IJPSR (2023), Volume 14, Issue 8 (Research Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 13 December 2022; received in revised form, 20 February 2023; accepted 29 May 2023; published 01 August 2023

POLYPHARMACY IN GERIATRIC PATIENTS WITH DRUG-DRUG INTERACTIONS AND COMORBID CONDITIONS

Prathyusha Thunla *, Madhusudan Rao Yamsani, Dasarikasapuram Rachitha, Srija Bandi and Neelam Swetha

Department of Pharmacy, Vaagdevi Institute of Pharmaceutical Sciences, Bollikunta - 506005, Warangal, Telangana, India.

Keywords:

Polypharmacy, Geriatrics, Comorbidities, Drug-drug Interactions, Medications

Correspondence to Author:
Prathyusha Thunla

Assistant Professor,
Department of Pharmacy,
Vaagdevi Institute of Pharmaceutical Sciences, Bollikunta - 506005,
Warangal, Telangana, India.

E-mail: ushapharmd10@gmail.com

ABSTRACT: Background: Geriatrics refers to the population of 60 years and older. The geriatric population is considered a significant consumer of prescription medications. Polypharmacy is a global phenomenon, and on the elderly population, the impact of polypharmacy is substantial. Aging is a multidimensional process, and it is a growing concern. Multiple comorbidities are one of the reasons for polypharmacy. Comorbidity is associated with more complex clinical management and the increase of drug use, and health care costs. In older adults, Drug-drug interactions have potentially life-threatening consequences. **Methods:** A prospective observational study was carried out for six months in a private corporate hospital in Secunderabad, Hyderabad. The data on patients aged 65 years and above who are hospitalized with comorbid conditions is collected from case sheets. Data includes socio-demographic details, number of medications, name of medications and comorbidities. **Results:** A total of 300 patients were included in the study. Polypharmacy was seen in 217 (72%) prescriptions and non-polypharmacy was seen in 83(27%) prescriptions. A total of 168 comorbid conditions were found among the total population. The most common comorbidities were Hypertension, Diabetes and Hypothyroidism. Out of 300 patients, 197 have Drug-drug interactions. **Conclusion:** The prevalence of polypharmacy is very high among the geriatric population in the study site. We have found many Drug-drug Interactions in the study. A close and intensive monitoring of geriatrics in regard with polypharmacy could restrain the consequences.

INTRODUCTION: Geriatrics refers to the population of 60 years and older [1]. The geriatric population is considered a significant consumer of prescription medications and stands for a significant portion of the global population [2].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.14(8).4066-71

This article can be accessed online on www.ijpsr.com

DOI link: http://doi.org/10.13040/IJPSR.0975-8232.14(8).4066-71

According to WHO, there is one elderly individual of age >60yrs for every nine people. By 2050, this value is expected to increase to one in five individuals, accounting for about half of the total growth of the world population [3, 4].

According to WHO, Polypharmacy is defined as using more medications that are 5 or more than clinically necessary. In contrast, hyper polypharmacy is defined as taking 10 or more medications simultaneously. Polypharmacy is commonly seen among older individuals due to multiple chronic health conditions [5].

Polypharmacy is a global phenomenon, and on the elderly population, the impact of polypharmacy is significant. Although polypharmacy is a growing public health issue, the prevalence of polypharmacy increases with age and varies in different populations [6]. Polypharmacy increases the risk of inappropriate drug use, hospitalizations and falls, underuse of effective treatment, poor medication adherence, drug-drug interactions, drug-disease interactions, medication errors and adverse drug effects [7] to [10]. According to previous studies, the factors related to polypharmacy include age, gender, levels of education, poor self-reported health, a high number of visits to health care professionals and types of disease and number of diseases [11]. The greater number of drugs an elderly use, the greater the probability of lower adherence to medication regimen and poorer health outcomes.

Polypharmacy is an important risk factor for appropriate medication prescribing; in older adults, a drug prescription should always be written with the utmost care because inappropriate medication prescribing may lead to the possibility of ADR which is very frequently observed among elderly people [12]. In India, according to National Health and Nutrition Examination Survey (NHANES-3), about 74% of the elderly population use prescribed medications [13]. In elderly people with an increase in age, the occurrence and concurrency of multiple chronic diseases also increase, and they suffer from dual medical problems that are both communicable as well as non-communicable diseases; therefore, the rate of medication use also increases evenly [14]. A single agent/ drug should be prescribed instead of multiple drugs to treat a single condition or disease. Proportionally compared to other age groups, elderly people use more drugs, *i.e.*, polypharmacy and it can lead to ADR's [15]. ADRs occur mostly due to OTC medications the most consistent risk factor for ADR is the number of drugs being taken; that is as the number of drugs increases, the risk of ADRs increases [16].

