Innovare Academic Sciences

International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 6, Issue 10, 2014

Original Article

INAPPROPRIATE MEDICATION USE IN THE ELDERLY POPULATION ATTENDING GONDAR UNIVERSITY HOSPITAL: A PRELIMINARY ASSESSMENT

ALEMAYEHU BERHANE MEKONNEN[1], AKSHAYA SRIKANTH BHAGAVATHULA[1*]

[1]Department of Clinical Pharmacy, School of Pharmacy, University of Gondar, Gondar, Ethiopia.
Email: akashypharmd@gmail.com

Received: 31 May 2014 Revised and Accepted: 25 Jul 2014

ABSTRACT

Objective: To assess the prevalence and associated factors of potentially inappropriate medications (PIMs) use in the elderly population attending Gondar University Hospital (GUH).

Methods: A two years (2011-2012) retrospective cross sectional analysis was conducted in Gondar University Hospital (GUH). Elderly patients, aged ≥65 years treated with prescription drugs were included in the study. Updated Beers criteria (2012 version) independent of diagnosis was employed to determine the appropriateness of each medication prescribed and SPSS (version16.0) was used for data analysis. P-value < 0.05 was considered as significant association indicator between the variables.

Results: A total sample of 1252 patients were used in the study, of whom 347(27.72%) were received at least one potentially inappropriate medication. The mean age of the participants was 71.15 ± 6.18. The most commonly used medications were immediate release nifedipine (53.89%), diclofenac (22.19%), ibuprofen (7.78%) and indomethacin (5.19%). PIM use and our variables were not associated with the prevalence of PIM use among the elderly.

Conclusion: PIMs prescriptions for elderly population attending GUH are common with no association with any of our demographic or any other variables we set, which implies to work on improving the availability of updated medical information and knowledge for prescribers and to involve in careful monitoring and optimal use of drug regimens of elderly patients attending GUH.

Keywords: PIM, Elderly, Beers criteria, Optimal drug use, Ethiopia, Africa.

INTRODUCTION

Inappropriate medication can be defined as drugs that pose more risks than benefits and the risk of using these medications may lead to life –threatening events.(1) Elderly patients commonly have multiple pathologies which may lead to poly-pharmacy and can alter the pharmacokinetics and pharmacodynamics which leads to adverse drug reactions from inappropriate medication. Overseas studies showed that about 11.5 to 14.0 % of community living elderly was using at least one inappropriate medication.(2) Several factors contribute to the greater propensity of adverse drug reactions (ADRs) in the elderly, including potentially inappropriate medication (PIM) use. Many studies revealed prescribing PIMs in elderly patients were commonly observed in ambulatory settings and hospitalization.(3-7) The largest prospective study of PIM usage evaluation in the hospitalized elderly in India had shown 23.5% of study patients received at least one PIM (at admission or during hospital stay) and more than one-third of these patients were prescribed aspirin/non-steroidal anti-inflammatory drugs (NSAIDs) in presence of bleeding disorder or along with anticoagulant.(8) The prevalence of PIM in elderly at hospital admission was found to be 66% in France (9), 32% in United States of America (10), 22.1% in Switzerland (11) and 23.7% in Taiwan (12). Further, about one-fourth of the adverse outcomes in the elderly are estimated to be due to PIM use. (12-13)

In 1991, Beers et al developed the first set of explicit criteria to measure inappropriateness of drugs prescribed for nursing home elderly which includes the lists of drugs that shouldn't be used together (drug-drug interactions or therapeutic duplications),drugs that should not be taken if a person has certain diseases(drug-disease interactions) and drugs that are likely to cause adverse drug effects in elderly people where safer alternatives exist(drugs to avoid in the elderly).(1) The Beers criteria (BC) are applicable to patients aged >65 years. The ages of 60 and 65 years are arbitrarily used as definition of elderly persons in most developing countries.(14) Although many of elderly patients received PIMs use as per Beers criteria, low frequency of occurrence of ADRs is reported in the literature (3.6-11.6%). (15-16)

Optimal drug use is essentially considered while treating elderly includes prescription of appropriate medications as well as avoidance of under treatment, over treatment and drug –drug and drug-disease interactions. Inappropriate medication use in elderly patients will result in principal adverse drug events(ADEs) that can lead to additional physician visits, hospitalizations, injury, deterioration of body functioning and death and also unwanted medication expenditures. Hence, emphasis should be given to assess and improvement of inappropriate medication use is an important factor to both patients and the health institutes or national level at large to safe guard the life and to reduce the healthcare cost of the elderly population.

