ASSESSMENT OF PREVALENCE OF POLYPHARMACY (IRRATIONAL) AMONG THE ELDERLY RURAL POPULATION OF SOUTH INDIA

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Abstract-
The aim of the study is to find out the prevalence of irrational polypharmacy in the prescriptions bought to the community pharmacy. Further the study is designed to find out the potential drug –drug interactions and inappropriate medications prescribed. The study utilized a prospective cross -sectional survey. A copy of the prescription was taken after obtaining the oral consent from the elderly subjects and the data collected was entered into the data collection forms. Each prescription was then analyzed for prevalence and types of polypharmacy, potential drug-drug interactions using Micromedex, inappropriate medications prescribed by employing AGS Beers Criteria. The potential drug –drug interactions were further classified based on severity as Major, Moderate and Minor. The study population was further categorized based on age into two groups: Pre-geriatric (60-64 years) and Geriatric (>65 years) to draw a comparison between the two groups. Among the total number of prescriptions (n=226) which were analyzed, majority of the prescriptions showed moderate to major polypharmacy (n=185) and a total of 84 drug interactions were observed. The study shows that the risk of polypharmacy increases with increase in age. The study revealed that the prevalence of polypharmacy, potential drug–drug interactions and the inappropriate medication was higher in males when compared to female population. The study shows the importance of developing tools to identify inappropriate prescribing patterns in the pre-geriatric group as they are also at an increased risk of inappropriate medication use. Study also helps in defining the role of a pharmacist in preventing irrational polypharmacy in these vulnerable populations.

Index Terms- Polypharmacy, Drug-drug interactions, Elderly, Potentially inappropriate medications, India

I. INTRODUCTION

Polypharmacy is a commonly used twelve lettered word in the medical community yet till date; there are over 10 definitions which are still being debated and no conclusion per se[1]. Polypharmacy is like a double-edged sword. It is favorable for its synergistic effects [2,3] and on the contrary can be a catastrophe if not employed with caution [4,5]. In a developing country like India, with a massive population of 135 crores and the margin of elderly people rising steadily[6], With a majority falling below poverty line and belonging to rural communities making accessibility to healthcare a challenge. As the age of an individual increases so does the proportion of medications [7] due to the rise in chronic diseases. The fate of rise in medications leads to multiple side effects which often gets mistaken as another disease and is treated accordingly [8]. Hence, the list of medications is never ending. Since more than half of India's population is below poverty line, as the number of medications increase so does the cost, and when it's an option between a daily meal for a family of five or medications and obviously the latter is never an option [9,10]. Despite various efforts, the fact that these people are uneducated and are unaware of the harms of medication non-adherence poses as a threat [11] and they finally resort to self-medication. Therefore, it is pivotal that prescribing patterns be changed and deprescribing becoming the new trend [12,13].

II. MATERIALS & METHODS

A cross sectional prospective survey was conducted in the selected community pharmacies of Ooty, Tamil Nadu. The study was designed in elderly population of both male and female who are above 60 years and those who are a resident of Ooty for 6 months of period (October 2018 to March 2018) with the following study criteria.

Inclusion Criteria:
- Elderly persons who are a resident of Ooty.
- Age above or equal to 60.
- Prescription containing two or more drugs.

Exclusion Criteria:
- The patient who is not willing to contribute their data to the survey.

SAMPLE SIZE CALCULATION:

In absence of reference data, prevalence of polypharmacy was assumed to be 50%. Sample size was calculated using the formula,

$$N = (Z1-\alpha/2)2 * pq / I^2$$

Hypothesized % frequency of outcome factor in the population, (p): 50%. Confidence limits as % of 100(absolute +/- %) (l): 5%
Z1-α/2 value for 95% confidence interval: 1.96.
Finally, as per the formula, the final number to be recruited was found to be 196.

ETHICAL APPROVAL:

The study was approved by the Institutional Ethics Committee, JSS College of Pharmacy, Ooty. (JSSCP/IEC/07/2018-19)

DATA COLLECTION:

The data was collected on a pre-designed data collection form from the selected community pharmacies and analyzed through the prescriptions of elderly patients include review of prescriptions, information regarding age, sex, social history, occupation, diagnosis (prime and co-morbid conditions), drug

prescribed and other supplements, OTC medication consumed were collected and the documentation of data was done in Microsoft Excel.

DATA ANALYSIS:

The data collected from the patient was then assessed for potential drug-drug interactions and inappropriate medications. The prevalence (of potential) of potential drug -drug interactions was calculated using the following equation,

Prevalence= (Number of Prescriptions with PDDIs/ Total Number of Prescriptions collected) *100

Each medication in the list was screened through Micromedex database and all the identified drug-drug interactions were classified on its severity into Major, Moderate and Minor. The AGS Beers Criteria was used to analyze the inappropriate medications prescribed. The subjects were further classified into pre-geriatrics (60-64) and geriatrics (>65) to compare the potential drug-drug interaction and inappropriate medication prescribed [14].

