

Inappropriate and Irrational Use of Medicines Prescribed to the Geriatric Patients in Pakistan

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Abstract

Objective: This study aims to evaluate the rational use of medicines among geriatric patients admitted to different hospitals.

Methodology: A retrospective study was conducted for the collection of data from geriatric patients (age \geq 60 years) admitted in the government hospitals. A clinical data of the geriatric patients admitted in medical unit were reviewed. The data was analyzed using descriptive and inferential statistics. The rational use of the drug was evaluated by using the WHO and Beer's criteria.

Results: A total of 390 geriatric cases was selected from three government hospitals. The total number of medicines prescribed was 2682 and the average number of medicines per prescription was 6.88. The percentage of generic drugs was 47.2% (184). Percentage of parenteral and antibiotic were 93.8% (366) and 72.6% (283) respectively, while the percentage of drugs from the National Essential Drug List (NEDL) was 99.2%. Polypharmacy was observed in 334 (85.6%) prescriptions. Potentially inappropriate medicines according to Beer's criteria were 58.5%. A significant association was present between inappropriate prescribing in geriatrics and different hospitals ($p < 0.001$), the number of drugs prescribed in geriatrics and different hospitals ($p < 0.001$) and the number of drugs and inappropriate prescribing ($p < 0.001$).

Conclusion: An increased number of prescription errors were present including polypharmacy, increased number of parenteral, antibiotics, and less number of drugs with generic names. It could be concluded that identification of the problem associated with prescription is the major step to remove the polypharmacy and inappropriate prescribing in geriatrics.

Keywords: Geriatrics, Beer's criteria, irrational prescribing, polypharmacy, inappropriate medicines.

1. INTRODUCTION

Gerontology derived from the Greek word *geront* meaning "old man". Geriatrics is a health discipline "encompassing psychosocial, economic, historical and physiological factors" for adults of 65 years and older [1]. Human population is increasing day-by-day. In early twentieth century only 1% of the human population was more than 65 years old, however, a significant increase was observed (up to 6%) at the end of twentieth century and it is believed that it may increase up to 20% in 2050 [2]. Approximately 60% of elders live in developing countries and it will rise to 70% in 2020 [3]. Pakistan is included in developing countries with a total population of 194 million

in 2014 and it may rise up to 348 million in 2050. Average life expectancy in Pakistan is 65 years and 4% of the elder form total population. Owing to this increased geriatric population, challenges for health care providers are being increased [4].

Improvement in socioeconomic and health consequences increase the life expectancy and decrease the fertility rate [5, 6], leading to increased elder population. This unusual changes in geriatric population had increased the burden of chronic diseases and chances of disability [3]. In spite of socioeconomic instabilities in Pakistan, the population of geriatrics is increasing. Chances of chronic diseases, loss of muscle mass, disability and

falls are more in Pakistan, because people lead asedentary lifestyle [7]. Commonly reported chronic diseases in elders are hypertension (42.5%), diabetes mellitus (28.1%) and arthritis (26.6%) [8]. Chronic diseases are the major causes of death and disability worldwide. In Pakistan, 42% of deaths reported due to chronic diseases and death rate will increase by 27%, but death due to diabetes increase by 51% which is second most commonly reported chronic disease [9].

One of the reasons elders have chronic and several concomitant diseases is their use of multiple medications for a longer period of time, leading to enhanced risks of morbidity and mortality [10]. More than 30% of geriatrics hospital admissions are due to that drug related problems [11]. Factors which cause the drug-related problems in geriatrics are multiple diseases, inappropriate prescribing, polypharmacy, drug interactions and change in pharmacokinetics and pharmacodynamics [11-13]. The most important cause of potentially harmful adverse drug reactions in geriatrics is the inappropriate use of drugs. The prevalence of inappropriate use of drugs ranges from 7.8 to 52% [9-11, 13-15]. Many potentially inappropriate drugs prescribed as a first line treatment by many health care providers which cause harmful drug interactions with less beneficial outcomes [16]. To avoid the use of inappropriate drugs in geriatrics Mark H. Beers developed the criteria in 1911 that was used in nursing home population [17]. Beers updated the criteria in 1997 including the 28 medicines or classes of medicines that were potentially inappropriate to use in geriatrics [18]. Recently in 2012, The American Geriatrics Society (AGS) and a panel of 11 experts updated the Beers criteria and named as updated 2012 AGS Beers Criteria. This criterion includes 53 medications or classes of medications that were potentially inappropriate to use in geriatrics [16]. In Pakistan, 4% of the total population is geriatrics [4] and not so much work done in above aspects in case of geriatrics. Therefore, the main aim of this study is to detect the polypharmacy in geriatrics and find out the inappropriate use of drugs in geriatrics in different areas of Pakistan.