Though, we, researchers, justify that this preliminary assessment can be used as starting or reference material to any concerned body to do further and more detailed investigation and to draw attention for the policy makers, since no research has been done in sub-Saharan region of Ethiopia before. In response, the aim of this study was to assess inappropriate medication use among elderly patients attending Gondar university hospital (GUH) and to quantify the prevalence and frequency of inappropriate drug use based on drug lists of Beers criteria (2012).

MATERIALS AND METHODS

Study design and Population

We conducted an institutional based retrospective cross-sectional study of medication use in the elderly using the GUH prescriptions database from January 1, 2011 to December 31, 2012. This database includes all medications available in GUH. Elderly patients of both inpatients and outpatients aged 65 and above attending and taking at least one medication from GUH pharmacy were included in the study. The study comprised of 1252 elderly subjects who had at least one prescription filled during the study period.

The University Hospital is located in Gondar Town, Amhara National Regional State, Ethiopia. The town consisted of one central referral Hospitaland three health centers. Gondar University Hospitalis a teaching as well as regional referral Hospital under Ministry of Education. The referral Hospital is meant to serve 5 million people as per the four tier system of theNational Ministry of Health. Chronic illness care is one of the services the Hospital provides to the population both within and outside of Gondar Town.

Data collection

The study protocol was approved by the Institutional Review Board of University of Gondar-School of Pharmacy, Gondar, Ethiopia. Permission was obtained from the GUH administration to use patients' medical records for the collection and analysis of prescription data. The records were retrospectively reviewed and following data were collected: patient's age, gender, medication information need by the patients such as clinical profile, name of the drug, dose or amount, dosage regimen, administration route and number of drugs prescribed at a time. Further, medication records (prescriptions) which fulfill the inclusion criteria were selected from record stores during the recruitment period and information pertaining to medication and their demographics were collected using rating scale for each parameter.

Data analysis

The data were analyzed by using SPSS (version 16.0) analysis software and Beers criteria (2012) as reference material in determining the drugs prescribed as appropriate or inappropriate. $P<0.05$ was used as significant association indicator among the variables.

Results

Of the total 1252 elderly patients included in the study, 692 (55.27%) were females and 910 (72.68%) were in the age 65-74 years. The mean age of the participants was 71.15 ± 6.18. One third of patients was prescribed one medication per prescription **(table 1).**

Table 1 Demographic characteristics of elderly population

Patient characteristics	Total number (1252)	Percent (%)
Gender		
Male	560	44.73
Female	692	55.27
Age (years)		
65- 74	910	72.68
75-84	272	21.73
≥85	70	5.59
Total number of medications per prescription		
1	399	31.9
2	333	26.6
3	289	23.1
4	147	11.7
5	59	4.7
≥6	25	2

Table 2: List of potentially inappropriate medication prescribed for elderly

Name	Frequency (347)	Percentage
Promethazine	1	0.29
Chlorpheniramine	2	0.57
Diphenhydramine	2	0.57
Trihexyphenidyl	4	1.15
Digoxin > 0.125mg/day	6	1.73
Nifedipine	187	53.89
Spironolactone >25mg/day	2	0.57
Amitryptiline	7	2.02
Chlorpromazine	1	0.29
Haloperidol	1	0.29
Phenobarbitone	4	1.15
Diazepam	3	0.87
Methoclopramide	3	0.87
Diclofenac	77	22.19
Ibuprofen	27	7.78
Indomethacin	18	5.2
Methyldopa	2	0.57

Potentially inappropriate medications (PIM)

Prescription analysis shows that 347(27.72%) patients received at least one PIM. Of those, 334 (96.25%) received one PIM and only 13(3.75%) received two and none had received three PIMs. The most frequently prescribed PIMs observed were immediate release nifedipine (53.89%), diclofenac (22.19%) followed by ibuprofen (7.78%) and indomethacin (5.2%) (**Table2)**

Association with potential inappropriate medications (PIMs)

Logistic regression analyses were performed to determine risk factors associated with PIMs. Comparison was made between groups for polypharmacy (> or equal to 6 medications) and without polypharmacy (1-5 medications). Results of the logistic regression analysis showed no significant correlation with polypharmacy (OR, 1.22: 95% CI 0.48-3.08). Furthermore, age and sex had no significant association with prescribing PIMs (**Table 3)**.

