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Research Article

PREVALENCE AND ASSESSMENT OF POLYPHARMACY IN SRI DEVRAJ URS MEDICAL COLLEGE & HOSPITAL, KOLAR

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ABSTRACT

The percentage of the population described as elderly is growing, and a higher prevalence of multiple, chronic disease states must be managed concurrently. Healthcare practitioners must appropriately use medication for multiple diseases and avoid risks often associated with multiple medication use such as adverse effects, drug/drug interactions, drug/disease interactions, and inappropriate dosing. The purpose of this study is to identify a consensus definition for polypharmacy (PP) and evaluate its prevalence and assessment. With this background, on permission with the Institution, the study was carried out to evaluate the prevalence and assessment of PP by using Data collection, Design of prescription database and Prescription Analysis in Sri Devraj Urs Medical College & Hospital, Kolar. As per the PP, concurrent uses of 2 to 4 drugs were classified as minor Polypharmacy and of 5 or more drugs as major Polypharmacy. Drugs were classified according to British National Formulary (BNF). A total of 1003 prescriptions were collected from Sri Devraj Urs Medical College & Hospital, Kolar. Out of 1003 prescriptions, 600 prescriptions found with Major PP and 403 prescriptions with Minor PP. The demographic data of our study showed that 66.80% (N=670) of male population and 33.20% (N=333) female population were enrolled and out of the total enrolled patients age group 19-60 year patients 83.75% (N=840) were dominant than other age group. This study provides evidence that the prevalence of PP is based on the knowledge obtained from our study and guidelines to reduce the problems by asking the patients to bring all medicines to counseling center, selecting a drug that may treat more than one condition, by monitoring the adverse reactions, educating the patient about the drug therapy and teach the patient to prioritize the currently used drugs and encourage compliance by routine check-ups.

Keywords: Polypharmacy, Prevalence, Prescription, Demographic data.

INTRODUCTION

The use of multiple medications, often termed as polypharmacy (PP), is recognized as an increasingly serious problem in the current healthcare system. There is to date no common definition of PP available. It is determined either as the simultaneous use of a certain number of medications (two to six and more) [1-3] or as the unnecessary overuse of drugs[4]. If defined as use of five or more drugs, between 4% [1]and 34%[5] of people aged 65 years and above are affected by PP. In addition, PP is recognized as an expensive practice. But the issue of multiple medication use, particularly by elderly patients, is a complex one. The potential risks of PP are evident; however, so are the benefits to patients when medication therapies are combined to cure, slow the progression, or reduce the symptoms of disease. Additionally, a plethora of drug therapies for chronic disease can improve quality of life and prevent complications, including disability and unnecessary hospitalization. Balancing the risks and benefits of multiple drug therapies in older adults becomes a challenging endeavor for prescribers. Education and strategies which enable the healthcare practitioner to achieve successful PP and avoid inappropriate PP must be developed and shared.

Escalating pharmaceutical costs, new budgetary demands and a growing awareness of health risks for patients with PP exert pressure on General Practitioners to reduce medication. This necessitates a good understanding of how multiple drug use comes about. A number of studies investigated determinants of prescribed PP and reported relevant socio-demographic factors (age, gender, education, employment and socio-economic status) [6,7] influence of disease (multi-morbidity, multiple complaints, well-being and chronic illness) [8,9] and health system factors (prescriber related, perceived patient pressure and free access to medications)[10-13]. These studies employed either limited numbers of health determinants or looked at overall health as the concept when predicting PP.