2. METHODS

2.1. Study Design and Setting

A retrospective study design was adopted [14, 19] to estimate the rational and inappropriate use of medicines among geriatric patients in

different government hospitals. This study was conducted in three government hospitals of Southern Punjab, Pakistan named as Bahawalpur Victoria Hospital (BVH) Bahawalpur, Nishter Hospital Multan and DHQ Bahawalnagar. The two hospitals were academic and one was non-academic. These are the only Government hospitals providing healthcare facilities to geriatrics patients in those areas. The ethical committee of Quaid-i-Azam University had approved the design of this study.

2.2. Participants and Data Collection

All the cases of geriatric patients having age 60 years or more than 60 years [13, 19] reported in the medicine unit of the selected hospitals (as indoor patients) during the specified time period (June 2016 to March 2017) were included in the study. The total number of selected cases who meet the inclusion criteria were 390. The criteria for the inclusion of patients were, having been treated in inpatient department and age 60 or more than 60 years. Patients using two or more than two medicines were included because study is focusing on polypharmacy. A data was collected from the hospitals by using the medical records of geriatric patients. A standardized information form was designed after comprehensive literature review to collect the data. Age, gender, prescription medicines and medical diagnosis were the parameters of interest.

2.3. Data Analysis

An updated 2012 Beers criteria was used to find the appropriateness of the prescribed drugs [20]. A WHO prescribing indicators were used to check the irrational use of medicines. WHO prescribing indicators were included number of drugs, parenteral and antibiotics prescribed. It also described the percentage of drugs prescribed from National essential drug list. Polypharmacy was identified from the number of prescribed drugs that are more than 5 per prescription. All the data regarding the patient's demographic and medication use was entered and analyzed by using Statistical Package for the Social Sciences (version 21.0) and Stata. Descriptive statistical methods were used to summarize the data. Chi-square and linear regression were used to find out the association between inappropriate prescribing in geriatrics and different hospitals, inappropriate prescribing

in geriatrics and gender, the number of drugs prescribed in geriatrics and different hospitals, the number of drugs and inappropriate prescribing. For all of these analyses, statistical significance was defined by $P < .05$.

3. RESULTS

3.1. Demographic Characteristics

Out of the 390 cases of geriatrics, 234 (60%) were males and 156 (40%) were females (Table I). Age of the geriatric patients in all of the hospitals were from 60 to 110 years. The mean age of the patients was 67.5 ± 8.657 . Among these 390 geriatric patients, 163 (41.8%) patients were in the range of 60-64 years, 78 (20%) were in the range of 65-69 years, 68 (17.4%) were in the range of 70-74 years, 24 (6.2%) were in the range of 75-79 years and 57 (14.6%) were of 80 years and more than 80 years of age (Table I).

Table I. Demographic characteristics and diagnosed diseases of the geriatric patients

Variables	Frequency	Percentage (%)
Age (Mean \pm SD*)	(67.5\pm8.657)	
60-64	163	41.8
65-69	78	20.0
70-74	68	17.4
75-79	24	06.2
80 & >80	57	14.6
Gender		
Male	234	60
Female	156	40
Mostly Diagnose Diseases	114	26.9
Cardiovascular diseases	75	17.7
Respiratory diseases	71	16.8
Cerebrovascular diseases	53	12.5
Endocrine disorders	50	11.8
Gastrointestinal disorders	50	11.8
Infectious diseases	6	1.4
Renal diseases	5	1.1
Liver diseases		