Population Aging and Multimorbidity: Aging is a multidimensional process and it is a growing concern. Drug-related problems increase with the increase in the aging population. The aging process is a biological reality that involves continuous changes in psychological, biological, functional, and social parameters that vary depending on genetic factors, age-related vulnerability, and differences in organ functions and reserves [17]. The aging process has its dynamic, largely beyond human control. A century ago, in 20 individuals, one individual was aged 65 years or over, and now, it is one in six individuals, and it is expected to be one in four individuals by 2050. For aged people, the proper medications are prescribed according to the history of the disease, physical and mental health, physical ability, and drug resistance. In the development of side effects, aging plays an important role due to drug accumulation. Aging and multimorbidity are two interlinked factors responsible for the rapid rise in the global prevalence of polypharmacy.

In 2008 WHO officially defined "Comorbidity as an individual suffering from two or more chronic diseases at the same time." It is often called multiple morbidities or multimorbidities and is frequently called comorbidity [18]. In the elderly population over 70 years of age,>50% suffer from one or more chronic conditions, including Hypertension, Diabetes mellitus, coronary heart disease, and cancer. Multiple comorbidities are one of the reasons for polypharmacy. Comorbidity leads to the difficulty of treatment with worse health outcomes which seriously affects the quality of life of a patient [19]. Comorbidity is associated with more complex clinical management, an increase in drug use and increased healthcare costs. In the elderly population with increasing aging, it is said that from 2015-2035 the number of people living with greater than four comorbidities will almost double (from 9.8%-17.0%). Increased comorbidities in the elderly population invite increased medication use; though the use of multiple drugs may be required to manage a single disease or comorbidities, harmful interactions may occur between these drugs.

Drug-Drug Interactions: Elderly people may take several drugs at once for multiple conditions that may lead to Drug-drug interactions. Alterations in the effect of one drug (object drug) as a result of the co-administration of another drug (precipitant drug) are called Drug interactions. In older adults, Drug-drug interactions have potentially life-threatening consequences, although most Drug-drug interactions are preventable sometimes,

patients are exposed to important complications and even death due to Drug-drug interactions [20].

Elderly people are more susceptible to Drug interactions than younger people due to changes in the physiological parameters that affect medications' PK and PD properties.

Prevention of Polypharmacy can be done by:

1. Discontinuing all unnecessary medications by the elderly.
2. A higher risk of medications is substituted with safer drugs.
3. Unessential drugs prescribed by different healthcare providers for the same condition should be identified and eliminated
4. Start a new medication at the lowest drug dose first, and incremental increase can be done if required.
5. Monitor Drug-drug and Drug-disease interactions.

METHODS AND MATERIALS: It is a Prospective observational study. The study, polypharmacy in geriatric patients with Drug-drug interactions and comorbid conditions, was carried out for six months in a private corporate hospital, Secunderabad Hyderabad. The patient data is collected and maintained confidentially per the hospital's norms. Confidentiality of patients' information is duly maintained, and basic principles of ethics in clinical research are strictly followed.

Written informed consent is obtained from all subjects before their inclusion in the study. Patients above 65 years with any disease or more than one disease and Patients prescribed more than 5 medications are included in this study. Patients below 65 years and Outpatients are excluded. The data on patients aged 65 years and above who are hospitalized with comorbid conditions is collected from case sheets. Data includes socio-demographic details, number of medications, name of medications, and comorbidities.

RESULTS: 300 patients were screened during the 6 months study period. Out of 300 patients, 190 (63.33%) were males, and 110 (36.66%) were females.

