

A Review on the Impact of Polypharmacy on Medication Adherence among Geriatrics

Shamili P^{1*}, Satish S², Ramakrishna Shabaraya A³

¹Student, Pharm D, Department of Pharmacy Practice, Srinivas College of Pharmacy, Mangalore, Karnataka, India

²Professor, Department of Pharmacy Practice, Srinivas College of Pharmacy, Mangalore, Karnataka, India

³Professor and Principal, Department of Pharmacy Practice, Srinivas College of Pharmacy, Mangalore, Karnataka, India

Submitted: 10-11-2023

Accepted: 20-11-2023

ABSTRACT:

Polypharmacy, the concurrent use of multiple medications, is a common and complex issue in the healthcare of geriatric patients. This review aims to explore the multifaceted relationship between polypharmacy and medication adherence in the elderly population. As the geriatric population continues to grow, managing their medication regimens becomes increasingly crucial for maintaining their health and well-being.

Several factors contributing to medication non-adherence among geriatrics in the context of polypharmacy are explored, including cognitive impairment, physical limitations, financial constraints, and the complexity of medication regimens. Additionally, the role of healthcare providers in addressing these challenges is discussed, with a focus on strategies to enhance medication adherence while minimizing polypharmacy-related risks.

The review also delves into potential interventions and solutions aimed at improving medication adherence in geriatric patients with polypharmacy. The importance of shared decision-making between healthcare providers and patients is emphasized as a means to individualize treatment plans and optimize medication management.

In conclusion, this review sheds light on the critical issue of polypharmacy and its impact on medication adherence among geriatric patients. Understanding the various factors contributing to non-adherence and implementing tailored interventions is essential in promoting better healthcare outcomes and enhancing the quality of life for this vulnerable population. Addressing fundamental steps will help to manage the complex interplay between polypharmacy and medication adherence in geriatrics.

KEYWORDS: Polypharmacy, Medication adherence, Geriatrics

I. INTRODUCTION:

The term Polypharmacy was coined centuries ago to explain the issues associated with multiple drug use. There is no standard definition for polypharmacy. However, in simple terms, it can be defined as the use of multiple drugs. The World Health Organization defines polypharmacy as the routine use of five or more medications. This includes over-the-counter, prescription and/or traditional and complementary medicines used by a patient¹. In U.S, it was reported that the prevalence of polypharmacy increased from 8.2% in 2000 to 15% in 2012 indicating that there is twofold increase in prevalence of polypharmacy².

POLYPHARMACY IN GERIATRICS:

Elderly patients are more prone to develop adverse drug events because of the metabolic changes which will proportionately increase as the number of drugs increase³. According to India's National Health and Nutrition Examination Survey (NHANES III), 74% of the aged population take prescribed drugs. Polypharmacy is a critical health-related concern, particularly among the elderly, that must be addressed urgently, as polypharmacy can negatively impact the elderly's quality of life⁴.

Aging and the onset of various diseases increase the necessity to take medications to the point where the number of prescriptions taken can reach 6–9. Polypharmacy is more likely to occur when a patient visits multiple doctors or is hospitalized. This is because new prescriptions may be recommended for the patient. One of the most prominent reasons of polypharmacy is a patient's lack of literacy and information⁵. Another reason is when the patients self-medicate for their symptoms and take it with their prescribed medicines.

Polypharmacy is more likely to be developed in people who are hospitalized or in patients who visit multiple prescribers⁶. Lack of communication of the patients with the doctors,

nurses or with the pharmacists can lead to a situation where in the patient may take the 2 different drugs for the same condition prescribed by two different prescribers.

Several studies on elderly population showed that polypharmacy was present in almost >50% of their study population and the average number of medications ranged from 6-14. In most of the studies it was found that polypharmacy was significantly more prevalent in elderly women than in elderly men^{5,6,7,8,9,10}

CONSEQUENCES OF POLYPHARMACY:

Polypharmacy has an impact on numerous aspects of medication safety. First, it has been related to an increased risk of adverse drug reactions, particularly among the elderly, due to physiological changes that occur with age and may alter the pharmacokinetics and pharmacodynamics of some drugs.

