriptions, while the STOPP tool detected PIP in 57.1% of cases. The START tool found 29 PPOs across 15 prescriptions (4.4%). Additionally, polypharmacy was significantly associated with PIP in both the Beers and STOPP evaluations (Akande-Sholabi et al., 2020). Together, these findings underscore the high prevalence of PIP and polypharmacy among elderly patients, even when assessed using standardized international screening tools.

Gallagher et al. (2020) investigated polypharmacy in southern Ireland by comparing an intervention group (IG) and a control group (CG). The intervention group included 200 patients with an average age of 74.5 years, each taking approximately nine medications. The control group contained 200 patients averaging 77.0 years and 10.8 medication each. The tool used was the STOPP criteria and START criteria. The outcome measures included PMI (Potentially Inappropriateness of Medication) % reduction from admission to discharge: IG (71%) and that

for CG (35.4%). Death of patient between the groups after 6 months was IG (5.3%) and CG (7.3%)

Herawati et al. (2020) conducted a study in Indonesia to assess polypharmacy by comparing an intervention group (IG) with a control group (CG). The IG group contained 30 patients averaging 72.5 years and 9.8 medication each and the CG group contained 33.6 patients averaging 67.8 years and 5 medication each. The outcome measure includes the GernonotoNet ADR risk score. The IG group got a mean score of 3.33 and the CG group got a mean score of 5.18 indicating that the risk of ADR is more in CG group than IG group

Lee et al. conducted a study in South Korea to evaluate polypharmacy using an intervention group (IG) and a control group (CG). The IG included 14 patients with an average age of 83.0 years, while the CG comprised 18 patients averaging 84.5 years. The study employed the 2019 updated American Geriatric Society (AGS) Beers Criteria, along with the STOPP and START tools, to assess prescribing appropriateness. Outcomes were measured by the number of adverse drug events (ADEs) reported during the study period and at a 30-day follow-up after discharge. Over the entire study period, the IG reported 3 ADEs compared to 8 in the CG. At the 30-day follow-up, no ADEs were reported in the IG, whereas the CG experienced 5 ADEs.

Another relevant study was conducted by Wehling et al. in Germany. The study had two groups the IG which contained 202 patients averaging 84 years and the CG group which contained 207 patients averaging 82 years, the tools used included Interaction checker and the Activity of Daily Living score(Barthel Index). The outcome measure included the ADR absolute risk reduction and the Activities of Daily Living score (Bartthel Index). The IG group had a 20% reduction of ADR compared to the CG group. The IG group also move from 54.6 to 64.1 in relation to Activities of Daily Living Score while the CG group had a move from 59.4 to 63.7 in the same index.

1.3 POLYPHARHARACY AND DEPRESCRIBING IN GERITRIC

While poly pharmacy can affect all population, it is particular to the older population due to reasons that will be stated subsequently. Polypharmacy is also a major area of concern to the elderly compared to other population due to the fact that they are of greater risk of adverse drug reaction (ADR) because of metabolic change associated with ageing. Unfortunately, the

symptoms caused by polypharmacy are often mistaken for normal signs of aging. These can include tiredness, sleepiness or reduced alertness, constipation, diarrhea, loss of appetite, confusion, falls, depression or loss of interest in usual activities, weakness, tremors, visual or auditory hallucinations, anxiety or restlessness, and dizziness (Rushabh J. Dagli)

Risk factors include

Multiple Chronic Condition

As individuals age, they become more vulnerable to multimorbidity—the presence of two or more chronic conditions—due to age-related physiological and pathological changes. This, in turn, increases the likelihood of being prescribed multiple medications.

Prescribing Cascade

Polypharmacy raises the risk of prescribing cascades, in which new medications are prescribed to treat side effects that are mistaken for separate medical conditions. Symptoms such as fatigue, drowsiness, decreased alertness, constipation, diarrhea, incontinence, loss of appetite, confusion, falls, depression, or reduced interest in usual activities may be misattributed to normal aging, leading to additional prescriptions.

Use of Non-Prescription and Alternative Medications

In recent years, the use of over-the-counter (OTC) medications and complementary products, such as herbal supplements, has increased among older adults. Fewer than half of patients report these products to their healthcare providers. Common OTCs include analgesics, laxatives, vitamins, and minerals. Because dietary supplements are not regulated by the FDA, there is uncertainty regarding their ingredients and potential risks, including possible herb–drug interactions.

Care Transitions

Transitions between care settings, such as from hospital to home or nursing facilities, are a frequent source of medication errors, increasing the risk of polypharmacy and associated adverse outcome.

Age-Related Changes in How the Body Handles Medications

Pharmacokinetics involves the processes of drug absorption, distribution, metabolism, and elimination.

Absorption: Aging generally has little effect on the total amount of drug absorbed but can slow the absorption rate, resulting in lower peak serum concentrations and a delayed time to reach peak effect. Drugs that undergo extensive first-pass metabolism may achieve higher concentrations in older adults due to reductions in liver size and blood flow. Additional factors—such as the route of administration, co-ingested substances, comorbidities, and gastrointestinal enzyme activity—can also influence drug absorption.

Distribution: Drug distribution refers to how a medication spreads throughout the body, commonly expressed as the volume of distribution (Vd). In older adults, reduced body water and lean body mass decrease the Vd for hydrophilic drugs such as ethanol and lithium. Conversely, increased fat stores raise the Vd for lipophilic drugs like diazepam and trazodone. Lower albumin levels in older adults increase the proportion of unbound, active drug, which can accumulate due to reduced elimination. Examples of drugs affected include ceftriaxone, phenytoin, and warfarin.

Metabolism: Drug metabolism occurs mainly in the liver, though the intestine, lungs, and kidneys also contribute. Aging leads to reductions in hepatic blood flow and liver size, lowering drug clearance by up to 30%. Metabolism occurs via Phase I pathways (e.g., oxidation by cytochrome P450 enzymes) or Phase II pathways (e.g., glucuronidation). Phase I metabolism is most affected by aging, making drugs primarily metabolized through Phase II pathways preferable for older adults.

Elimination: Most drugs are eliminated by the kidneys. Age-related declines in renal size, blood flow, and glomerular filtration, along with decreased muscle mass reducing creatinine production, impair drug clearance. Serum creatinine levels may appear normal despite reduced renal function,

so the Cockcroft–Gault equation is commonly used to estimate creatinine clearance for proper medication dosing in older patients.

Age-Related Change in Pharmacodynamics

Pharmacodynamics looks at a drug's molecular, biochemical, and physiological effects. How these effects change with age can vary, depending on both the specific drug and the type of response being measured. For example, older adults show reduced response measured. For example, older adults show reduced response to beta-adrenergic drugs like salbutamol and propranolol due to decreased cyclic AMP synthesis. (Varghese and Ishida and Haseer 2024)

1.4 The Reasoning Behind Deprescribing in Clinical Care

Deprescribing is a deliberate and structured intervention aimed at managing polypharmacy, discontinuing potentially inappropriate medications (PIMs), and enhancing patient outcomes (Page et al., 2016, 2018a; Scott et al., 2015, 2017). It is distinguished from unintentional omission of necessary prescriptions or patient non-adherence by its specific focus on achieving therapeutic benefit (Page et al., 2018b). When multiple drugs are identified for discontinuation, a stepwise approach is recommended—each medication should be withdrawn sequentially, typically at monthly intervals, so that any resulting changes in clinical condition can be traced to a single drug (Page et al., 2018b). However, deprescribing may be considered when there's a risk of adverse drug reactions or when withdrawal effects are unlikely, such as with dietary supplements two or more medications may be stopped simultaneously.

Polypharmacy emphasizes the importance of regular medication reviews, which often lead to deprescribing decisions. Multimorbidity also justifies deprescribing since patients with several chronic diseases are more likely to experience drug–disease interactions, where treatment for one condition may negatively affect another (Schuling et al., 2012). Another contributor to unnecessary medication use is the involvement of multiple prescribers and healthcare facilities, which can cause communication gaps leading to continued use of medications that should have been stopped (Ailabouni et al., 2016). Improving collaboration among healthcare providers can therefore reduce prescribing errors and improve adherence to deprescribing practices (Reeve & Wiese, 2014)

Older adults should be prioritized for deprescribing because they face a higher risk of polypharmacy, transitions in care, and management by multiple prescribers (Reeve et al., 2015). Given Nigeria's aging population, strengthening deprescribing awareness and implementation is crucial.

1.5 How Deprescribing Affects Healthcare in Nigeria

Minimizing Harms Associated with Polypharmacy

Polypharmacy has been independently associated with drug-related hospital admissions in Nigeria (Adedapo et al., 2020). While deprescribing has the potential to reduce these adverse outcomes, a significant challenge is the influence of pharmaceutical sales representatives, who may encourage physicians to prescribe multiple medications through incentives (Fadare et al., 2018). Strengthening prescribers' knowledge of rational prescribing and reinforcing professional ethics are therefore crucial to protect patient wellbeing.

Improving Medication Adherence

Research has shown a link between polypharmacy and poor medication adherence (Marcum & Gellad, 2012). Studies suggest that as many as 55% of older adults taking multiple medications do not fully follow their prescribed regimens (Zelko et al., 2016). In Nigeria, non-adherence among individuals with chronic conditions ranges from 40% to 60.8% (Usman et al., 2019; Adisa et al., 2011; Chukwujekwu & Adesokun, 2017). Although deprescribing is thought to improve adherence, a systematic review found insufficient evidence to definitively confirm this effect (Ulley et al., 2019). Still, implementing deprescribing practices in Nigeria has the potential to enhance medication adherence and support better health outcomes.