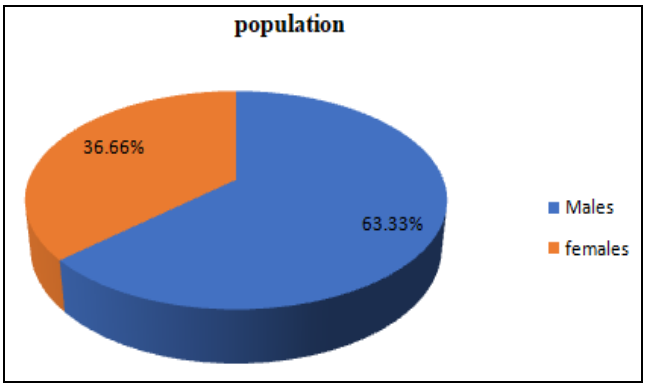

FIG. 1: GENDER DISTRIBUTION OF TOTAL CASES REPORTED

TABLE 1: NUMBER OF POLYPHARMACY MEDICATIONS: MALES AND FEMALES

Gender	Population	Polypharmacy	Percentage
Males	190	137	72.105%
Females	110	80	72.72

A total of 217 polypharmacy prescriptions were found in 300 prescriptions in the in-patient department, out of which males high in polypharmacy than females.

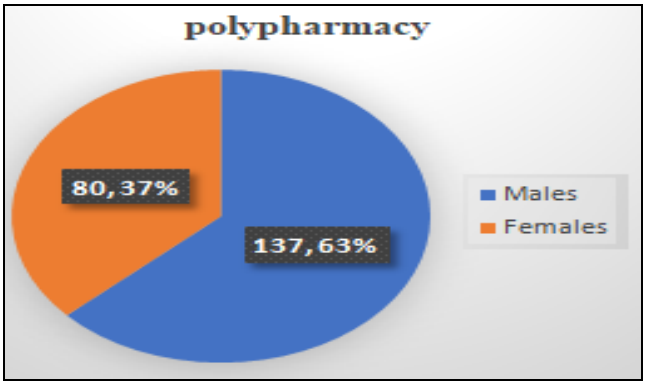

FIG. 2: POLYPHARMACY: MALES AND FEMALES

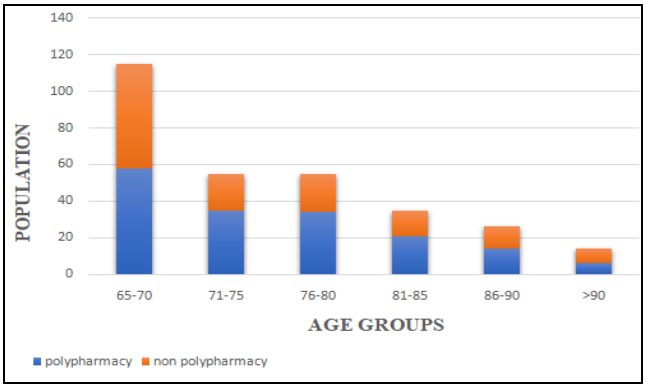

FIG. 3: POLYPHARMACY AND NON-POLYPHARMACY IN THE POPULATION

The maximum percentage of polypharmacy was in the age group of 71-75 (63.33%) followed by the age group 76-80(61.81%), and the least was found in those above 90 years (42.85%).

TABLE 2: COMORBIDITIES IN MALES AND FEMALES

Gender	Population	Comorbidities	Percentage
Males	190	106	55%
Females	110	62	56%

A total of 168 comorbidities are there in 300 patients in In-patient department. Out of which, Males have highest comorbidities than females.