Studies revealed that there is an increased risk for an ADE visit with increasing number of medications. Also there has been reports of increased risk of hip fracture and some other commonly reported ADRs among study participants with polypharmacy were falls, sedation, constipation, hyperkalaemia, and hyperglycemia^{11,12,13,14,15,16}.

Second, it is associated with an increased risk of potentially inappropriate medications (PIMs), as evidenced by several studies that found approximately 20% of PIMs in prescriptions^{6,17,18,19,20}. Third, it has been reported to be associated with medication non-adherence in a disease-specific older population¹⁰. Furthermore, increased medicine use may result in rising healthcare expenses. As a result, a comprehensive understanding of the epidemiology of polypharmacy among the elderly is required²⁰.

Drug-drug interactions and the risk of a prescription cascade are both increased by polypharmacy. When an adverse medication event is misinterpreted as a new medical illness and additional pharmacological therapy is recommended to treat this medical condition, a prescribing cascade occurs³. Several studies showed that there was a positive correlation between the number of drugs dispensed and the number of drug interactions i.e., as the number of medications increased, the incidence of drug drug interactions increased as well^{21, 22, 23, 24}

Patients and their families are also burdened by polypharmacy because they must understand the purpose of several prescriptions

provided by multiple clinicians, obtain refills, take each medication at the correct time of day, and notice side effects. It can result in negative pharmacological effects, drug interactions, noncompliance, and a prescription cascade.

MEDICATION NON-ADHERENCE

Medication non-adherence is a multifaceted problem produced by a complex interaction of various modifiable and unmodifiable factors that can be classified into five dimensions (socioeconomic, patient-related, therapy-related, condition-related and health system-related). The more complicated a treatment plan is, the greater the chance of noncompliance²⁵

The causes could be linked to the patient, the treatment, or the health-care provider. As a result, a large number of patients do not get the most out of their medication, resulting in increased morbidity and mortality, as well as increased societal expenses. Non-compliance has negative consequences such as increased morbidity, death, and expenses²⁶

There are two types of approaches for measuring adherence: direct and indirect ways of measurement. Direct approaches include direct observed therapy, detecting or measuring a biological marker added to the drug formulation in the blood, and measuring the level of a medication or its metabolite in blood or urine. Patient questionnaires, patient self-reports, pill counts, prescription refill rates, clinical response assessment, and electronic medication monitors are examples of indirect approaches²⁷.

Polypharmacy and Adherence

Polypharmacy is often associated with medication non-adherence. Multimorbid patients are more likely to have polypharmacy and frailty, rendering them more prone to non-adherence and its consequences²⁵.

Polypharmacy can cause challenges with drug adherence in older persons, particularly if it is linked to visual or cognitive deterioration, which is common with ageing and can lead to negative outcomes such as treatment failure or hospitalisation²⁸. Complex dose schedules, prescription instruction confusion, high drug costs, side effects, and frequent refills are all ways that polypharmacy affects adherence.

According to multiple studies, patients were shown to adhere to their therapy when they took fewer number of medicines and as the number of medications increased, adherence

declined^{10,29,30,31,32,33,34,35,36}. While just a few studies demonstrate that patients who took more medications had improved adherence^{37, 38}

I NTERVENTIONS TO REDUCE POLYPHARMACY

Medication adherence is an important consideration in patient care especially in the geriatric population. The elderly people will usually have multiple co morbid conditions for which they will be prescribed with multiple medications. Although polypharmacy cannot be avoided always, certain approaches like eliminating pharmacological duplication, reducing dose frequency and medication mistake, and reviewing the drug regimen on a regular basis with the support of clinical pharmacy services can all help to simplify the medication routine³⁹. The medication schedule can be made simpler by removing pharmacological overlap, decreasing dose repetition and medication errors, and regularly assessing the drug regimen with the assistance of clinical pharmacy services. The primary care physician can try to reduce the number of medications by adapting any of the following methods.