Reducing Harms from PIMs, Falls, and Adverse Drug Reactions (ADRs)

Deprescribing can help reduce adverse drug reactions (ADRs) by minimizing the use of inappropriate medications, preventing harmful drug interactions, addressing incorrect indications, and lowering the risk of medication-related falls. In Nigeria, the prevalence of potentially inappropriate medication (PIM) use among older adults ranges from 15.7% to 46.5% (Eze &

Olowu, 2011; Fadare et al., 2015b). Falls and ADRs among the elderly have been reported in approximately 23% (Bekibele & Gureje, 2010) and 10.7% (Aderemi-Williams et al., 2015) of cases, respectively, and ADRs are also associated with longer hospital stays (Fasipe et al., 2019). Introducing deprescribing interventions in clinical practice could significantly reduce these risks. Considering Nigeria's growing elderly population and the limited awareness among prescribers about PIM assessment tools, enhancing education on deprescribing and integrating it into routine practice is urgently needed (Reeve et al., 2015; Fadare et al., 2019).

Economic Benefits

Inappropriate prescribing adds to unnecessary healthcare costs. In Nigeria, roughly 70% of the population lives below the poverty line (Kale, 2012), and nearly 90% of citizens lack health insurance, relying primarily on out-of-pocket payments for medications (Aregbeshola, 2016). By discontinuing unnecessary or inappropriate medications through deprescribing, medication expenses could be reduced, potentially lowering total drug costs by up to 20% (Morin et al., 2019). Thus, deprescribing not only promotes safer prescribing but also supports economic sustainability in the Nigerian healthcare system.

1.6 CHALLENGE OF DEPRESCRIBING IN GERIATRIC PATIENT

Deprescribing is inherently challenging for healthcare professionals, especially when it comes to older patients with multiple health conditions, as it requires careful consideration of both life expectancy and how the body's handling of medications—how drugs are absorbed, distributed, metabolized, and cleared—changes as we get older. These changes are crucial for identifying potentially inappropriate medications and doses, and distinguishing drug-induced side effects from those related to aging itself. Safe prescribing and deprescribing require a deep understanding of the patient's overall clinical context, emphasizing that both processes are equally important in mitigating drug-related harm and managing the potential risks of withdrawal. Although there are tools available, such as STOPP, Beer's Criteria, the Medication Appropriateness Index, and Medstopper, which aim to guide the safe discontinuation of inappropriate medications, challenges persist in managing polypharmacy and chronic conditions, particularly when alternatives to medication are not viable. However, beyond complexity, several

factors contribute to prescribers' reluctance to deprescribe. (Cullinan and Hanses and Byrne and Denis and Kearny and Sham 2017)

Interprofessional Dynamics

In the management of older patients with multiple health issues, it's common for several healthcare professionals to be involved. This often leads to care being guided by different specialty-specific protocols, with individual clinicians focusing on their respective areas of expertise. Some physicians may also feel that medication management within their specialty is solely their responsibility, leaving broader oversight to others. This division can lead to poor communication across healthcare settings, which is a known contributor to suboptimal prescribing. Research indicates a mixed perception of the role of pharmacists in managing polypharmacy. While some general practitioners (GPs) welcome input from pharmacists, especially when managing complex cases of multimorbidity, others may value pharmacists' recommendations less, with the relationship between medical and pharmacy professionals influencing these views. Studies have shown that junior doctors often defer responsibility for deprescribing to GPs and consultants, with pharmacists playing a secondary role. Evidence suggests that pharmacists, whether working alone or collaborating with a multidisciplinary team, have a positive impact on medication appropriateness for older patients. GPs, for their part, often see themselves as the coordinators of overall health management for patients, including reviewing medications and potentially reducing doses or discontinuing unnecessary drugs. However, they also face significant challenges, such as high workload and time constraints, which make it difficult to prioritize deprescribing alongside other responsibilities. Reluctance to modify medications prescribed by specialists is another significant barrier. Many practitioners are hesitant to challenge or change medications prescribed by other doctors, especially specialists, out of concern for causing offense or upsetting a patient's care regimen. . (Cullinan and Hanses and Byrne and Denis and Kearny and Sham 2017)

Difficulty in Medication Review

Effective deprescribing begins with a comprehensive medication review, a task that becomes especially complicated In older patients who have multiple chronic conditions, a lack of coordination among different prescribers can lead to a fragmented picture of the patient's overall

medication plan. This problem is often made worse by poor communication and incomplete records of treatment changes, which can create confusion about why certain medications were prescribed or adjusted. Inadequate documentation, including details on drug initiation, changes, and discontinuation, makes it difficult for doctors to understand the intentions of other healthcare providers. Additionally, challenges in obtaining an accurate and up-to-date list of medications can hinder deprescribing decisions. Miscommunication between different sources of information—such as pharmacies, patients, family members, and GPs—further complicates the process. (Cullinan and Hanses and Byrne and Denis and Kearny and Sham 2017)

Lack of Knowledge and Evidence

A significant barrier to deprescribing is the lack of knowledge among medical professionals about which medications are safe to discontinue. Medical training often fails to address the specific needs of older, multimorbid patients, despite their distinct pharmacological characteristics—such as altered drug metabolism Older adults often experience reduced kidney and liver function, changes in body composition, and the added complexity of managing multiple health conditions. Many healthcare providers, without specialized training, may feel unsure about making safe decisions when it comes to deprescribing. The problem is compounded by the lack of clinical trial data focused on older patients with multiple conditions. Most guidelines are based on studies in younger, healthier populations, and so they don't fully address the unique challenges faced by elderly patients with complex health needs. This gap in evidence limits the ability to develop comprehensive deprescribing guidelines tailored to this population. (Cullinan and Hanses and Byrne and Denis and Kearny and Sham 2017)

Patient Factors

The patient's role in deprescribing is extremely important. Many older adults may unintentionally downplay or not report medication side effects, assuming they are just part of getting older rather than possible drug-related issues. Factors such as cognitive impairment, limited independence, and advanced age can further influence how patients manage and communicate about their medications. Some patients may also be reluctant to stop taking medications they are familiar with, especially if they associate these medications with a sense of stability or security. Furthermore, patients and their families may have specific expectations or

demands regarding treatment, which can influence decisions around deprescribing. Healthcare providers may also feel pressured by patients or their families to prescribe medications, even when they know these treatments may not be necessary or optimal. (Cullinan and Hanses and Byrne and Denis and Kearny and Sham 2017).

1.7 STATEMENT OF PROBLEM

Polypharmacy, which means taking five or more medications at the same time, is a major concern in older adults, especially those with cancer, neurological, or heart-related conditions. These patients face a higher risk of side effects, drug interactions, difficulty sticking to their medication schedules, increased healthcare costs, and a lower quality of life because of the complexity of their treatment regimens. In geriatric oncology, cancer treatments combined with medications for comorbidities exacerbate polypharmacy. In neurology, conditions such as epilepsy, Parkinson's disease, or dementia often require multiple drugs, increasing the risk of cognitive and functional decline. Similarly, hypertensives frequently receive multiple antihypertensive agents alongside treatments for coexisting conditions, amplifying the potential for inappropriate prescribing. Despite the recognized risks, there is a lack of standardized, patient-centered approaches to assess and manage polypharmacy in these specific populations. Incomplete medication reviews and a fragmented healthcare system often allow potentially inappropriate medications (PIMs) to persist, which can lead to preventable hospitalizations, illness, and even death.

This study therefore aims to examine how common polypharmacy is among the population described above and to explore the relationship between the number of medications used and patient outcomes and also spot potentially inappropriate medication as in the START/STOPP criteria, and also the patient attitude to deprescription.

1.8 JUSTIFICATION OF STUDY

The study of polypharmacy and deprescribing strategies in geriatric oncology, neurology, and cardiovascular related patients is justified by several critical factors:

1; Widespread Use and Consequences of Multiple Medications:

Geriatric people living with chronic conditions are disproportionately affected by polypharmacy, with studies indicating that up to 60% of adults in hospital settings receive equal to or greater than five medications. This increases the risk of ADRs, reported in 10-20% of geriatric patients, and contributes to hospital readmissions and functional decline. Investigating tailored assessment and deprescribing strategies can mitigate these risks.

2. Unique Challenges in Specific Populations:

Geriatric oncology, neurology, and cardiovascular aliment patients face distinct challenges due to disease complexity and age-related physiological changes. For instance, chemotherapy in oncology patients interacts with comorbidities, while neurological conditions like dementia impair adherence. cardiovascular management often involves polypharmacy to achieve blood pressure control, increasing interaction risks. Targeted research is needed to develop evidence-based deprescribing protocols for these groups.

3. Limited Implementation of Deprescribing

Despite resources such as the Beers Criteria and the STOPP/START guidelines, deprescribing is underutilized in clinical practice due to barriers such as provider hesitancy, lack of time, and patient resistance. Research focused on overcoming these barriers in oncology, neurology, and cardiovascular settings can enhance the adoption of deprescribing, improving patient outcomes.