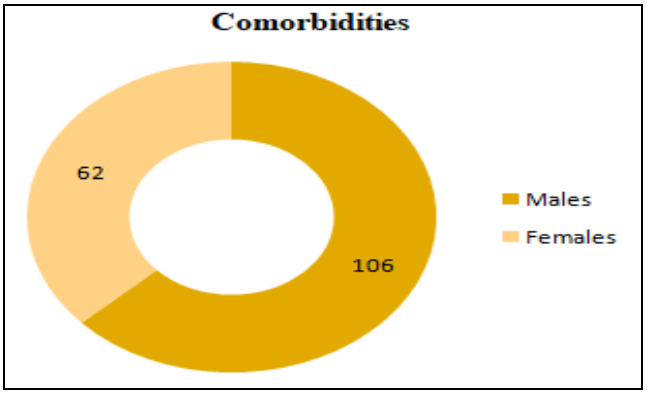

FIG. 4: COMORBID CONDITIONS IN MALES AND FEMALES

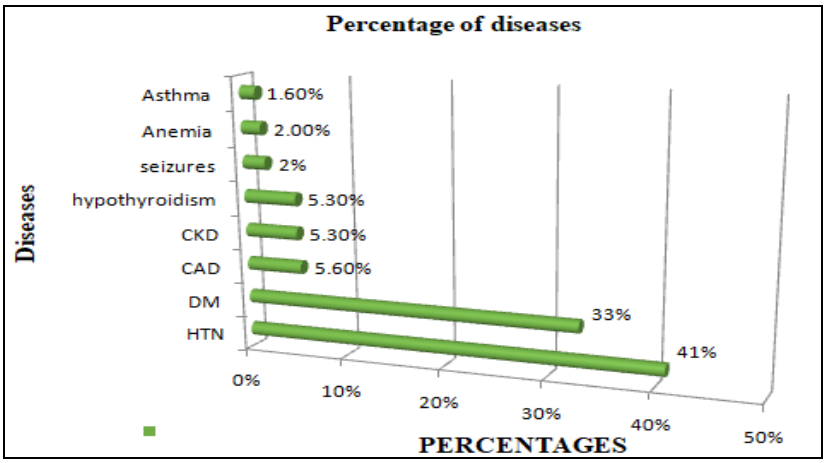

FIG. 5: DISTRIBUTION OF VARIOUS DISEASES AMONG THE TOTAL POPULATION

The comorbid conditions of the study population were analysed. 125(41%) with Hypertension have the highest disease rate followed by 99(33%) Diabetes Miletus and least no of disease rate (1.6%) were suffering from Anaemia.

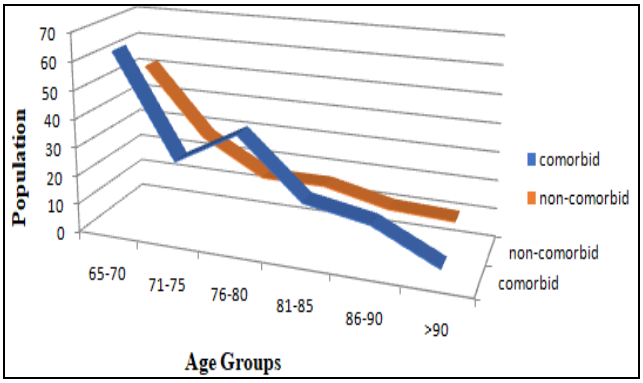

FIG. 6: COMORBID AND NON-COMORBID CONDITIONS

TABLE 3: DRUG-DRUG INTERACTIONS AMONG MALES AND FEMALES

Gender	Drug-Drug Interactions	Percentage
Males	129	65.89%
Females	68	34.11%

A total number of 197 Drug-Drug Interactions were identified in the study population. In that, Males have a greater number of Drug-drug Interactions compared to Females.