Deprescribing: has a number of advantages, including improved health outcomes by resolving adverse drug reactions, improved medication adherence, and lower direct medical healthcare expenses. Deprescribing, on the other hand, might lead to withdrawal symptoms and the aggravation or recurrence of medical issues. These risks can be reduced with proper planning, monitoring, and, if necessary, re-initiation of drugs. Several research studies have been done on deprescribing and was associated with improved clinical outcomes^{40, 41,42, 43, 44}.

Beers criteria:The 2019 update employs five criteria: medications that should be avoided in older patients in general, medications that should be avoided in older patients with specific conditions, medications that should be used with caution due to benefits that may outweigh risks, medication interactions, and changes in dosing based on kidney function. In addition to these criteria, medication decisions should take a variety of factors into account, such as discontinuing medications when they are no longer beneficial. Some studies have applied Beers criteria and have identified use of potential inappropriate medications^{19,45,46,47}. Beers criteria can be used by

pharmacists, physicians and other health care providers as an important tool to identify the potentially inappropriate medication and polypharmacy. Therefore, the pharmacist can play an important role in decreasing inappropriate medications used which can eventually reduce polypharmacy.

START/STOPP Criteria: Screening Tool of Older Persons' potentially inappropriate Prescriptions (STOPP)/Screening Tool to Alert doctors to the Right Treatment (START) criteria was developed when 18 Irish and British experts in geriatrics, clinical pharmacology, geriatric psychology, and primary medicine formed a panel that created a list of 65 drugs that shouldn't be prescribed for specific diseases and 22 drugs that should be prescribed for particular conditions⁴⁸. START/STOPP criteria are useful in detecting PIMs in the elderly population, especially in patients with polypharmacy^{48,49,50}. Thus, the detection of PIMs necessitates further evaluation of its impact on clinical outcomes, as well as efforts to implement interventions to improve prescribing practice in the elderly.

Medication Appropriate Index: It was created with the goal of evaluating the effectiveness of medications in all age groups. This tool is designed to evaluate patients' self-medication practices as well as the appropriateness of medications prescribed by a healthcare provider. It is a 10-item questionnaire with a maximum score of 18 representing inappropriateness and a minimum score of 0 representing appropriateness⁵¹. It has proven to be effective in identifying potentially inappropriate medications (PIMs), emphasizing the importance of an appropriate prescribing pattern in the elderly⁵¹.

IMPROVING ADHERENCE IN ELDERLY

Medication non-adherence can lead to treatment failure and hence methods to improve adherence has to be followed. There are several strategies available to enhance adherence in the elderly. Simple medication regimens, educating patients and caregivers about their disease and medications, using medication adherence tools such as pill boxes, medication adherence apps, and easy availability of cheaper medications can all help to improve overall adherence⁵². The difference between improving adherence among the elderly and others is that most of the elderly will have a caregiver present. As a result, improving adherence

among the elderly includes both intervention with the elderly and intervention with the caregiver.

II. CONCLUSION

Several research studies have shown that polypharmacy can have varying effects on drug adherence, potentially influencing it positively or negatively by either enhancing or diminishing adherence levels. When polypharmacy decreases adherence, it leads to various consequences and hence methods to reduce polypharmacy has to be considered along with the methods to increase adherence. Clinicians in all settings should consider medication reviews and dosing adjustments for elderly patients in order to detect changes in patient status such as renal or liver impairments.

Medication reviews can help to identify the PIMs, reduce polypharmacy and help in the improvement of medication adherence. Overall, polypharmacy can complicate medication adherence, but with proper support, education, and communication between patients and healthcare providers, it is possible to improve adherence and ensure better health outcomes for patients on multiple medications.