4. Patient-Centered Care and Quality of Life:

Geriatric patients often prioritize quality of life over prolonged treatment, particularly in oncology with limited life expectancy. Deprescribing aligns treatments with patient goals, reducing medication burden and improving well-being. Studying effective strategies ensures that interventions are individualized and holistic.

5. Economic and Healthcare System Burden:

Polypharmacy contributes to increased healthcare costs through hospitalizations, emergency visits, and management of ADRs. Developing and implementing deprescribing strategies can reduce these costs, benefiting healthcare systems and patients. Research in this area provides evidence to guide resource allocation and policy development.

1.9 OBJCTIVE OF STUDY

General Objective

Assessment of polypharmacy and deprescription strategies in geriatric patients

Specific Objective

To evaluate the occurrence of polypharmacy >5 medication

To determine the potential inappropriate medication (PIM) using the START/STOPP criteria

To examine the association between a higher reported medication use and potentially inappropriate medications identified using the START/STOPP criteria."

To assess the patient attitude towards deprescribing

CHAPTER TWO

METHODS

2.1 Study Design

The study is designed as a cross-sectional analysis, with the goal of assessing the prevalence of poly pharmacy and potential inappropriate medication (PIM) in geriatric patients

2.2 Study Settings

This study will be carried out in the Geriatric ward, General Practice Clinic, Consultant Out Patient Department (COPD), Oncology ward and neurology ward. The study is conducted at the University of Benin Teaching Hospital, which plays a leading role in providing research opportunities for university lecturers and other investigators exploring economic morbidity and related healthcare issues.

2.3 Study Population

The study population consists of geriatric patients over 60 years of age at the University of Benin Teaching Hospital, who have been diagnosed with at least one of the following condition oncology cardiovascular related issues or neurological issues

2.4 Inclusion Criteria

This included patients with any of the following condition, oncology, cardiovascular related issues, or neurological conditions. Participants must be 60 years of age or older and capable of providing informed consent.

2.5 Exclusion Criteria

This excludes patients with a life expectancy of less than six months, those unable to provide informed consent, or those with severe cognitive impairment without a caregiver to act as a proxy.

2.6 Research Instrument

The research instrument is a structured data collection from designed to capture the following information; Patient demographics, number of medication taken daily, difficulty managing medication, adverse effects from medication in the past 6 months, hospitalization due to reaction to drug, and attitude towards deprescribing by patients and assessment of Potential Inappropriate Medication using the START/STOPP criteria. The data collection form will be pre-tested before use on a small sample of patients, 10-20 in number, to ensure its clarity and comprehensiveness

Screening Tool of Older Persons' Prescriptions (STOPP) version 3.

Potentially Inappropriate Prescriptions in Patients Aged 65 Years and Older

Section A: Indication of Medication

1. Any medication prescribed without a clear clinical indication.

2. Any medication prescribed for longer than the recommended duration, where treatment duration is well established.

3. Duplicate prescriptions within the same drug class for regular daily use (excluding PRN or "as-needed" use), for example: two concurrent NSAIDs, SSRIs, loop diuretics, ACE inhibitors, anticoagulants, antipsychotics, or opioid analgesics. Optimizing monotherapy within a single drug class should be considered before adding a new agent.

Section B: Cardiovascular System

1. Digoxin for heart failure in patients with normal systolic ventricular function, as there is no clear evidence of benefit.

2. Verapamil or diltiazem in patients with NYHA Class III or IV heart failure, as these may worsen heart failure with reduced ejection fraction (HFREF).

3. Beta-blockers used in combination with verapamil or diltiazem, due to the increased risk of heart block.

4. Ventricular rate-limiting drugs—such as beta-blockers, verapamil, diltiazem, or digoxin—should be avoided in patients with bradycardia (<50/min), type II heart block, or complete heart block, as they may cause complete heart block or asystole.

5. Beta-blockers as monotherapy for uncomplicated hypertension (without angina, aortic aneurysm, or other conditions where beta-blocker therapy is clearly indicated), since there is no strong evidence of efficacy.

6. Amiodarone as first-line therapy for supraventricular tachyarrhythmias, due to a higher risk of serious side effects compared with beta-blockers, digoxin, verapamil, or diltiazem.

7. Loop diuretics should not be used as first-line treatment for hypertension unless heart failure requiring diuretic therapy is present, as safer and more effective alternatives exist.

8. Loop diuretics for dependent ankle edema without clinical, biochemical, or radiological evidence of heart failure, liver failure, nephrotic syndrome, or renal failure, since leg elevation or compression hosiery is usually more appropriate.

9. Thiazide diuretics should be avoided in patients with significant hypokalemia (serum K^+ < 3.0 mmol/L), hyponatremia (serum Na^+ < 130 mmol/L), hypercalcemia (corrected serum calcium > 2.65 mmol/L), or a history of gout, as these conditions may be worsened.

10. Loop diuretics for hypertension in patients with concurrent urinary incontinence, as they may exacerbate the incontinence.

11. Centrally-acting antihypertensives (e.g., methyldopa, clonidine, moxonidine, rilmenidine, guanfacine), since they are generally less well tolerated in older adults compared with younger patients.

12. Angiotensin-Converting Enzyme Inhibitors (ACEIs) or Angiotensin Receptor Blockers (ARBs) should be avoided in patients with hyperkalemia (serum K^+ > 5.5 mmol/L).

13. Aldosterone antagonists (e.g., spironolactone, eplerenone) should not be used with concurrent potassium-sparing drugs (e.g., ACEIs, ARBs, amiloride, triamterene) without regular monitoring of serum potassium, due to the risk of dangerous hyperkalemia (K^+ > 6.0 mmol/L). Serum potassium should be checked at least every six months.

14. Phosphodiesterase type-5 inhibitors (e.g., sildenafil, tadalafil, vardenafil) should be avoided in severe heart failure with hypotension (systolic BP < 90 mmHg) or in patients on concurrent nitrate therapy for angina, due to the risk of cardiovascular collapse.

15. Drugs known to prolong the QTc interval in patients with demonstrable QTc prolongation (>450 ms in males, >470 ms in females) should be avoided. This includes quinolones, macrolides, ondansetron, citalopram (>20 mg/day), escitalopram (>10 mg/day), tricyclic antidepressants, lithium, haloperidol, digoxin, class 1A and class III

antiarrhythmics, tizanidine, phenothiazines, astemizole, and mirabegron, due to the risk of life-threatening ventricular arrhythmias.

16. Statins for primary cardiovascular prevention are generally not recommended in individuals aged ≥85 years with established frailty and a life expectancy likely less than three years, due to lack of evidence for benefit.

17. Long-term systemic (non-topical) NSAIDs should be avoided in patients with a history of coronary, cerebral, or peripheral vascular disease, due to an increased risk of thrombosis.

18. Long-term antipsychotic therapy should be used cautiously in patients with a history of coronary, cerebral, or peripheral vascular disease, due to increased thrombotic risk.

19. NSAIDs or systemic corticosteroids should be avoided in patients with heart failure requiring loop diuretic therapy, as they may exacerbate heart failure.

20. Antihypertensive drugs should be used cautiously in severe symptomatic aortic stenosis, due to the risk of severe hypotension and syncope.

21. Digoxin should not be used as first-line therapy for long-term (>3 months) ventricular rate control in atrial fibrillation, due to increased mortality associated with long-term use. Cardio-selective beta-blockers are generally preferred.

Section C: Coagulation System

1. Long-term aspirin at doses greater than 100 mg per day should be avoided, as it increases the risk of bleeding without evidence of additional efficacy.

2. Antiplatelet agents, vitamin K antagonists, direct thrombin inhibitors, or factor Xa inhibitors should be avoided in patients with a significant risk of major bleeding, such as those with uncontrolled severe hypertension, bleeding diathesis, or recent non-trivial spontaneous bleeding.

3. Long-term combination therapy with aspirin plus clopidogrel (>4 weeks) for secondary stroke prevention is not recommended unless the patient has had a coronary stent within

the past 12 months, concurrent acute coronary syndrome, or high-grade symptomatic carotid artery stenosis, as there is no added long-term benefit over clopidogrel monotherapy.

4. Antiplatelet agents combined with vitamin K antagonists, direct thrombin inhibitors, or factor Xa inhibitors should be avoided in patients with chronic atrial fibrillation unless there is a concurrent coronary stent or angiographically proven high-grade (>50%) coronary artery stenosis, as no added benefit is seen from dual therapy.

5. Antiplatelet agents combined with vitamin K antagonists, direct thrombin inhibitors, or factor Xa inhibitors should not be used for patients with stable coronary, cerebrovascular, or peripheral arterial disease, due to lack of evidence for additional benefit.

6. Ticlopidine should be avoided in all circumstances, as clopidogrel and prasugrel offer similar efficacy, stronger evidence, and fewer side effects.

7. Antiplatelet agents should not be used as alternatives to vitamin K antagonists, direct thrombin inhibitors, or factor Xa inhibitors for stroke prevention in patients with chronic atrial fibrillation, as there is no evidence of efficacy.

8. Vitamin K antagonists, direct thrombin inhibitors, or factor Xa inhibitors should not be continued for more than six months after a first episode of deep venous thrombosis in the absence of ongoing provoking risk factors (e.g., thrombophilia), as there is no proven added benefit.

9. Vitamin K antagonists, direct thrombin inhibitors, or factor Xa inhibitors should not be continued for more than 12 months after a first pulmonary embolism without ongoing provoking risk factors (e.g., thrombophilia), due to lack of proven benefit.