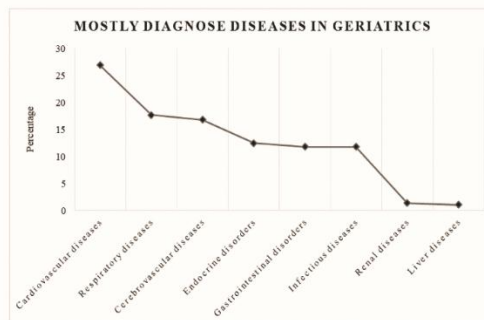
*SD: Standard deviation

3.2. Diagnosed Diseases

The most common diseases diagnosed in geriatrics are presented in Table I. The frequently diagnosed disease were cardiovascular 114 (26.9%), followed by respiratory diseases 75 (17.7%), cerebrovascular diseases 71 (16.8%), endocrine disorders 53 (12.5%), gastrointestinal disorders and

infectious diseases 50 (11.8%) (Figure 1). Less commonly diagnosed diseases were renal diseases 6 (1.4%) and liver diseases 5 (1.1%).

Figure 1: Mostly diagnosed diseases in Geriatrics



3.3. Polypharmacy in Geriatrics

Table II. Polypharmacy in geriatrics

Number of medicines	Frequency	Percentage (%)
<5	56	14.4
5-10	296	75.9
>10	38	9.7

Table III. Correlation between different variables

	Inappropriate prescribing		p-value	
	Yes (%)	No (%)		
Hospitals				
DHQ	93 (71.5)	37 (28.5)	<0.001	
Bahawalnagar	89 (68.5)	41 (31.5)		
Bahawalpur	46 (35.4)	84 (64.6)		
Victoria Nishtar Hospital Multan				
	Number of medicines			
	<5 (%)	5-10 (%)	>10 (%)	
Hospitals				
DHQ	1 (0.8)	98 (75.4)	31 (23.8)	<0.001
Bahawalnagar	24 (18.5)	100 (76.9)	6 (4.6)	
Bahawalpur	31 (23.8)	98 (75.4)	1 (0.8)	
Victoria Nishtar Hospital Multan				
	Number of medicines			
	<5 (%)	5-10 (%)	>10 (%)	
Inappropriate Prescribing				
Yes	16 (7.0)	181 (78.4)	24 (10.5)	<0.001
No	40 (24.7)	115 (72.3)	14 (8.6)	

Among the total prescriptions studied (390), 56 (14.4%) prescriptions had less than 5 drugs, 296 (75.9%) prescriptions had 5-10 drugs and 38 (9.7%) prescriptions had more than 10

prescriptions. The polypharmacy was found in 334 (85.6%) prescriptions (Table II). There was a significant correlation present between the number of prescribed medicines and different hospitals. The polypharmacy was practiced mostly in DHQ Bahawalnagar 129 (99.2%), followed by BVH Bahawalpur 106 (81.5%) and less commonly practiced in Nishtar Hospital Multan 99 (76.2%) (Table III).

3.4. WHO Prescribing Indicators

Five prescribing indicators selected by WHO are shown in Table IV. The average number of drugs prescribed were 6.88±2.56 having the range of 1-16, the maximum number of drugs prescribed were 16, but according to WHO standard the average number of drugs prescribed should be 1.6-1.8. Only 47.2% (184) of drugs were prescribed by generic while according to WHO criteria all the drugs must be prescribed by generic (Figure 2). An average number of prescribed drugs with generic were 0.8±1.017 and the maximum number of drugs prescribed by generic per prescription was 4.

TableIV. *Inappropriate prescribing (WHO criteria) in geriatrics*

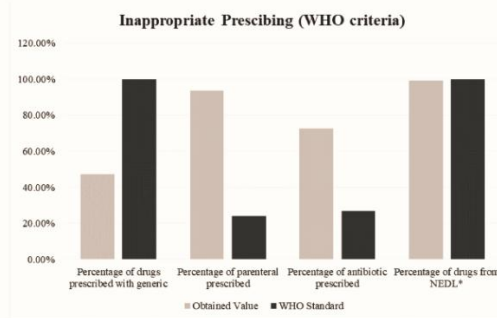
Prescribing Indicators	Obtained Value	WHO Standard	Range
Average number of drugs per prescription	6.88	1.6-1.8	1-16
Percentage of drugs prescribed with generic	47.2%	100%	0-4
Percentage of parenteral prescribed	93.8%	13.4-24.1%	0-9
Percentage of antibiotic prescribed	72.6%	20-26.8%	0-5
Percentage of drugs from NEDL*	99.2%	100%	0-8