REFERENCES

- [1]. World Health Organization. Medication safety in polypharmacy: technical report. World Health Organization; 2019.
- [2]. Wang X, Liu K, Shirai K, Tang C, Hu Y, Wang Y, et al. Prevalence and trends of polypharmacy in US adults, 1999–2018. *Global Health Research and Policy*. 2023;8(1):1-9.
- [3]. Al Ameri M. Prevalence of Poly-pharmacy in the Elderly: Implications of Age, Gender, Co-morbidities and Drug Interactions. *SOJ Pharmacy & Pharmaceutical Sciences*. 2014;1(3):1-7.
- [4]. Gupta R, Malhotra A, Malhotra P. A study on polypharmacy among elderly medicine in-patients of a tertiary care teaching hospital of North India. *National Journal of Physiology, Pharmacy and Pharmacology*. 2018;8(9):1297-1301.
- [5]. Hosseini SR, Zabihi A, Amiri SR, Bijani A. Polypharmacy among the Elderly. *Journal of mid-life health*. 2018;9(2):97-103.
- [6]. Rakesh KB, Chowta MN, Shenoy AK, Shastry R, Pai SB. Evaluation of polypharmacy and appropriateness of prescription in geriatric patients: A cross-sectional study at a tertiary care hospital. *Indian journal of pharmacology*. 2017;49(1):16-20.
- [7]. Nobili A, Franchi C, Pasina L, Tettamanti M, Baviera M, Monesi L, et al. Drug utilization and polypharmacy in an Italian elderly population: The EPIFARM-elderly project. *Pharmacoepidemiol Drug Saf*. 2011;20:488–96
- [8]. Charlesworth CJ, Smit E, Lee DS, Alramadhan F, Odden MC. Polypharmacy among adults aged 65 years and older in the United States: 1988-2010. *J Gerontol A Biol Sci Med Sci*. 2015;70:989–95.
- [9]. Raju S, Sujitha PJ, Sambathkumar R. A prospective observational study on polypharmacy in geriatrics at a tertiary care hospital, Erode. *International Journal of Research and Review*. 2021; 8(1): 602-7
- [10]. Shareinia H, Sadeghmoghadam L, Mokhtarzadeh M, Zahrayi S, Jafari N, Noori R. Relationship Between Polypharmacy and Medication Adherence in the Hypertensive Elderly Patients. *Disease and Diagnosis*. 2020;9(4):153-7.
- [11]. Bourgeois F, Shannon M, Valim C, Mandl K. Adverse drug events in the outpatient setting: an 11-year national analysis. *Pharmacoepidemiology and Drug Safety*. 2010;19(9):901-10.
- [12]. Goldberg R, Mabee J, Chan L, Wong S. Drug-drug and drug-disease interactions in the ED: Analysis of a high-risk population. *The American Journal of Emergency Medicine*. 1996;14(5):447-50.
- [13]. Nguyen J, Fouts M, Kotabe S, Lo E. Polypharmacy as a risk factor for adverse drug reactions in geriatric nursing home residents. *The American Journal of Geriatric Pharmacotherapy*. 2006;4(1):36-41.
- [14]. Hohl CM, Dankoff J, Colacone A, Afilalo M. Polypharmacy, adverse drug-related events, and potential adverse drug interactions in elderly patients presenting to an emergency department. *Annals of emergency medicine*. 2001;38(6):666-71.
- [15]. Maher RL, Hanlon J, Hajjar ER. Clinical consequences of polypharmacy in elderly. *Expert opinion on drug safety*. 2014;13(1):57-65.
- [16]. Kojima T, Akishita M, Nakamura T, Nomura K, Ogawa S, Iijima K, et al. Association of polypharmacy with fall risk among geriatric outpatients. *Geriatrics & Gerontology International*. 2011;11(4):438-44
- [17]. Pérez T, Moriarty F, Wallace E, McDowell R, Redmond P, Fahey T. Prevalence of potentially inappropriate prescribing in older people in primary care and its association