10. NSAIDs should not be combined with vitamin K antagonists, direct thrombin inhibitors, or factor Xa inhibitors, because this combination increases the risk of major gastrointestinal bleeding.

11. Vitamin K antagonists should not be used as first-line anticoagulants for atrial fibrillation unless the patient has a metallic heart valve, moderate-to-severe mitral stenosis, or an eGFR < 15 mL/min/1.73 m^2, as direct thrombin inhibitors or factor Xa inhibitors are equally effective and generally safer.

12. SSRIs should be used cautiously in combination with vitamin K antagonists, direct thrombin inhibitors, or factor Xa inhibitors in patients with a history of major hemorrhage, due to the increased bleeding risk from the antiplatelet effects of SSRIs.

13. Direct thrombin inhibitors (e.g., dabigatran) should be avoided in combination with diltiazem or verapamil, due to an increased risk of bleeding.

14. Apixaban, dabigatran, edoxaban, and rivaroxaban should be used cautiously with P-glycoprotein (P-gp) inhibitors (e.g., amiodarone, azithromycin, carvedilol, cyclosporin, dronedarone, itraconazole, ketoconazole [systemic], macrolides, quinine, ranolazine, tamoxifen, ticagrelor, verapamil), as co-administration increases the risk of bleeding.

15. Systemic estrogens or androgens should be avoided in patients with a previous history of venous thromboembolism, due to the increased risk of recurrence.

16. Aspirin should not be used for primary prevention of cardiovascular disease, as there is no evidence of benefit.

Section D: Central Nervous System

1. Tricyclic antidepressants (TCAs) should be avoided in patients with dementia, narrow-angle glaucoma, cardiac conduction abnormalities, prostatism, chronic constipation, recent falls, a history of urinary retention, or orthostatic hypotension, due to the risk of worsening these conditions.

2. Initiating TCAs as first-line treatment for major depression is not recommended, as they carry a higher risk of adverse effects compared with SSRIs or SNRIs.

3. Serotonin-norepinephrine reuptake inhibitors (SNRIs, e.g., venlafaxine, duloxetine) should be used cautiously in patients with severe hypertension (systolic BP > 180 mmHg and/or diastolic BP > 105 mmHg), as they may exacerbate hypertension.

4. Antipsychotics with moderate-to-marked antimuscarinic/anticholinergic effects (e.g., acepromazine, chlorpromazine, clozapine, flupenthixol, fluphenazine, levomepromazine, olanzapine, pipothiazine, promazine, thioridazine) should be avoided in patients with lower urinary tract symptoms due to benign prostatic hyperplasia or a history of urinary retention, due to high risk of urinary retention.

5. Antipsychotics prescribed for behavioral and psychological symptoms of dementia (BPSD) should not be continued at an unchanged dose for more than three months without medication review, due to increased risk of extrapyramidal side effects, cognitive decline, and major cardiovascular morbidity and mortality.

6. SSRIs should be used cautiously in patients with current or recent significant hyponatremia (serum Na^+ < 130 mmol/L), as they may worsen or precipitate hyponatremia.

7. SSRIs should be used cautiously in patients with current or recent significant bleeding, due to the risk of exacerbation or recurrence of bleeding from their antiplatelet effects.

8. 8Benzodiazepines should not be used for longer than four weeks, as there is no indication for extended use. Prolonged use increases the risk of sedation, confusion, impaired balance, falls, and road traffic accidents. All benzodiazepines taken for more than four weeks should be withdrawn gradually to avoid benzodiazepine withdrawal syndrome.

9. Benzodiazepines should not be used to manage agitated behavior or psychotic symptoms in dementia, as there is no evidence of efficacy.

10. Benzodiazepines should not be used for insomnia for longer than two weeks due to high risk of dependence, falls, fractures, and road traffic accidents.

11. Z-drugs (zolpidem, zopiclone, zaleplon) should not be used for insomnia for longer than two weeks, as they increase the risk of falls and fractures.

12. Antipsychotics (other than clozapine or quetiapine) should be avoided in patients with parkinsonism or Dementia with Lewy Bodies, due to the risk of severe extrapyramidal symptoms.

13. Anticholinergic/antimuscarinic drugs (e.g., biperiden, orphenadrine, procyclidine, trihexyphenidyl) should not be used to treat extrapyramidal side effects of antipsychotics, due to the risk of anticholinergic toxicity.

14. Drugs with potent anticholinergic/antimuscarinic effects should be avoided in patients with delirium or dementia, as they may exacerbate cognitive impairment. Commonly prescribed drugs with strong anticholinergic effects include:

- Tricyclic antidepressants (e.g., amitriptyline, doxepin, imipramine, nortriptyline)
- Antipsychotics (e.g., chlorpromazine, clozapine, thioridazine)
- First-generation antihistamines (e.g., diphenhydramine, chlorpheniramine)
- Bladder antispasmodics (e.g., tolterodine, oxybutynin)
- Hyoscine, procyclidine, benzatropine, tizanidine

15. Antipsychotics should not be continued for longer than 12 weeks in patients with behavioral and psychological symptoms of dementia (BPSD) unless symptoms are severe and non-pharmacological treatments have failed, due to increased risk of stroke and myocardial infarction.

16. Antipsychotics should not be used as hypnotics, unless insomnia is caused by psychosis or BPSD related to dementia. Use as sleep aids is not recommended in product labeling and increases the risk of confusion, hypotension, extrapyramidal side effects, and falls.

17. Acetylcholinesterase inhibitors should be avoided in patients with a known history of persistent bradycardia (<60 beats/min), heart block, or recurrent unexplained syncope, due to the risk of cardiac conduction failure, syncope, and injury.

18. Acetylcholinesterase inhibitors should be used cautiously in patients concurrently taking drugs that induce persistent bradycardia (e.g., beta-blockers, digoxin, diltiazem, verapamil), due to risk of cardiac conduction failure, syncope, and injury.

19. Memantine should be avoided in patients with a current or previous seizure disorder, due to increased risk of seizures.

20. Nootropics, including Ginkgo biloba, piracetam, pramiracetam, phenylpiracetam, aniracetam, phosphatidylserine, modafinil, L-theanine, omega-3 fatty acids, Panax ginseng, Rhodiola, and creatine, should not be used in dementia, as there is no evidence of efficacy.

21. Phenothiazines should not be used as first-line treatment for psychosis or non-cognitive symptoms of dementia, since safer and more effective alternatives exist. Phenothiazines are sedating and have significant antimuscarinic toxicity in older adults, except in limited indications such as:

- Prochlorperazine for nausea, vomiting, or vertigo
- Chlorpromazine for persistent hiccups
- Levomepromazine as an antiemetic in palliative care

22. Levodopa or dopamine agonists should not be used for benign essential tremor, as there is no evidence of efficacy.

23. Levodopa or dopamine agonists should not be used to treat extrapyramidal side effects of antipsychotics or other forms of drug-induced Parkinsonism, to avoid inappropriate prescribing cascades.

24. First-generation antihistamines should not be used as first-line treatment for allergy or pruritus, as safer antihistamines with fewer side effects are now widely available.

25. First-generation antihistamines should not be used for insomnia, due to a high risk of side effects. Z-drugs are generally safer and more appropriate for short-term use.

Section E: Renal System

The following drugs are potentially inappropriate in older adults with acute or chronic kidney disease when renal function falls below specified eGFR thresholds:

1. Digoxin: Long-term maintenance doses ≥125 µg/day should be avoided if eGFR < 30 mL/min/1.73 m², due to risk of digoxin toxicity if plasma levels are not monitored.

2. Direct thrombin inhibitors (e.g., dabigatran) should be avoided if eGFR < 30 mL/min/1.73 m², due to increased risk of bleeding.

3. Factor Xa inhibitors (e.g., rivaroxaban, apixaban, edoxaban) should be avoided if eGFR < 15 mL/min/1.73 m², due to increased risk of bleeding.

4. NSAIDs should be avoided if eGFR < 50 mL/min/1.73 m², as they may worsen renal function.

5. Colchicine should be avoided if eGFR < 10 mL/min/1.73 m², due to risk of toxicity.

6. Metformin should be avoided if eGFR < 30 mL/min/1.73 m², due to risk of lactic acidosis.

7. Mineralocorticoid receptor antagonists (e.g., spironolactone, eplerenone) should be avoided if eGFR < 30 mL/min/1.73 m², due to risk of dangerous hyperkalemia.

8. 8. Nitrofurantoin should be avoided if eGFR < 45 mL/min/1.73 m², due to increased risk of nitrofurantoin toxicity.

9. Bisphosphonates should be avoided if eGFR < 30 mL/min/1.73 m², due to increased risk of acute renal failure.

10. Methotrexate should be avoided if eGFR < 30 mL/min/1.73 m², due to increased risk of methotrexate toxicity.

Section F: Gastrointestinal System

1. Prochlorperazine or metoclopramide should be avoided in patients with Parkinsonism, as they may exacerbate Parkinsonian symptoms.

2. Proton pump inhibitors (PPIs) should not be continued at full therapeutic doses for >8 weeks in uncomplicated peptic ulcer disease. Dose reduction, earlier discontinuation, or maintenance therapy with an H2 antagonist is usually indicated.