DISCUSSION

Pharmacotherapy in the elderly requires a balance between inappropriate medication use and under treatment. Our study showed the high prevalence, 27.72% of the elderly patients received at least one PIM. Comparing these results to the prior studies, the figure varies from 16.3 to 62.5% (Guaraldo et al., 2011) (17). But this was much higher than Ma et al (19%) and Zaveri et al. Study (23.58%) using Beer's criteria 2003. (18,19) This can be explained

by the diversity in the severity of disease in the study subjects and could be due to the use of the latest version of Beer's criteria 2012 in our study. Among PIMs, the most commonly prescribed medications were nifedipine (IR), diclofenac, ibuprofen, and indomethacin which should be avoided in elderly irrespective of diagnosis. Using calcium channel blockers and NSAIDs were identified as potentially inappropriate. Calcium channel blockers (CCBs) are classified into two classes: dihydropyridines (nifedipine, amlodipine, and felodpine) and non dihydropyridines (verapamil and diltiazem), which are commonly used for treating hypertension and tachyarrhythmias respectively. The clinical efficacy of CCBs as antihypertensives in elderly may be due to multiple comorbidities restricting the use of alternative anti-hypertensive's like beta blockers or angiotensin converting enzyme inhibitors.

Table 3: Logistic regression analysis*

Variables	Appropriateness of medications		OR** (95% CI)	P-value
	Appropriate(%)	Inappropriate %		
Sex				
Male	415(74.11)	145(145(25.89)	1.18(0.92,1.51)	0.195
female	490(70.8)	202(29.2)		
Age				
65-74	648(71.2)	262(28.8)	1.62(0.89,2.96)	0.12
75-84	201(73.9)	71(26.1)	1.41(0.74,2.69)	0.29
>=85	56(80)	14(20)		
Poly pharmacy				
1-5	886(72.2)	341(27.8)		
>=6	19(76)	6(24)	1.22(0.48,3.08)	0.675

The most common side effects include flushing, headache, hypotension, constipation etc. Nevertheless, prescribers should be aware of potential side effects in the elderly for considering the most appropriate drug. Therefore, as one of the members of this class of anti-hypertensive's, nifedipine immediate release is listed in Beers criteria (2012) as PIM. In Gondar University Hospital, controlled released nifedipine was not available till January 2013. This is the reason why many of the elderly population were put on the inappropriate immediate release nifedipine as their follow up medication.

Considering selective NSAIDs like diclofenac, ibuprofen that relieve mild to moderate pain, and lower body temperature in fever. These agents are believed to act by inhibiting cyclooxygenase and some other enzymes that catalyze prostaglandins biosynthesis. This inhibition prevents the sensitization of pain receptors to mediators or modulators of pain. Several of these drugs were also used as anti-inflammatory agents. The main adverse effects of these drugs are increases the gastrointestinal bleeding, peptic ulcer disease and decrease renal function especially if an elderly is on anticoagulants, antiplatelets and steroidal therapy. NSAIDs induced peptic ulcers occurs in approximately 1% patients treated 3-6 months. The better option is to avoid chronic use of NSAIDs unless other alternatives are not effective and using gastro-protective agents like proton pump inhibitors and misoprostol can be beneficial. (2,15)

According to Chen et al., (20) and Oliveria et al (21) studies, the most common inappropriately used drug classes among the elderly are sedative- hypnotics (18.6%) and muscle relaxant (17.5%) followed by antiplatelet agents (10.3%), antihistamines (9.3%), antispasmodics (9.3%) and alpha-blockers (8.2%).The high proportion of PIMs in this study may reflect a lack of understanding the prescribing medication principles in the elderly and unavailability of safe medications for the elderly. Patients aged between 65-74 years had more PIMs than aged ≥75 years which is similar to a study at Hong Kong. (18)

In this study, no relationship was found between the variables we assess and PIMs use prevalence like age does not correlate with an increase in prevalence of PIM use. Detailed clinical studies that include sequencing of drug treatment are required to clarify these issues. Nevertheless, review of treatment medications is advisable in patients subjected to polypharmacy, with a view to avoid over prescribing and untoward side effects.

CONCLUSION

The preliminary assessment of this study reported high prevalence of PIMs in elderly patients in GUH and no significant factors were found in relation with PIMs use. The leading factor for common PIMs use is associated with prescribing quality. Further, it reiterates the need for "geriatric prescription guidelines" by the preparing explicit criteria in order to develop a new medication reviewing tool that suits for Ethiopian older population.

Limitations

- Prescriptions were not complete and legible to tell basic information
- Poor and manual documentation(organization) of prescriptions in the pharmacy
- Drug-drug and drug-disease interactions were not examined for the reason we were used prescriptions only
- Concurrent use of medications with disease conditions was not evaluated.

FUNDING

No funding sources

CONFLICT OF INTEREST

None declared

ACKNOWLEDGEMENT

The authors wish to acknowledge the support of the University of Gondar hospital administration staff for allowing to access the data and School of Pharmacy for their assistance and support.