*NEDL: National Essential Drug List

The percentage of prescriptions having at least one parenteral prescribed were 93.8% (366) but according to WHO standard the percentage of parenteral must be in the range of 13.4-24.1% (Figure 2). The average number of parenteral were 3.09±1.712 and the maximum number of parenteral prescribed with generic per prescription were 9. Percentage of prescription having at least one antibiotic prescribed to geriatrics were 72.6% (283) but according to WHO criteria percentage of antibiotic

prescribed should be 20-26.8% (Figure 2). The average number of antibiotic prescribed were 1.05±0.872 and the maximum number of antibiotic prescribed by generic per prescription were 5. Most of the prescribed drugs were from the National Essential Drug List (NEDL) that were 387 (99.2%) (Figure 2). The average number of prescribed drugs from NEDL were 3.75±1.8505 and the maximum number of drugs prescribed prescription were 8.

Figure 2: Inappropriate prescribing in Geriatrics according to WHO criteria



3.5. Potentially Inappropriate Medicines

TableV. *Inappropriate prescribing (Beer's criteria) in geriatrics*

Variables		Frequency	Percentage (%)
<i>Inappropriate prescribing</i>	Yes	228	58.5
	No	162	41.5
	Total	390	100.0
<i>Number of inappropriate prescribing</i>	0	162	41.5
	1	162	41.5
	2	49	12.6
	3	15	3.8
	4	2	0.5
	Total	390	100.0

A number of inappropriate prescribed drugs according to Beer's criteria is presented in Table V. Of the 390 prescriptions, 228 (58.5%) prescriptions had at least one inappropriately prescribed drugs from Beer's generated inappropriately prescribed list of the drugs for geriatrics. The average number of inappropriately prescribed drugs were 0.8±0.839 and the maximum number of inappropriately prescribed drugs per prescription were 4. A strong and positive correlation was found between the inappropriate prescribing and different hospitals (p = <0.001). Inappropriate prescribing was practiced mostly in DHQ Bahawalnagar (non-academic) 93 (71.5%) out of 130, followed by Bahawalpur Victoria Hospital (academic) 89 (68.5%) out of 130 and less commonly in Nishtar Hospital Multan (academic) that was 46 (35.4%) out of 130

(Table III). Chances of inappropriate prescribing increased as the number of prescribed medicines increased ($p = <0.001$). There was 181 (78.4%) inappropriate prescribing out of 228 present when the number of drugs prescribed was 5-10 per prescription (Table III).

4. DISCUSSION

As compared to adults, the issue of polypharmacy is of particular concern in geriatrics. The polypharmacy is common in geriatric patients due to the presence of multiple diseases. Polypharmacy is defined as the use of five or more medicines per prescription. According to our study, the usage of five or more drugs was present in 85.6% prescriptions. This result correlates with the finding of Sapkota et al. [21], who find that the prevalence of polypharmacy in geriatrics was 76%. This finding is also matched closely with the finding of Joshi et al. [22] according to which the prevalence of polypharmacy in geriatrics was 73%. The study showed that the polypharmacy is significantly associated with inappropriate prescribing and with different hospitals. Polypharmacy in geriatrics associated with thesevere type of adverse reactions, drug interactions and also the cost of treatment which may lead towards non-adherence and non-compliance as the patients have more than 5 medicines to cope with. It is although not possible to remove the polypharmacy but patient feedback and pharmacist review of medications help to improve the practice and to encourage the prescriber to remove certain medicines to reduce Polypharmacy.

Our results exhibited a little practice of rational drug prescribing in health care setting. Rational drug prescribing can be defined as, "the use of the least number of drugs to obtain the best possible effect in the shortest period of time at a reasonable cost" [23]. The study showed that most of the prescriptions are inappropriate according to the WHO proposed criteria. According to WHO standard, the average number of drugs prescribed per prescription must be 1.6-1.8 but in this study, the average number of drug prescribed was 6.88 which is closely related to the finding of Taskeen et al. who find out that the average number of drugs prescribed in geriatrics was 6.07 [15]. According to WHO criteria, all the drugs must be prescribed with generic but 47.2% of drugs prescribed by generic was reported in this study, this finding confirmed

studies conducted by Uchenna IH Eze and Adebiyi O Olowu [13] which was 48.9% and 53.6% by Joshi et al. [22]. Our result exhibited that the prescribers were not following the WHO prescriber indicator recommendations. Prescribing by generic name are cost effective because it allows the dispensing of various brands of the drug having the same chemical formula and efficacy that are cheaper. This is the basis of use of essential drug list [24].