3. Drugs likely to cause constipation (e.g., systemic antimuscarinics, oral iron, opioids, verapamil, aluminum antacids) should be avoided in patients with chronic constipation when non-constipating alternatives are available, due to risk of worsening constipation.

4. Oral elemental iron should not exceed 200 mg daily (e.g., ferrous fumarate >600 mg/day, ferrous sulfate >600 mg/day, ferrous gluconate >1800 mg/day), as there is no evidence of increased absorption at higher doses.

5. Corticosteroids should be used cautiously in patients with a history of peptic ulcer disease or erosive oesophagitis, as they increase the risk of relapse unless a PPI is co-prescribed.

6. Antiplatelet or anticoagulant drugs should be used cautiously in patients with a history of Gastric Antral Vascular Ectasia (GAVE, “watermelon stomach”), due to risk of major gastrointestinal bleeding.

7. Antipsychotics should be used cautiously in patients with dysphagia, as they increase the risk of aspiration pneumonia.

8. Megestrol acetate should not be used to increase appetite, due to unproven efficacy and increased risk of thrombosis and death.

1. Theophylline should not be used as monotherapy for COPD, as safer and more effective alternatives exist. Theophylline carries a high risk of adverse effects due to its narrow therapeutic index.

2. Systemic corticosteroids should not be used for maintenance therapy in moderate-to-severe COPD, as they expose patients to unnecessary long-term side effects. Effective inhaled corticosteroid therapies are available.

3. Long-acting muscarinic antagonists (e.g., tiotropium, aclidinium, umeclidinium, glycopyrronium) should be used cautiously in patients with a history of narrow-angle glaucoma (risk of exacerbating glaucoma) or bladder outflow obstruction (risk of urinary retention).

4. Benzodiazepines should be avoided in patients with acute or chronic respiratory failure (e.g., $pO_2 < 8.0$ kPa ± $pCO_2 > 6.5$ kPa), due to risk of worsening respiratory failure.

Section H: Musculoskeletal System

1. Non-steroidal anti-inflammatory drugs (NSAIDs), excluding COX-2 selective agents, should be avoided in patients with a history of peptic ulcer disease or gastrointestinal bleeding unless used with a concurrent PPI or H2 antagonist, due to risk of ulcer relapse.

2. NSAIDs should be avoided in patients with severe hypertension (systolic BP consistently >170 mmHg and/or diastolic BP consistently >100 mmHg), due to risk of exacerbating hypertension.

3. Long-term NSAID use (>3 months) for osteoarthritis pain should be avoided if paracetamol has not been tried, as simple analgesics are usually equally effective and safer.

4. Long-term corticosteroid therapy (>3 months) as monotherapy for rheumatoid arthritis should be avoided due to risk of systemic corticosteroid side effects.

5. Corticosteroids (other than periodic intra-articular injections for mono-articular pain) should not be used for osteoarthritis, due to risk of systemic side effects.

6. Long-term NSAID or colchicine therapy (>3 months) for chronic gout should be avoided when there is no contraindication to a xanthine-oxidase inhibitor (e.g., allopurinol, febuxostat), as xanthine-oxidase inhibitors are the first-choice prophylactic agents.

7. NSAIDs should be used cautiously with concurrent corticosteroid therapy for any form of arthritis or rheumatism, due to increased risk of peptic ulcer disease.

8. Oral bisphosphonates should be avoided in patients with a current or recent history of upper gastrointestinal disease (e.g., dysphagia, oesophagitis, gastritis, duodenitis, peptic ulcer disease, or upper GI bleeding) due to risk of relapse or exacerbation.

9. Long-term opioid therapy for osteoarthritis should be avoided due to lack of evidence of efficacy and increased risk of serious adverse effects.

Section I: Urogenital System

1. Systemic antimuscarinic drugs (e.g., oxybutynin, tolterodine, trospium) should be avoided in patients with dementia or chronic cognitive impairment, due to risk of increased confusion and agitation.

2. Systemic antimuscarinic drugs (e.g., oxybutynin, tolterodine, trospium) should be avoided in patients with narrow-angle glaucoma, due to risk of acute exacerbation.

3. Systemic antimuscarinic drugs (e.g., oxybutynin, tolterodine, trospium) should be avoided for lower urinary tract symptoms in men with benign prostatic hyperplasia (BPH) and high post-void residual volume (>200 mL), due to uncertain efficacy and increased risk of urinary retention.

4. Systemic antimuscarinic drugs should be avoided in patients with constipation, due to risk of exacerbating constipation.

5. Alpha-1 receptor antagonists (other than silodosin, e.g., alfuzosin, doxazosin, indoramin, tamsulosin, terazosin) should be avoided in patients with symptomatic orthostatic hypotension or a history of syncope, due to risk of precipitating recurrent syncope.

6. Mirabegron should be used cautiously in patients with labile or severe hypertension, due to risk of exacerbating hypertension.

7. Duloxetine should not be used for urinary urgency or urge incontinence, as it is indicated only for stress incontinence.

8. Antibiotics should not be used to treat asymptomatic bacteriuria, as there is no indication for therapy.

Section J: Endocrine System

1. Sulfonylureas with a long half-life (e.g., glibenclamide, chlorpropamide, glimepiride) should be avoided in patients with type 2 diabetes mellitus, due to risk of prolonged hypoglycemia.

2. Thiazolidinediones (e.g., rosiglitazone, pioglitazone) should be avoided in patients with heart failure, due to risk of exacerbating heart failure.

3. Non-selective beta-blockers should be used cautiously in patients with diabetes mellitus who experience frequent hypoglycemic episodes, as they may mask symptoms of hypoglycemia.

4. Sodium-glucose co-transporter 2 (SGLT2) inhibitors (e.g., canagliflozin, dapagliflozin, empagliflozin, ertugliflozin) should be avoided in patients with symptomatic hypotension, due to risk of exacerbating hypotension.

5. Systemic estrogens should be avoided in patients with a history of breast cancer, due to increased risk of recurrence.

6. Systemic estrogens should be avoided in patients with a history of venous thromboembolism, due to increased risk of recurrence.

7. Menopausal hormone therapy (estrogen plus progestin) should be avoided in patients with a history of stenotic coronary, cerebral, or peripheral arterial disease, due to increased risk of acute arterial thrombosis.

8. Systemic estrogens without progestogens should be avoided in patients with an intact uterus, due to risk of endometrial cancer.

9. Levothyroxine should not be used for subclinical hypothyroidism (normal free T4, elevated TSH <10 mU/L), as there is no evidence of benefit and a risk of iatrogenic thyrotoxicosis.

10. Vasopressin analogues (e.g., desmopressin, vasopressin) should not be used for urinary incontinence or urinary frequency, due to risk of symptomatic hyponatremia.

Section K: Drug Classes that Predictably Increase Falls Risk in Susceptible Older People

1. Benzodiazepines should be avoided in patients with recurrent falls, as they may reduce sensorium and impair balance.

2. Antipsychotic drugs should be used cautiously in patients with recurrent falls, due to risk of inducing Parkinsonism.

3. Vasodilator drugs should be avoided in patients with recurrent falls and persistent postural hypotension (systolic BP drop ≥20 mmHg and/or diastolic BP drop ≥10 mmHg), due to increased risk of syncope and falls.

4. Hypnotic Z-drugs (e.g., zopiclone, zolpidem, zaleplon) should be avoided in patients with recurrent falls, due to risk of protracted daytime sedation and ataxia.

5. Anti-epileptic drugs should be used cautiously in patients with recurrent falls, as they may impair sensorium and adversely affect cerebellar function.

6. First-generation antihistamines should be avoided in patients with recurrent falls, due to risk of impaired sensorium.

7. Opioids should be used cautiously in patients with recurrent falls, due to risk of impaired sensorium.

8. Antidepressants should be used cautiously in patients with recurrent falls, due to risk of impaired sensorium.

9. Alpha blockers used as antihypertensives should be avoided in patients with recurrent falls, due to risk of orthostatic hypotension.

10. Alpha blockers for prostatic bladder outflow symptoms, other than silodosin, should be used cautiously in patients with recurrent falls, due to risk of orthostatic hypotension.

11. Centrally acting antihypertensives should be used cautiously in patients with recurrent falls, due to potential for impaired sensorium and orthostatic hypotension.

12. Antimuscarinics for treatment of overactive bladder or urge incontinence should be used cautiously in patients with recurrent falls, due to risk of impaired balance and confusion.

Section L: Analgesic Drugs

1. Oral or transdermal strong opioids (e.g., morphine, oxycodone, fentanyl, buprenorphine, diamorphine, methadone, tramadol, pethidine, pentazocine) should not be used as first-line therapy for mild pain; paracetamol or NSAIDs should be considered first, according to the WHO analgesic ladder.

2. Daily regular opioids should not be prescribed without a concomitant laxative, due to risk of severe constipation.

3. Long-acting opioids should not be prescribed without short-acting opioids for breakthrough moderate-to-severe pain, to prevent persistence of severe pain.

4. Topical lidocaine (lignocaine) patches should not be used for chronic osteoarthritis pain, due to lack of evidence of efficacy.

5. Gabapentinoids (e.g., gabapentin, pregabalin) should not be used for non-neuropathic pain, due to lack of evidence of efficacy.

6. Paracetamol should be used with caution at doses ≥3 g/24 hours in patients with poor nutritional status (BMI <18) or chronic liver disease, due to risk of hepatotoxicity.