- with hospital admission: longitudinal study. *BMJ*. 2018;k4524.
- [18]. Parthasarathi G, Ramesh M, Guido S, Harugeri A, Joseph J. Potentially inappropriate medication use in elderly patients: A study of prevalence and predictors in two teaching hospitals. *Journal of Postgraduate Medicine*. 2010;56(3):186-91
- [19]. Kumar KN, Holyachi S, Reddy K, Nayak P, Byahatti N. Prevalence of polypharmacy and potentially inappropriate medication use among elderly people in the rural field practice area of a medical college in Karnataka. *Int J Med Sci Public Health*. 2015;4(8):1071-5.
- [20]. Tan Y, Suppiah S, Bautista M, Malhotra R. Polypharmacy among community-dwelling elderly in Singapore: Prevalence, risk factors and association with medication non-adherence. *Proceedings of Singapore Healthcare*. 2019;28(4):224-31.
- [21]. Van Hare R. Potential adverse drug interactions in the emergency room (An issue in the quality of care). *Annals of Emergency Medicine*. 1990;19(7):847-8.
- [22]. Doan J, Zakrzewski-Jakubiak H, Roy J, Turgeon J, Tannenbaum C. Prevalence and Risk of Potential Cytochrome P450-Mediated Drug-Drug Interactions in Older Hospitalized Patients with Polypharmacy. *Annals of Pharmacotherapy*. 2013;47(3):324-32
- [23]. Juurlink D. Drug-Drug Interactions Among Elderly Patients Hospitalized for Drug Toxicity. *JAMA*. 2003;289(13):1652.
- [24]. MN L, Unnisa A. Prevalence And Clinical Consequences Of Polypharmacy On Medication Profile Among The Elderly In A Tertiary Care Teaching Hospital. *Asian Journal of Pharmaceutical and Clinical Research*. 2020; 13(6): 121-6
- [25]. González-Bueno J, Sevilla-Sánchez D, Puigoriol-Juventeny E, Molist-Brunet N, Codina-Jané C, Espauella-Panicot J. Factors Associated with Medication Non-Adherence among Patients with Multimorbidity and Polypharmacy Admitted to an Intermediate Care Center. *International Journal of Environmental Research and Public Health*. 2021;18 (18):9606.
- [26]. Hugtenburg JG, Timmers L, Elders PJ, Vervloet M, van Dijk L. Definitions, variants, and causes of nonadherence with medication: a challenge for tailored interventions. *Patient preference and adherence*. 2013;7:675-82.
- [27]. Anghel LA, Farcas AM, Oprean RN. An overview of the common methods used to measure treatment adherence. *Medicine and pharmacy reports*. 2019;92(2):117-22.
- [28]. von Buedingen F, Hammer MS, Meid AD, Müller WE, Gerlach FM, Muth C. Changes in prescribed medicines in older patients with multimorbidity and polypharmacy in general practice. *BMC family practice*. 2018;19:1-11.
- [29]. Shruthi R, Jyothi R, Pundarikaksha HP, Nagesh GN, Tushar TJ. A Study of Medication Compliance in Geriatric Patients with Chronic Illnesses at a Tertiary Care Hospital. *Journal of clinical and diagnostic research*. 2016;10(12):40-3.
- [30]. Ownby R, Hertzog C, Crocco E, Duara R. Factors related to medication adherence in memory disorder clinic patients. *Aging & Mental Health*. 2006;10(4):378-85.
- [31]. Gray S, Mahoney J, Blough D. Medication Adherence in Elderly Patients Receiving Home Health Services following Hospital Discharge. *Annals of Pharmacotherapy*. 2001;35(5):539-45.
- [32]. Turner BJ, Hollenbeak C, Weiner MG, et al. Barriers to adherence and hypertension control in a racially diverse representative sample of elderly primary care patients. *Pharmacoepidemiology and Drug Safety*. 2009; 18 (8): 672-81
- [33]. Tamilselvan T, Kumutha T, Priyanka MKN, Bose R, Shabana S and Sindhuja M. Incidence of Polypharmacy and Drug related problems among Geriatric patients in a Multispecialty hospital. *International Journal of Research and Development in Pharmacy & Life Science*. 2018; 7(4):3055-9
- [34]. Choudhry NK, Fischer MA, Avorn J, Liberman JN, Schneeweiss S, Pakes J, et al.. The implications of therapeutic complexity on adherence to cardiovascular medications. *Archives of Internal Medicine*. 2011; 171:814-22
- [35]. Cárdenas-Valladolid J, Martín-Madrado C, Salinero-Fort MA, et al. Prevalence of adherence to treatment in homebound elderly people in primary health care: a descriptive, cross-sectional, multicentre study. *Drugs Aging*. 2010;27(8):641-51.
- [36]. Pasina L, Brucato AL, Falcone C, Cucchi E, Bresciani A, Sottocorno M, et al. Medication non-adherence among elderly patients newly discharged and receiving polypharmacy. *Drugs Aging* 2014;31:283-9.
- [37]. Gazmararian J, Kripalani S, Miller M, Echt K, Ren J, Rask K. Factors associated with