III. RESULTS:

A total of 226 prescriptions were analyzed during the 6-month study period. The total prescriptions were then classified into three different types based on the number of drugs in each prescription into major (>5 drugs), moderate (4-5 drugs) and minor (2-3 drugs). Prescriptions with major polypharmacy had the maximum prevalence of 112 (49.50%) prescriptions followed by moderate at 73 (32.30%) and minor at 41 (18.14%). Among these, 84 prescriptions contained potential drug-drug interactions and 75 of them had inappropriate medications. The included study subjects had 114(50.44%) male subjects and 112(49.55%) female subjects (Table-1).

Drugs and illnesses in the study population: The sum of drugs present in all the prescriptions was 1281, out of which 667 and 614 drugs were prescribed to male and female subjects respectively. Since the study population consisted of elderly people, a majority of them had chronic illnesses like cardiovascular conditions (79 subjects), respiratory conditions (54 subjects) and muscular disorders (33 subjects). Most commonly prescribed drug classes include gastric acid suppressants (16.7%), supplements (15.37%), anti-hypertensives (13.66%) and analgesics (13.33). Cardiac glycosides, anti-malarials etc. were the least prescribed. The frequency of each prescribed drug class has been demonstrated in Table-2.

Analysis of prescriptions based on gender:

Both male and female subjects had high numbers of polypharmacy. Male subjects had a higher number of major polypharmacy (65) compared to females (47). Potential drug-drug interactions also showed a similar pattern where males had 47 (55.95%) and females has 37 (44.04%) potential drug-drug interactions (repetition) among a total of 84. When the potential drug-drug interactions were categorized into major, moderate and minor based on severity, male subjects had a predominance of major interactions (41 (60.29%)) and in female subjects, moderate severity had a majority with 38 (51.35%) interactions. AGS Beers Criteria, which is used to assess the presence of inappropriate medication utilization in elderly population with ages 65 and above was used to assess inappropriateness of prescriptions in the

elderly from ages 60-64 also as there is no tool available for this population. Total number of inappropriate medications prescribed was 95 (71.42%) with males dominating at 57 (60%) and females at 38 (28.57%).

Analysis of prescriptions based on age: Although the age groups 60-64 years and > 65 years seem to be close, there is a huge difference in terms of treatment and consideration of medications. In this study, a total of 85 (37.61) subjects were in the pre geriatric group and 141 (62.38%) were in the geriatric group. The most common definition of polypharmacy, a prescription having 5 or more drugs was considered for the study. The geriatric group had more polypharmacy prescriptions (118) compared to the pre geriatric group (67) in terms of numbers due to higher presence of chronic illnesses and larger sample size. In terms of percentage, both the groups had high proportions of polypharmacy (major and moderate) with 78.8% and 83.68% in pre geriatric and geriatric groups respectively. Further, assessment was done to observe the pattern of prescribing and results of intensity of polypharmacy are depicted in Table-3. There were 52 (36.87%) prescriptions with potential drug-drug interactions in geriatric group and 32 (37.62%) in the pre geriatric group. Moderate potential interactions were the highest in both the groups with 36(51.42%) and 33(44%) in pre geriatric and geriatric groups respectively. Total number of inappropriate medications were at 55 (57.89%) and 40 (42.10%) in pre geriatric and geriatric groups respectively. Complete information about the numbers and percentage is shown in Table-3.

IV. DISCUSSION:

The pre-geriatric and geriatric are two special risk groups with respect to drug prescribing. Polypharmacy was categorized into three: minor (2-3 drugs), moderate (4-5 drugs) and major (>5 drugs) and furthermore potential drug-drug interactions and number of inappropriate medications present were quantified. Our study population, consisted of 226 subjects, 114(50.44%) male and 112(49.55%) females. The total number of drugs prescribed in this population was found to be 1281 drugs. Among which 667(52.06%) were prescribed in male subjects and 614(47.9%) were prescribed in female subjects. The existing prescription pattern in the elderly mainly shows a high utilization of drugs classes like gastric acid suppressants (16.7%).

This study was focused on subjects above 60 years and they were divided into two groups, pre geriatric (60-64 years) and geriatric (>65 years). Higher prevalence of polypharmacy in these two age groups is due to the increase in age and presence of chronic illnesses such as cardiovascular, endocrine and muscular related. As the number of illnesses and co morbidities increase, the number of medications prescribed also increases to combat the illness. In some cases, patients do well with multiple therapies and in majority of the cases it leads to more negative outcomes such as drug-drug interactions, drug-disease interactions, medication non-adherence and geriatric syndromes.