Section M: Antimuscarinic/Anticholinergic Drug Burden

1. Concomitant use of two or more drugs with antimuscarinic/anticholinergic properties (e.g., bladder or intestinal antispasmodics, tricyclic antidepressants, first-generation

antihistamines, antipsychotics) should be avoided, due to increased risk of antimuscarinic/anticholineric toxicity.

2.7 Sample Size Determination

Simple random technique was used for selecting a representative sample from the population. The sample size for this study was determined using the Slovin formula, based on the defined study population as described below.

$n= N/(1+Ne^2)$

The estimated population of patient that fits criterial that uses the hospital every month was said to be around 600

N= Total population

n= Sample size

e= Error margin at specified confidence level, using confidence level of 95% and percentage error of 5% (0.05)

$n=600/(1+600(0.05^2))$

n=240 patients

2.8 Method of Data Analysis

The collected data will be entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics, including frequencies, percentages, and means, will be used to summarize the data. Inferential statistics, such as Chi-square tests and correlation analyses, will be applied to examine associations between medication adherence and its influencing factors. A p-value of less than 0.05 will be considered statistically significant."

2.9 Data Collection Procedure

After obtaining ethical clearance and informed consent, due to the age of the population the questionnaire was read to those who could not read and their answers recorded while maintaining confidentiality and encouraging honest response.

2.10 Ethical Consideration

Ethical approval for the study will be obtained from the Health Research Ethics Committee (HREC) of the University of Benin Teaching Hospital. Patient confidentiality will be strictly maintained, and all data collected will be securely stored and used solely for the purposes of this research.

CHAPTER THREE

DATA ANALYSIS

3.1 SOCIODEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

A total of 240 patients participated in the study, of whom 135 (56.3%) were male and 105 (43.8%) were female. The mean age of participants was 70.38 ± 4.13 years, with an age range of 65 to 89 years. The majority of respondents (96.6%) were between 60 and 79 years of age. In terms of educational attainment, 96 (40%) participants had completed primary education, 85 (35.4%) had secondary education, 32 (13.3%) had no formal education, while 27 (11.3%) attained tertiary education.

Table 3.1: Sociodemographic Characteristics of the Respondents

Demographics	**n (%)**
Age distribution (years)	
60–69	124 (51.6)
70–79	108 (45.0)
80–89	8 (3.3)
Sex	
Male	135 (56.3)
Female	105 (43.8)
Education level	
No formal education	32 (13.3)

Demographics	n (%)
Age distribution (years)	
Primary education	96 (40.0)
Secondary education	85 (35.4)
Tertiary education	27 (11.3)

3.2 DISTRIBUTION OF AILMENTS AMONG PARTICIPANTS

Out of the 240 participants, cardiovascular-related conditions were the most common initial ailments, accounting for 52.1% of the study population. Neurological conditions followed with 28.3%, while oncology-related cases comprised 19.6%. This indicates that cardiovascular diseases form the predominant underlying condition among the elderly patients in this study.

Table 3.2: Distribution of Initial Ailments among Participants

Initial Condition	Frequency	Percent	Valid Percent	Cumulative Percent
Cardiovascular related	125	52.1	52.1	52.1
Oncology	47	19.6	19.6	71.7
Neurology	68	28.3	28.3	100
Total	240	100.0	100.0	—

3.3 DISTRIBUTION OF COMORBIDITIES AND POLYPHARMACY ACROSS AGE GROUPS

Among the 240 participants, the most prevalent comorbidities were diabetes mellitus and asthma, affecting 30.4% and 31.2% of the population respectively, followed by stroke (27.5%) and chronic kidney disease (26.3%). Hypertension and arthritis were present in 23.3% and 24.5% of participants respectively, while malaria (13.3%), ulcer (9.2%), hyperlipidaemia/dyslipidaemia (5.0%), GERD (1.7%), and other conditions (9.2%) were less common. Age-stratified analysis showed that the 70–79-year group carried the highest burden of most comorbidities, including asthma (49.1%), diabetes mellitus (35.2%), chronic kidney disease (35.2%), stroke (34.3%), and arthritis (30.6%). The 60–69-year group had moderate prevalence, while the 80–89-year groups had smaller sample sizes.

Pearson chi-square tests revealed statistically significant associations between age group and several comorbidities, including hypertension ($\chi^2 = 14.54$, $p = 0.002$), asthma ($\chi^2 = 36.15$, $p < 0.001$), chronic kidney disease ($\chi^2 = 9.999$, $p = 0.019$), while associations for stroke, arthritis, malaria, ulcer, hyperlipidemia/dyslipidemia, GERD, and other conditions the results were statistically significant ($p < 0.05$), highlighting age-related differences in the distribution of comorbidities and emphasizing the higher prevalence of polypharmacy among older adults with chronic conditions. Polypharmacy was most common among participants with diabetes mellitus and asthma, with 36.5% of these patients receiving multiple medications, followed by stroke (33.7%), chronic kidney disease (28.7%), arthritis (27.0%), and hypertension (25.8%) this reflects the complexity of managing multiple chronic conditions in this population.

Table 3.3: Distribution Of Comorbidities and Polypharmacy Across Age Groups

Comorbidities	Total n (%)	60–69 years n (%)	70–79 years n (%)	80–89 years n (%)	Patients with comorbidities on polypharmacy n (%)
Diabetes mellitus	73 (30.4)	21 (17.4)	38 (35.2)	12 (37.5)	65 (36.5)
Hypertension	59 (24.5)	24 (19.8)	31 (28.7)	1 (12.5)	46 (25.8)
Asthma	75 (31.2)	19 (15.6)	53 (49.1)	1 (12.5)	65 (36.5)
Chronic kidney disease	63 (26.3)	21 (17.4)	38 (35.2)	3 (37.5)	51 (28.7)
Stroke	66 (27.5)	27 (22.3)	37 (34.3)	1 (12.5)	60 (33.7)
Arthritis	56 (23.3)	20 (16.5)	33 (30.6)	2 (25.0)	48 (27.0)
Malaria	32 (13.3)	23 (19.0)	8 (7.4)	1 (12.5)	27 (15.2)
Ulcer	22 (9.2)	12 (9.9)	9 (8.3)	1 (12.5)	18 (10.1)
Hyperlipidemia/ Dyslipidemia	12 (5.0)	10 (8.3)	2 (1.9)	0 (0.0)	12 (6.7)
GERD	4 (1.7)	4 (3.3)	0 (0.0)	0 (0.0)	4 (2.2)
Others	22 (9.2)	15 (12.4)	5 (4.6)	2 (25.0)	18 (10.1)

3.4 FREQUENCY OF COMORBIDITIES BY AGE

The distribution of the number of comorbidities among the 240 patients showed that 32 (13.3%) had no comorbidities, 48 (20.0%) had one, 81 (33.8%) had two, 38 (15.8%) had three, 40 (16.7%) had four, and only 1 (0.4%) had five comorbidities. Age-stratified analysis revealed that in the 60–69 years group, the majority had one or two comorbidities. Among patients aged 70–79 years, two or four comorbidities were most common, and in the 80–89 years group, two or three comorbidities predominated. The association between age group and the number of comorbidities was found to be statistically significant. (Pearson Chi-square = 23.23, df = 10, p = 0.025), indicating that the burden of comorbidities differed across age categories.

Table 3.4: Frequency of Comorbidities by Age

Number of comorbidities	Total n (%)	60–69 years n (%)	70–79 years n (%)	80–89 years n (%)
0	32 (13.3)	22 (18.2)	9 (8.3)	1 (12.5)
1	48 (20.0)	33 (27.3)	15 (13.9)	0 (0.0)
2	81 (33.8)	39 (32.2)	37 (34.3)	5 (62.5)
3	38 (15.8)	17 (14.0)	19 (17.6)	2 (25.0)
4	40 (16.7)	13 (10.7)	27 (25.0)	0 (0.0)
5	1 (0.4)	0 (0.0)	1 (0.9)	0 (0.0)
Total	240 (100)	124 (100)	108 (100)	8 (100)

3.5 CORRELATION BETWEEN NUMBER OF DRUGS PRESCRIBED AND NUMBER OF COMORBIDITIES

A moderate positive and statistically significant correlation was observed between the number of drugs prescribed and the number of comorbidities among participants ($r = 0.517$, $p < 0.01$). This suggests that patients with a greater number of comorbid conditions were more likely to be prescribed a higher number of medications.

Table 3.5: Correlation Between Number of Drugs Prescribed and Number of Comorbidities

Variables	Pearson Correlation (r)	Sig. (2-tailed)	N
Number of Drugs vs Comorbidities	0.517	0.000	240

3.6 NUMBER OF COMORBIDITIES TO NUMBERS OF DRUGS USED

A chi-square test of independence was conducted to examine the relationship between the number of comorbidities and the number of drugs prescribed. The association was statistically significant, $\chi^2(30) = 215.89$, $p < 0.001$, indicating that the number of drugs prescribed increased with the number of comorbidities. Patients with two or more comorbidities were more likely to receive six or more medications, whereas those without comorbidities were mostly prescribed fewer drugs. This pattern is consistent with the observed positive correlation between comorbidity count and polypharmacy ($r = 0.517$, $p < 0.01$).