- medication refill adherence in cardiovascular-related diseases. *Journal of General Internal Medicine*. 2006;21(12):1215-21.
- [38]. Grant RW, Devita NG, Singer DE, Meigs JB. Polypharmacy and medication adherence in patients with type 2 diabetes. *Diabetes Care*. 2003;26(5):1408-12
- [39]. Colley CA, Lucas LM. Polypharmacy: the cure becomes the disease. *Journal of general internal medicine*. 1993;8:278-83.
- [40]. Garfinkel D. Poly-de-prescribing to treat polypharmacy: efficacy and safety. *Therapeutic advances in drug safety*. 2018;9(1):25-43.
- [41]. Jungo K.T, Mantelli S, Rozsnyai Z, Missiou A, Kitanovska B.G, Weltermann B, et al. General practitioners' deprescribing decisions in older adults with polypharmacy: A case vignette study in 31 countries. *BMC Geriatrics*. 2021;21:19:1-12
- [42]. Ailabouni N, Mangin D, Nishtala PS. DEFEAT-polypharmacy: deprescribing anticholinergic and sedative medicines feasibility trial in residential aged care facilities. *International Journal of Clinical Pharmacy*. 2019;41(1):167-78.
- [43]. Garfinkel D, Mangin D. Feasibility study of a systematic approach for discontinuation of multiple medications in older adults: addressing polypharmacy. *Archives of Internal Medicine*. 2010;170(18):1648-54.
- [44]. Garfinkel D., Zur-Gil S., Ben-Israel H. The war against polypharmacy: a new cost-effective geriatric-palliative approach for improving drug therapy in disabled elderly people. *Israel Medical Association Journal*. 2007;9:430-34.
- [45]. Khamis S, Abdi AM, Uzan A, Basgut B. Applying beers criteria for elderly patients to assess rational drug use at a university hospital in Northern Cyprus. *Journal of Pharmacy and Bioallied Science*. 2019;11:133-41.
- [46]. Sultana R, Naaz S, Adil M, Fatima S, Khabita M. Evaluation of Geriatric Prescriptions Applying Beers Criteria In A Tertiary Care Hospital. *Indian Research Journal of Pharmacy and Science*. 2019;6(2):1852-60.
- [47]. Lim YJ, Kim HY, Choi J, Lee JS, Ahn AL, Oh EJ, et al. Potentially inappropriate medications by beers criteria in older outpatients: prevalence and risk factors. *Korean J Fam Med*. 2016;37:329-33
- [48]. Lee SJ, Cho SW, Lee YJ, Choi JH, Ga H, Kim YH, et al. Survey of potentially inappropriate prescription using STOPP/START criteria in Inha University Hospital. *Korean Journal of Family Medicine*. 2013;34(5):319-26.
- [49]. Awad A, Hanna O. Potentially inappropriate medication use among geriatric patients in primary care setting: A cross-sectional study using the Beers, STOPP, FORTA and MAI criteria. *Plos one*. 2019;14(6):1-17
- [50]. Keche YN, Gaikwad NR, Wasnik PN, Siddiqui S, Nagpure K, Dhaneria S. Usefulness of STOPP/START criteria and Beers criteria for prescribing in geriatric patients in a tertiary health care center, Raipur, Central India. *Journal of Family Medicine and Primary Care*. 2022;11(11):7064-71.
- [51]. Hanlon JT, Schmadar KE, Samsa GP, Weinberger M, Uttech KM, Lewis IK, Cohen HJ, Feussner JR. A method for assessing drug therapy appropriateness. *Journal of clinical epidemiology*. 1992;45(10):1045-51.
- [52]. Punnapurath S, Vijayakumar P, Platty PL, Krishna S, Thomas T. A study of medication compliance in geriatric patients with chronic illness. *Journal of Family Medicine and Primary Care*. 2021;10(4):1644-8.