REFERENCES

1. Beers MH. Explicit criteria for determining potentially inappropriate medication use by the elderly: an update. Arch Int Med 1997;157:1531-6.
2. Christine M. Campanelli. American geriatric society updated beer's criteria for potentially inappropriate medication in older adults. JAGS J Am Geriatr Soc 2012;60(4):616–31.
3. Lima. Potentially inappropriate medications used by the elderly: prevalence and risk factors in Brazilian care homes. BMC Geriatr 2013;13:52.
4. Limpawattana P, Kamolchai N, Theeranut A, Pimporm J. Potentially inappropriate prescribing of Thai older adults in an internal medicine outpatient clinic of a tertiary care hospital. Afr J Pharm Pharmacol 2013;34(7):2417-22.
5. Lai HY, Hwang SJ, Chen YC, Chen TJ, Lin MH, Chen LK. Prevalence of the prescribing of potentially inappropriate medications at ambulatory care visits by elderly patients covered by the taiwanese national health insurance program. Clin Ther 2009;31:1859-70.
6. Ruggiero C, Dell`Aquila G, Gasperini B, Onder G, Lattanzio F, Volpato S, *et al*. Potentially inappropriate drug prescriptions

and risk of hospitalization among older, Italian nursing home residents: the ULISSE project. Drugs Aging 2010;27:747–58.

7. Bhavya NC, Torgal SS. Potentially inappropriate medications in hospitalised elderly patients: a cross sectional study. Int J Basic Clin Pharmacol 2014;3:215-9.
8. Mandavi, Triwari P, Kapur V. Inappropriate drug prescribing identified among Indian elderly hospitalized patients. Int J Risk Saf Med 2007;19:111-6.
9. Laroche ML, Charmes JP, Nouaille Y, Fourrier A, Merle L. Impact of hospitalization in an acute medical geriatric unit on potentially inappropriate medication use. Drugs Aging 2006;23:49-59.
10. Cartwright OM, Moulin J, Hale LS. A retrospective evaluation of potentially inappropriate medication use in hospitalized elderly patients. Proceedings of the 3rd Annual GRASP Symposium, Wichita State University; 2007. p. 41-2.
11. Egger SS, Bechmann A, Hubmann N, Schlienger RG, Krohenbohl S. Prevalence of potentially inappropriate medication use in elderly patients: comparison between general medical and geriatric wards. Drugs Aging 2006;23:823-37.
12. Lin HY, Liao CC, Cheng SH, Wang PC, Hsueh YS. Association of potentially inappropriate medication use with adverse outcomes in ambulatory elderly patients with chronic diseases: experience in a taiwanese medical setting. Drugs Aging 2008;25:49-59.
13. Cullen DJ, Sweitzer BJ, Bates DW, Burdick E, Edmondson A, Leape LL. Preventable adverse drug events in hospitalized patients: a comparative study of intensive care and general care units. Crit Care Med 1997;25:1289-97.
14. WHO: Definition of an elder or elderly people. World Health Organization; 2009.
15. Page RL, Ruscin JM. The risk of adverse drug events and hospital-related morbidity and mortality among older adults with potentially inappropriate medication use. Am J Geriatr Pharmacother 2006;4:297–305.
16. Budnitz DS, Shehab N, Kegler SR, Richards CL. Medication use leading to emergency department visits for adverse drug events in older adults. Ann Int Med 2007;147:755-65.
17. Guaraldo L, Cano FG, Damasceno GS, Rozenfeld S. Inappropriate medication use among the elderly: a systematic review of administrative databases. BMC Geriatr 2011;11:7.
18. Ma HM, Lun CM, Dai LK, Kwok CWT, Woo J. Potentially inappropriate medication in elderly patients in outpatient clinics. Asian J Gerontol Geriatr 2008;3:27-33.
19. Zaveri HG, Mansuri SM, Patel VJ. Use of potentially inappropriate medicines in elderly: a prospective study in medicine out-patient department of a tertiary care teaching hospital. Indian J Pharmacol 2010;42(2):95-8.
20. Chen LL, Tangiisuran B, Shafie AA, Hassali MA. Evaluation of potentially inappropriate medications among older residents of Malaysian nursing homes. Int J Clin Pharm 2012;34:596-603.
21. Oliveira MG, Amorim WW, de Jesus SR, Rodrigues VA, Passos LC. Factors associated with potentially inappropriate medication use by the elderly in the Brazilian primary care setting. Int J Clin Pharm 2012;34:626-32.