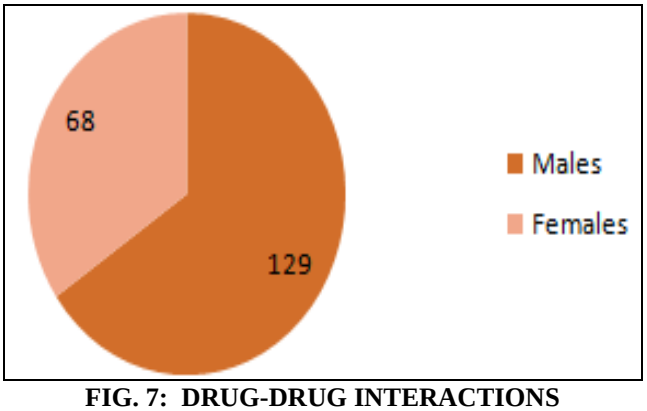

FIG. 7: DRUG-DRUG INTERACTIONS

TABLE 4: SEVERITY OF THE DRUG-DRUG INTERACTIONS

Severity	Population	Percentage
Severe	88	29.33%
Moderate	146	48.66%
Minor	66	22%

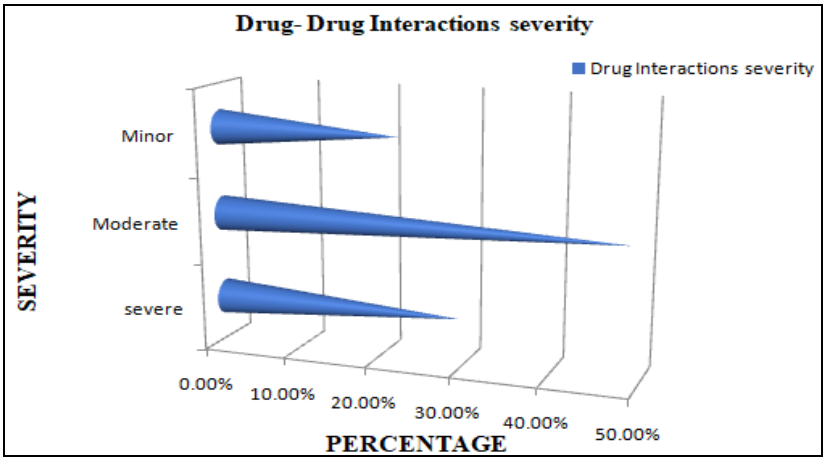

FIG. 8: SEVERITY OF DRUG INTERACTIONS

DISCUSSION: The study highlights the prevalence of polypharmacy in geriatric populations with comorbid conditions and Drug-Drug Interactions. Polypharmacy refers to the use of multiple medications for multiple conditions. Our study included 300 patients in 6 months, of which 190 were males and 110 were females. It has been found that age, comorbid conditions, number of drugs during the hospital stay were predictors of polypharmacy prevalence in this study. We analyzed 300 prescriptions of patients admitted in the in-patient department. Polypharmacy was seen in 217 (72%) prescriptions, and non-polypharmacy was seen in 83(27%). Many patients have 6-9 drugs prescribed and 90 prescriptions had super polypharmacy (more than 10 drugs).

This can be explained by the fact that admitted patients with multiple comorbidities are managed by specialists and need multiple drugs for the prevention and control of diseases. WHO limits the average number of drugs per prescription to be within the range of 1.4-2.4. In the US the prevalence of polypharmacy was 28% of all adults and 61% of adults over 65 years of age had two or more chronic diseases. Among 190 males' polypharmacy was 137 and 110 were female, polypharmacy was 80. Older patients are more vulnerable, and the prevalence of multimorbidity increases with age, along with those of polypharmacy. A total of 168 comorbid conditions were found among the total population. Most chronic diseases became more common with age. The likelihood of having two or more significant conditions is 60% by the age of 75-79 years. Among 190 males the number comorbid conditions were found to be 106; among 110 females the number of comorbid conditions were found to be 62.

The most common comorbidities were Hypertension, Diabetes and Hypothyroidism. Polypharmacy is common in hospitalized patients and carries a high risk of drug-drug and drug-disease interactions. These may cause harmful effects, inadequate therapeutic effects, dose missing, overdosing, drug-drug interactions and adverse drug reactions were found among the total population. Among 190 males, the number of drug-drug interactions was 129, and among 110 females, the number of interactions was 68. Drug-Drug Interactions were found to be pre-dominant among males. Co-administration of potentially interacting drugs might increase the number of adverse events, which can be confused with the severity of comorbidities. The consequences of such interactions include a longer duration of treatment period with the administration of more drugs to patients, resulting in a higher probability of drug-drug interactions.

CONCLUSION: The prevalence of polypharmacy is very high among the geriatric population in the study site. We have found many Drug-drug Interactions in the study. Close and intensive monitoring of geriatrics regarding polypharmacy could restrain the consequences. Clinical Pharmacists play an important role in handling this crisis efficiently by performing medication chart reviews, patient counseling regarding drug safety *etc*. A multidisciplinary approach involving physicians, nurses and clinical pharmacists to work as a team is the best way to deal with the challenges.

ACKNOWLEDGEMENTS: Nil

Author Contribution: The author has actively participated in the research and formulating the manuscript.

Funding: Nil

CONFLICTS OF INTEREST: The authors declare that there is no conflict of interest.

REFERENCES:

1. Sheikh-Taha M and Asmar M: Polypharmacy and severe potential drug-drug interactions among older adults with cardiovascular disease in the United States. BMC Geriatrics 2021; 21(1): 1-6.
2. Bojuwoye AO, Suleman F and Perumal-Pillay VA: Polypharmacy and the occurrence of potential drug–drug interactions among geriatric patients at the outpatient pharmacy department of a regional hospital in Durban, South Africa. Journal of Pharmaceutical Policy and Practice 2022; 15(1): 1-2.
3. Hermann M, Carstens N, Kvinge L, Fjell A, Wennersberg M, Folleso K, Skaug K, Seiger A, Cronfalk BS and Bostrom AM: Polypharmacy and potential drug–drug interactions in home-dwelling older people–a cross-sectional study. Journal of Multidisciplinary Healthcare 2021; 14: 589.
4. Borodo SB, Jatau AI, Mohammed M, Aminu N, Shitu Z and Sha'aban A: The burden of polypharmacy and potentially inappropriate medication in Nigeria: a clarion call for deprescribing practice. Bulletin of the National Research Centre 2022; 46(1): 1-8.
5. AL-Musawe L, Torre C, Guerreiro JP, Rodrigues AT, Raposo JF, Mota-Filipe H and Martins AP: Polypharmacy, potentially serious clinically relevant drug-drug interactions, and inappropriate medicines in elderly people with type 2 diabetes and their impact on quality of life. Pharmacology Research & Perspectives 2020; 8(4): 00621.
6. Hermann M, Carstens N, Kvinge L, Fjell A, Wennersberg M, Folleso K, Skaug K, Seiger A, Cronfalk BS and Bostrom AM: Polypharmacy and potential drug-drug interactions in home-dwelling older people–a cross-sectional study. J of Multidisci Healthcare 2021; 14: 589.
7. Gupta R, Malhotra A and 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.
8. Samajdar SS, Das S, Sarkar S, Mukherjee S, Pathak A, Stålsby Lundborg C, Saha I, Tripathi SK, Pal J, Chatterjee N and Joshi SR: Association between Polypharmacy and Cardiovascular Autonomic Function among Elderly Patients in an Urban Municipality Area of Kolkata, India: A Record-Based Cross-Sectional Study. Geriatrics 2022; 7(6): 136.
9. Hosseini SR, Zabihi A, Amiri SR and Bijani A: Polypharmacy among the Elderly. Journal of Mid-life Health 2018; 9(2): 97.
10. Kurczewska-Michalak M, Lewek P, Jankowska-Polańska B, Giardini A, Granata N, Maffoni M, Costa E, Midão L and Kardas P: Polypharmacy management in older adults: a scoping review of available interventions. Frontiers in Pharmacology 2021;1
11. Khezrian M, McNeil CJ, Murray AD and Myint PK: An overview of prevalence, determinants and health outcomes of polypharmacy. Therapeutic Advances in Drug Safety 2020; 11: 2042098620933741.
12. Sinha A, Mukherjee S, Tripathi S and Dutta S: Issues and challenges of polypharmacy in the elderly: A review of contemporary Indian literature. Journal of Family Medicine and Primary Care 2021; 10(10): 3544.
13. Fan ZY, Yang Y, Zhang CH, Yin RY, Tang L and Zhang F: Prevalence and patterns of comorbidity among middle-aged and elderly people in China: a cross-sectional study based on CHARLS data. Int J of Gen Med 2021; 14: 1449.
14. Alsuwaidan S, Algharbi A, Alyami S, Almukhlifi N and Alsalamah S: Prevalence of comorbidity among elderly. Glob J Aging Geriatr Res 2021; 1: 1-8.
15. Emmerton D, Khan S, Conway J, Mosby D and Abdelhafiz AH: Ageing, comorbidity and frailty-synergistic risk factors for covid-19 adverse outcomes. OBM Geriatrics 2020; 4(3): 1.
16. Sheikh-Taha M and Asmar M: Polypharmacy and severe potential drug-drug interactions among older adults with cardiovascular disease in the United States. BMC Geriatrics 2021; 21: 1-6.
17. Dias BM, Santos FS and Reis AM: Potential drug interactions in drug therapy prescribed for older adults at hospital discharge: cross-sectional study. Sao Paulo Medical Journal 2019; 137: 369-78.
18. Tahmasebivand M, Soltani F, Kouti L and Izadpanah M: Frequency and risk factors of polypharmacy and drug interactions among patients in general intensive care unit of Golestan Hospital, Ahvaz, southwest of Iran. AIMS Medical Science 2020; 7(2): 69-78.
19. Halloran MO, Boyle C, Kehoe B, Bagkeris E, Mallon P, Post FA, Vera J, Williams I, Anderson J, Winston A and Sachikonye M: Polypharmacy and drug–drug interactions in older and younger people living with HIV: the POPPY study. Antiviral Therapy 2019; 24(3): 193-201.
20. Zhao M, Liu CF, Feng YF and Chen H: Potential drug-drug interactions in drug therapy for older adults with chronic coronary syndrome at hospital discharge: A real-world study. Frontiers in Pharmacology 2022; 13.

How to cite this article:
Thunla P, Yamsani MR, Rachitha D, Bandi S and Swetha N: Polypharmacy in geriatric patients with drug-drug interactions and co-morbid conditions. Int J Pharm Sci & Res 2023; 14(8): 4066-71. doi: 10.13040/IJPSR.0975-8232.14(8).4066-71.