The presence of potential drug-drug interactions was assessed using online database MICROMEDEX. In the 226 prescriptions we analyzed, 84(37.16%) were found to have potential drug-drug interactions. The interactions present in these prescriptions were further classified based on severity into: Major, Moderate and Minor. In the prescriptions which were analyzed, moderate

potential drug-drug interactions were the maximum at 51.42% and 44% in the pre-geriatric and geriatric groups respectively, followed by major potential drug-drug interactions at 44.28% and 40% in the two groups respectively. Minor potential drug-drug interactions were found to be the least in both the groups. Since Beers criteria is a frequently used method for evaluating appropriateness of prescribing in the elderly, it was used in both the comparison groups in this study. A higher number of inappropriate medications was found to be in the geriatric group 55 (57.89%) rather than the pre geriatric group 40(42.10%).

As a general rule, healthcare providers should minimize the number of medications prescribed for older adults, keeping the dosing schedule as simple as possible and limit the frequent number of medication changes. This must be followed by periodic review at specific intervals.

V. CONCLUSION

By observing the results of our study, research team is in an opinion that there a need of increasing awareness of the list of potentially inappropriate medications in the elderly as listed in the AGS Beers Criteria. Moreover, raising awareness among physicians taking steps to sensitize higher authorities regarding polypharmacy and dangerous drug interactions may help to curb irrational prescriptions and ensure safety of the elderly. The lack of a tool to assess inappropriate medications in pre geriatric group raises the need to develop a tool to assess the same.

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Table-1: Analysis of prescriptions based on gender

Characteristic	Number of prescriptions (n)	Percentage (%)
Demographic characteristics	Total n=226	
Male	114	50.44
Female	112	49.55
Type of polypharmacy		
Minor (2-3 drugs)	41	18.14
Male	17	14.92
Female	24	21.42
Moderate (4-5 drugs)	73	32.3
Male	32	28.07
Female	41	35.96
Major (>5 drugs)	112	49.55
Male	65	57.01
Female	47	41.96
Total number of drugs	1281	
Male subjects	667	52.06
Female subjects	614	47.93
Total number of potential drug-drug interactions	84	
Male	47	55.95
Female	37	44.04
Severity of potential drug-drug interactions	145	
Major	61	42.06
Male	41	60.29
Female	20	27.02
Moderate	69	47.58
Male	31	45.58
Female	38	51.35
Minor	15	10.3
Male	10	14.7
Female	5	6.75
Presence of inappropriate medications	95	
Male	57	60
Female	38	40

Table-2: Most commonly prescribed drugs in the study population

Name of drug class	Frequency in percentage (%)
Gastric acid suppressants	16.7
Supplements	15.37
Antihypertensives	13.66
Analgesics	13.34
Bronchodilators	11
Antidiabetics	5.85
Anticoagulants	5.77
Antihistamines	5.15
Statins	4.37
Antibiotics	3.12
Vasodilators	1.4
Expectorants	0.85
Antidepressants	0.85
Steroids	0.46
Sedatives	0.39
Antineoplastic agents	0.31
Antithyroid agents	0.31
Antiepileptics	0.15
Antiemetics	0.07
Antimalarials	0.07
Laxatives	0.07
Cardiac glycosides	0.07
Others	0.31

Table-3: Analysis of prescriptions based on age

Characteristic	Number of prescriptions (n)	Percentage (%)
Age group	Total (n) = 226	
Pre geriatric (60-64 years)	85	37.61
Geriatric (>65 years)	141	62.38
Prescriptions containing polypharmacy (moderate and major)	185	
Pre geriatric (60-64 years)	67	78.82
Geriatric (>65 years)	118	83.68
Type of polypharmacy	226	
Pre geriatric (60-64 years)	85	
Geriatric (>65 years)	141	
Minor	41	18.1
Pre geriatric (60-64 years)	18	21.17
Geriatric (>65 years)	23	16.31
Moderate	73	32.3
Pre geriatric (60-64 years)	19	22.35
Geriatric (>65 years)	54	38.29
Major	112	49.55
Pre geriatric (60-64 years)	48	56.47
Geriatric (>65 years)	64	45.39
Presence of potential drug-drug interactions		
Pre geriatric (60-64 years)	32	37.64
Geriatric (>65 years)	52	36.86
Severity of potential drug-drug interactions		
Major	61	42.06
Pre geriatric (60-64 years)	31	43.66
Geriatric (>65 years)	30	40
Moderate	69	47.58
Pre geriatric (60-64 years)	36	51.42
Geriatric (>65 years)	33	44
Minor	15	10.3
Pre geriatric (60-64 years)	3	4.28
Geriatric (>65 years)	12	16
Number of inappropriate medications	95	
Pre geriatric (60-64 years)	40	42.10
Geriatric (>65 years)	55	57.89