According to our results, the use of parenteral in geriatrics was too high, that is 93.8%, both according to the WHO criteria which is 13.4-24.1% and according to the previous conducted studies like 30% find out by Sapkota et al. [21] and 7.05% find out by Taskeen et al. [15] In geriatrics the high rate of parenteral use could be due to swallowing problems and patient's compliance. The pressure from the geriatric patients and family members to prescribe parenteral for immediate relief may have contributed immensely to this high rate.

Percentage of the antibiotic prescribed according to our study was also very high, that is 72.6%, but according to WHO standard it must be in the range of 20-26.8%. This finding is also too high as compared to the reports of Sapkota et al. [21] that is 18%. The reason for high rate of antibiotic use may be due to a number of infectious diseases, poor immunity and inappropriate facilities to check the infection causing agents.

Inappropriate prescribing is the main issue in case of the geriatric patients. It increases the burden of cost on the patients due to two main reasons including the ineffectiveness and adverse reactions of the drugs which may lead to hospitalization. Beer's proposed the criteria to find out the inappropriate drugs that should be avoided in geriatrics. Eze and Olowu, and Chitra et al. found out that more than half of the medicines prescribed to geriatrics were inappropriate according to the Beer's criteria, [13, 19] this finding is correlated with our finding because in our study we find 58.5% inappropriate prescribing. Many previous studies also find out that most of the medicines prescribed to the geriatrics were inappropriate, though the level of occurrence was less as compare to our study [25, 26].

Besides all these findings, this study evaluates the correlations between inappropriate prescribing in geriatrics and different hospitals,

inappropriate prescribing in geriatrics and gender, the number of drugs prescribed in geriatrics and different hospitals, the number of drugs and inappropriate prescribing. Inappropriate prescribing was more common in non-academic healthcare settings as compared to academic healthcare settings. In all these variables, we find a significant correlation ($p < 0.001$) except between inappropriate prescribing in geriatrics and gender. There is no study conducted to find out this type of correlations. The only study conducted in this regard is to find out the correlation between a number of prescribed drugs and drug-drug interactions. The study conducted by Nobili et al., [28] Teixeira et al. [29] and Janchawee et al. [27] showed that there is a significant relationship between a number of prescribed drugs and drug-drug interactions.

5. CONCLUSION

Polypharmacy in geriatrics is common among all the hospitals of southern Punjab but more common among the hospitals in lower areas. The Same type of findings present in the case of inappropriate prescribing and rational use of drugs. More than 50% of the drugs prescribed to the geriatric patients were inappropriate according to Beer's criteria and inappropriate use of medicines were common in non-academic hospitals. An increase number of prescription errors were also found in this study like polypharmacy, extensive use of parenteral, antibiotics and drugs with brand name. These errors highlight the need of paying attention towards prescriptions and prescribers to reduce the inappropriate prescribing, especially in geriatrics to avoid serious health related consequences. Special healthcare department should be established for geriatrics in hospitals to provide better healthcare facilities to geriatrics. The absence of pharmacist in healthcare sector leads to the inappropriate use of drugs. Both pharmacist and prescriber must be involved in prescribing and reviewing procedure to remove such type of errors, to improve the quality of life and to decrease the economic burden.

6. LIMITATION

There were some limitations in this study. First, the study used a convenient method to collect the data. Second, the study was conducted in a limited number of healthcare sectors. Three, only hospitalized patients were included in this

study. Despite these limitations, the study provides important and necessary information about inappropriate prescribing and irrational use of medicines in geriatrics.

7. ACKNOWLEDGMENT

AUTHOR'S CONTRIBUTION

Study concept and design: Fakhar-ud-Din, Gul Majid Khan. Acquisition and interpretation of data: Ammanullah, Gul Majid Khan. Critical revision of manuscript: Ammanullah, Fakhar-ud-Din, Gul Majid Khan. Study supervision: Gul Majid Khan, Fakhar-ud-Din.

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