Table **3.6: Number of Comorbidities to Numbers of Drugs Used**

Number of Comorbidities	**3 Drugs**	**4 Drugs**	**5 Drugs**	**6 Drugs**	**7 Drugs**	**8 Drugs**	**9 Drugs**	**Total (%)**
0	11	10	8	3	0	0	0	32 (13.3)
1	10	13	12	11	2	0	0	48 (20.0)
2	9	4	6	31	19	12	0	81 (33.8)
3	0	5	3	25	4	1	0	38 (15.8)
4	0	0	0	30	8	0	2	40 (16.7)
5	0	0	0	0	0	0	1	1 (0.4)
Total (%)	30 (12.5)	32 (13.3)	29 (12.1)	100 (41.7)	33 (13.8)	13 (5.4)	3 (1.3)	240 (100)

3.7 DISTRIBUTION OF NUMBER OF MEDICATIONS AND POLYPHARMACY

Out of 240 patients analysed, 178 patients were taking five or more medications, indicating that polypharmacy was present in 74.2% of patients. Among them, 80 (44.8%) were females and 98 (55.2%) were males, with no statistically significant difference between sexes ($\chi^2 = 4.001$, $p = 0.676$).

Table 3.7: Distribution of Number of Medications and Polypharmacy

Number of Medications	Total n (%)	Female n (%)	Male n (%)
3	30 (12.5)	14 (13.3)	16 (11.9)
4	32 (13.3)	11 (10.5)	21 (15.6)
5	29 (12.1)	13 (12.4)	16 (11.9)
6	100 (41.7)	46 (43.8)	54 (40.0)
7	33 (13.8)	12 (11.4)	21 (15.6)
8	13 (5.4)	8 (7.6)	5 (3.7)
9	3 (1.3)	1 (1.0)	2 (1.5)
Total	240 (100)	105 (43.8)	135 (56.3)

3.8: DISTRIBUTION OF POLYPHARMACY AMONG PARTICIPANTS

Out of the total 240 participants assessed, 178 participants (74.2%) were identified as exhibiting polypharmacy, while 62 individuals (25.8%) were using fewer than 5 drugs.

Table 3.8: Distribution of Polypharmacy Among Participants

Polypharmacy Status	Frequency	Percent	Valid Percent	Cumulative Percent
Polypharmacy Absent	62	25.8	25.8	25.8
Polypharmacy Present	178	74.2	74.2	100.0
Total	240	100.0	100.0	—

3.9: FREQUENCY AND CLASS OF POTENTIALLY INAPPROPRIATE MEDICATIONS

Among the 240 participants assessed, 48 (20.0%) were identified as receiving potentially inappropriate medications (PIMs). The PIMs identified, based on the specified criteria, include:

Table: 3.9: Frequency and Class of Potentially Inappropriate Medications

PIM	Class
1	Systemic oestrogen with history of breast cancer
2	Memantine inappropriate for someone with seizures
3	z-drugs > 2 weeks
4	thiazolidinediones (which may exacerbate heart failure)
5	Methyldopa is not well tolerated in older patients
6	clopidogrel and aspirin (no additional benefit)
7	Dabigatran and diltiazem increases risk of bleeding
8	antiplatelet, vit k antagonist, and factor Xa inhibitors increases the risk of bleeding
9	Central acting antihypertensive may cause orthostatic hypotension
10	Spironolactone and valsartan (risk of hyperkalaemia)
11	dabigatran and diltiazem increase risk of bleeding
12	memantine inappropriate for someone with seizures
13	antiplatelet, vit k antagonist, and factor Xa inhibitors increases the risk of bleeding
14	propranolol reduces the hypoglycaemic symptoms of diabetes mellitus, aspirin unindicated
15	NSAIDS in hypertension, furosemide not indicated expect case of heart failure.

16	methyldopa is not well tolerated in older patients
17	propranolol and atenolol are from the same class
18	prednisolone increase relapse of ulcer
19	methyldopa is not well tolerated in older patients
20	statins is not indicated
21	NSAID in hypertension, furosemide not indicated expect case of heart failure, NSAID along with prednisolone (increases risk of ulcer)
22	multiple antibiotics and use of ibuprofen for patients with ulcer
23	NSAID and corticosteroid in treatment of arthritis
24	Clopidogrel is not indicated
25	methyldopa not tolerated in older patients
26	furosemide with NSAID increases the risk of heart failure
27	prednisolone increase relapse of ulcer
28	methyldopa not tolerated in older patients
29	propranolol reduces the hypoglycaemic symptoms of diabetes mellitus, aspirin unindicated
30	clopidogrel and aspirin (no additional benefit)
31	Corticosteroid with history of peptic ulcer
32	prolong use of NSAID in hypertension
33	propranolol reduces the hypoglycaemic symptoms of diabetes mellitus, aspirin unindicated

34	prednisolone unindicated
35	clopidogrel and aspirin (no additional benefit)
36	Using two medications with antimuscarinic effects simultaneously can elevate the risk of antimuscarinic toxicity.
37	NSAID with ulcer without PPI or H2 antagoinst
38	Methyldopa is not well tolerated in older patients
39	propranolol reduces the hypoglycemic symptoms of diabetes mellitus, aspirin unindicated
40	clopidogrel and aspirin (no additional benefit)
41	long term use of NSAID with hypertension
42	Using two medications with antimuscarinic effects simultaneously can elevate the risk of antimuscarinic toxicity., prolonged use of NSAID with ulcer
43	methyldopa is not well tolerated in older patients
44	Spironolactone and valsartan (risk of hyperkalaemia)
45	beta block and diltiazem (increased risk of heart block)
46	Prednisolone in ulcer
47	clopidogrel and aspirin (no additional benefit)
48	methyldopa not well tolerated in older patients, sildenafil along with antihypertensive increases risk of hypotension

3.10 DISTRIBUTION OF POTENTIALLY INAPPROPRIATE MEDICATIONS (PIMS) AMONG PATIENTS

A chi-square test of independence was performed to examine the relationship between gender, age category, and the type of potentially inappropriate medication (PIM). The results indicated no significant association between gender and PIM, $\chi^2(1, N = 48) = 0.075$, $p = .784$, suggesting that both males (71.4%) and females (75.0%) were similarly likely to receive medications classified as potentially inappropriate. Likewise, no significant association was found between age category and PIM, $\chi^2(2, N = 48) = 0.353$, $p = .838$.

Table 3.10: Distribution of Potentially Inappropriate Medications (PIMS) Among Patients

Variable	Category	Inappropriate Use	Total (%)
Gender	Male	28	28 (100%)
	Female	20	20 (100%)
Age Categories	60–69	35	35 (100%)
	70–79	10	10 (100%)
	80–89	3	3 (100%)
Total	—	48	48 (100%)

3.11 DISTRIBUTION OF PIMS BY NUMBER OF DRUGS

The frequency of potentially inappropriate medications (PIMs) varied according to the number of drugs prescribed. Participants taking eight medications had the highest proportion of PIMs (69.2%), followed by those taking seven (36.4%) and five (41.4%) drugs. Those prescribed three or four medications showed the lowest proportions of PIMs (6.7% and 9.4%, respectively), while no PIMs were observed among participants taking nine drugs. Chi-square analysis indicated a statistically significant association between the number of drugs and the presence of PIMs, $\chi^2(6, N = 240) = 46.091$, $p < .001$. A significant linear trend was also observed, showing that the likelihood of having a PIM increased as the number of prescribed drugs rose (Linear-by-Linear Association = 10.817, $p = .001$).

Table 3.11: Distribution of Pims by Number of Drugs

Number of Drugs	Participants with PIMs (n)	Percentage of PIMs (%)
3	2	6.7
4	3	9.4
5	12	41.4
6	10	10.0
7	12	36.4
8	9	69.2
9	0	0.0
Total	48	20.0

3.12 FREQUENCY OF RESPONSES FOR ATTITUDES TOWARDS DEPRESCRIBING

Among the 240 participants, attitudes towards deprescribing varied across the five statements. The majority of participants reported trusting their doctor's advice (98.0%) and expressed willingness to discontinue one or more medications if recommended by their doctor (93.3%). More than half agreed that they feel they are taking too many medications (65.5%) and were concerned about potential side effects (68.4%). Fewer participants agreed that stopping some medications could improve their quality of life (30.8%), with the majority remaining neutral (54.2%). The mean scores reflected these trends: the highest mean was for trust in the doctor's advice (M = 4.05, SD = 0.31), followed by willingness to stop medications (M = 3.99, SD = 0.50), and concern about side effects (M = 3.73, SD = 0.53). The lowest mean was for perceived improvement in quality of life (M = 3.16, SD = 0.77). Overall, the results indicate that participants were generally positive and receptive towards deprescribing, particularly when guided by their healthcare provider.

Table 3.12: Frequency Of Responses For Attitudes Towards Deprescribing

Statement	SD	D	N	A	SA	Mean ± SD
I feel that I am taking too many medications	9 (3.8%)	20 (8.3%)	54 (22.5%)	141 (58.8%)	16 (6.7%)	3.56 ± 0.88
I would be willing to stop one or more of my medications if my doctor says it is possible	3 (1.3%)	0	13 (5.4%)	205 (85.4%)	19 (7.9%)	3.99 ± 0.50
I am concerned about potential side effects from my medication	0	0	76 (31.7%)	154 (64.2%)	10 (4.2%)	3.73 ± 0.53

I trust my doctor's advice about which medication I should take or stop	0	0	5 (2.1%)	217 (90.4%)	18 (7.5%)	4.05 ± 0.31
Stopping some of my medication could improve my quality of life	6 (2.5%)	30 (12.5%)	130 (54.2%)	67 (27.9%)	7 (2.9%)	3.16 ± 0.77

The overall mean score of participants' attitudes towards deprescribing, calculated from the five Likert-scale items, was 3.70 ± 0.31 (range: 3.39–4.01), indicating a generally positive attitude towards deprescribing among the participants.

Variable	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Mean score	240	3.39	4.01	3.70	0.31

CHAPTER FOUR

DISCUSSION

4.1 Prevalence of Polypharmacy

The result from this study revealed that polypharmacy was strikingly widespread, about three-fourth of the population were taking five or more medication indicating a very high prevalence of polypharmacy. This prevalence shows no meaningful difference across gender. This high incidence was strongly associated with concurrent medical conditions such as diabetes, asthma, stroke etc, highlighting the difficulties of managing multiple persistent disorders. This finding is higher than that with Saka et al. (2018 and 2018b). It also higher than a study carried out in South India by (K B Rakesh, Mukta N Chowta, Ashok K Shenoy, Rajeshwari Shastry and Sunil B Pai) which gave a prevalence of polypharmacy of around 60%

4.2 Potential Inappropriate Mediation PIMs

The investigation found that potentially inappropriate medications (PIMs) affected about one-fifth of the patients. Some of the offending drugs class include central acting antihypentensive, corticosteroid,NSAID etc Statistical tests revealed o significant ties between PIM presence and gender. This finding aligns with that of Wuraola Akande Sholabi, Lawrence A Adesbusoye, Olufemi O Olowookere 2018 which gave a 31% prevalence of PIM. It also aligns with the findings of a study carried out in South India by (K B Rakesh, Mukta N Chowta, Ashok K Shenoy, Rajeshwari Shastry and Sunil B Pai 2018) which stated the prevalence of PIM using to be 19%. A chi-square test of independence was conducted and showed no significant association between gender and PIMs indicating both male and female predominantly received medication classified as PIM

4.3 Relation Between Number of Drugs and Spotted PIM

The analysis revealed a clear and progressively increasing pattern in the occurrence of potentially inappropriate medications (PIMs), with the proportion of affected patients rising alongside the total number of drugs prescribed. Chi-square analysis demonstrated a statistically significant association between the number of medications and the presence of PIMs, with a significant linear trend indicating that the likelihood of PIMs increases as the number of prescribed drugs rises. These findings are consistent with those of M-C Weng et al. (QJM, 2013), who reported that the number of medications can serve as an indicator of PIM risk in older patients with chronic conditions. Clinicians should therefore be particularly vigilant for PIMs in older outpatients prescribed five or more medications.

4.4 Patients' Attitudes Towards Deprescribing

Participants showed generally positive attitudes toward deprescribing, with a mean score of 3.70 ± 0.31 (range 3.39–4.01) on a Likert scale. High agreement was noted for trusting doctors' advice and willingness to stop medications if recommended. Concerns about too many medications and side effects were moderate, while perceived quality-of-life improvements from stopping were lower. This is in tandem with the finding of Kristie Rebecca Weir et al. 2022 stating a greater than 80% that gave a positive attitude to deprescription.

4.5 Limitations of the study

The study conducted was only confined to University of Benin Teaching Hospital Benin city, Edo state. Thus, the outcome obtained only represented the situation in Benin city, which cannot be generalized to other states of nations. A study with longer duration and covering other states of the nations would thus give and in-depth scenario of the topic of interest. Despite this limitation, we believe the study provide insights into the assessment of polypharmacy and deprescription in geriatric patients with chronic diseases. Therefore, we believe these findings can provide valuable insights to inform the decisions of educators and health policymakers.

CHAPTER FIVE

CONCLUSION

This study on polypharmacy, associated health conditions, potentially unsuitable medications (PIMs), and views on medication reduction in 240 older individuals at a Nigerian healthcare facility offers vital understanding of elderly care obstacles in settings with limited resources. Results indicate widespread polypharmacy (74.2%), largely fuelled by multiple illnesses, where heart-related issues (52.1%) stand as the primary starting problem and diabetes or asthma emerge as frequent additional burdens. A noteworthy yet troubling PIM level (20.0%). Impressively, participants displayed favourable outlooks on cutting back drugs (average rating 3.70), including deep confidence in medical professionals (98.0%) and readiness to decrease intake (93.3%), hinting at openness to refined treatment methods. In essence, the data show how aging-linked multiple conditions worsen polypharmacy, matching general patterns in lower-income nations while spotlighting unique Nigerian elements such as widespread diseases and flaws in standard prescribing. Such discoveries reinforce the worldwide strain on older adult health but also reveal paths to better, more effective treatment, which could enhance daily living and cut down expenses in medical services.

5.1 Recommendations

To tackle the highlighted problems, here are practical, research-supported suggestions customized for Nigeria, inspired by effective strategies from other countries:

1. **Launch Organized Medication Reduction Efforts**: Medical staff ought to incorporate doctor-guided plans for trimming drugs, like modified STOPP/START or Beers standards, into regular checks for seniors. Trial initiatives at local facilities might focus on those at greater danger (for instance, taking five or more items), seeking 20–30% cuts in prescriptions, similar to outcomes in comparable resource-constrained areas. Sessions to train drug experts and physicians, backed by agencies such as NAFDAC, would aid rollout, capitalizing on the research's strong participant agreement (93.3%) for better follow-through.

2. **Improve Guidelines for Handling Multiple Illnesses**: Create country-wide protocols that favor comprehensive treatment instead of focusing on one disease at a time, giving priority to issues like diabetes and high blood pressure. Adding digital systems for writing prescriptions to highlight PIMs and possible clashes could lessen the seen connection between drug amounts and risks. Working with the Federal Ministry of Health to add plans based on age groups would ease pressures in the 70–79 segment.

3. **Boost Educational and Outreach Activities**: Inform individuals, family supporters, and health workers about dangers of too many drugs and advantages of scaling back via local programs and broadcasts. Target easing worries over unwanted effects (68.4%) and raising views on life quality improvements (now only 30.8%). Affordable steps, such as advice from pharmacists, can use the study's confidence results to increase involvement.

4. **Bolster Drug Safety Monitoring and Studies**: Widen tracking networks to watch PIMs and polypharmacy across the nation, covering over-the-counter items frequently missed in Nigeria. Upcoming long-term research needs to assess results from reducing meds, like hospital stays, and look into differences between city and countryside areas. Support from groups like WHO Africa might fund wider tests to confirm approaches.

5. **Push for Policy Changes and Funding Distribution**: Press for updates in rules to ensure better availability of reasonably priced, suitable treatments and experts in elderly care. Rewards for check-ups in basic health services could fix common errors in ordering drugs, eventually dropping the 74.2% polypharmacy load and related spending.

Putting these ideas into action would help Nigeria move toward more secure drug handling for older people, fitting with international aims for sustainable, healthy later years.

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APPENDIX

Questionnaire: Assessment of Polypharmacy and Deprescription in Geriatric Patients with chronic Diseases

Instructions: This questionnaire is designed to understand your medication use and perspectives on reducing medications. Please answer all questions as accurately as possible. Your responses will remain confidential and will be used solely for research purposes.

Section A: Demographic Information

Age: ____ years

Sex:

Male [ ]

Female [ ]

Highest Level of Education:

No formal education [ ]

Primary education [ ]

Secondary education [ ]

Tertiary education [ ]

Number of Comorbidities: ____ (e.g., diabetes, heart disease)

Co Morbidity (if any)_____

Section B: Medication Use

How many medications (prescribed and over-the-counter) do you take daily?

____ medications

Do you have difficulty managing your medications?

Never [ ]

Sometimes [ ]

Often [ ]

Always [ ]

Have you experienced any side effects from your medications in the past 6 months?

Yes [ ]

No [ ]

Who primarily manages your medications?

Self [ ]

Caregiver [ ]

Healthcare provider [ ]

Section C: Attitudes Towards Deprescribing (Adapted from rPATD)

I feel that I am taking too many medications.

Strongly Agree [ ]

Agree [ ]

Neutral [ ]

Disagree [ ]

Strongly Disagree [ ]

I would be willing to stop one or more of my medications if my doctor says it is possible.

Strongly Agree [ ]

Agree [ ]

Neutral [ ]

Disagree [ ]

Strongly Disagree [ ]

I am concerned about potential side effects from my medications.

Strongly Agree [ ]

Agree [ ]

Neutral [ ]

Disagree [ ]

Strongly Disagree [ ]

I trust my doctor's advice about which medications I should take or stop.

Strongly Agree [ ]

Agree [ ]

Neutral [ ]

Disagree [ ]

Strongly Disagree [ ]

Stopping some of my medications could improve my quality of life.

Strongly Agree [ ]

Agree [ ]

Neutral [ ]

Disagree [ ]

Strongly Disagree [ ]

Section D: TO BE FILLED BY INVESTIGATOR USING PRESCRIPTION OF PATIENT

Medication used by the patients, including OTC

_____

Patients Diagnosis in accordance to the inclusion criteria

_____

Potential inappropriate medication

Yes [ ]

No [ ]

Potential inappropriate medication classify (if any)

_____