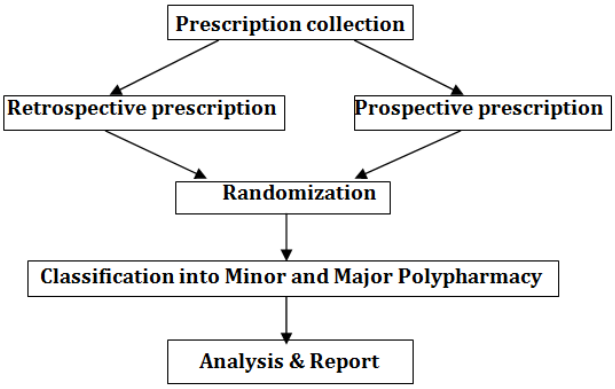
When several medications are used simultaneously, there is an increased risk of drug-drug interactions and adverse drug reactions[14]. Epidemiological studies of risk factors for adverse drug reactions have shown that the number of concurrently used drugs is the most important predictor of these complications[15]. Studies from many countries have shown that a considerable part of hospital admissions is precipitated by drug-related problems and iatrogenic illness[16-17]. PP may be responsible for unnecessary health expenditures directly due to the cost of superfluous medication, but also indirectly due to the increased number of hospitalizations caused by drug-related complications[18]. The beneficial effect of reducing the occurrence of PP in the population has been addressed in order to cut down on expenditures for both physician and hospital services. A study examining the factors associated with variations in general practitioner prescribing costs showed that diagnoses associated with multiple drug use (cardiovascular diseases, diabetes mellitus, psychiatric disorders) were strongly related to high drug expenditures[19,20]. The occurrence of multi-morbidity predicted high prescribing costs. A considerable part of the health care resources is thus used for costs due to expensive multiple drug regimes and expenditures caused by drug-related morbidity attributable to PP[21].

A review of the literature, however, revealed that no consensus existed in the medical literature on the definition for PP[22-24]. Thus, it became necessary to evaluate prevalence and assessment of PP. Therefore, the present study is to focus on the problem of PP in our scenario, to find out the prevalence and the associated risk factors. The main purpose of this study was by means of a prescription database to develop and compare different methods of identifying drug users exposed to PP. Based on such methods we wanted to obtain knowledge about the occurrence of PP in the population and knowledge about the characteristics of individuals exposed to PP.

METHODS

The validity of epidemiology estimation of PP is related to the methods used for the identification of PP. Most of the studies are based on hospital records, hospital database, interviews or questionnaires[25]. The emerging of large computerized population prescription database allow for population based analysis of individual drug purchase[26]. Due to lack of such computerized prescription database in the current setup, our study was mainly

based upon prescription survey. The below mentioned procedures were followed for the study:



Study Site: Sri Devraj Urs Medical College cum Research Centre & Hospital, Kolar which is a 1200 bedded hospital.

Study Period: 4 months study (May 2011 to August 2011)

Study Design: retrospectively and prospectively

Study Material: Random selection of case sheets.

Study Criteria:

Inclusion Criteria: All prescription that contains one or more than one drug, Inpatient and outpatient and Age between 2 to 70.

Exclusion Criteria: Patients with disease conditions like hypertension, diabetes mellitus and rheumatoid arthritis. Patient ages below 2years were not included in the study.

Classification of PP

PP was defined as the concurrent use of two or more drugs. The concurrent uses of 2 to 4 drugs are classified as minor PP and of five or more drugs as major PP[27-28]. Drugs were classified according to British National Formulary (BNF)

Study Procedure

(1). Institutional ethical committee approval. (2). Data collection: prescriptions were collected from patient's hospital records and patient counseling center after getting oral consent from the patients. (3). Design prescription database: collected prescriptions were entered into Microsoft Office Excel sheet according to their age, gender, therapeutic category, number of prescription, length of hospital stay etc., and (4). Prescription Analysis: collected prescriptions were scrutinized for PP. For this purpose minor PP is concurrent use of 2 to 4 drugs are classified as minor PP and of five or more drugs as major PP.

Outcome of the study: Quantitative Estimation of PP and PP Vs Hospital stay

RESULTS

Demographic details

A total of 1003 prescriptions were collected from the Sri Devraj Urs Medical College cum Research Centre & Hospital, Kolar (1200 bedded hospital). Out of 1003 prescriptions 600 prescriptions found with Major PP and 403 prescriptions with Minor PP.

(a) Gender: Out of 1003 prescription, 670 (66.80%) prescriptions were males and 333 (33.20%) were females [Table 1].

(b) Age: The collected prescriptions were classified according to the age. 4.39 % (N=44) are up to 18 years of age, 83.75 % (N=840) are between 19-60 years of age and 11.86% (N=119) are above 60 years [Table 1].

(c) Hospital Stay: The collected prescriptions were categorized into three groups depending on the length of hospital stay**.** 55% of patients discharged within a week, 39% of patients got discharged 1-2 week while 6% patients admitted more than 2 week [Table 1].

Quantitative Estimation PP

Collected prescriptions were analyzed for PP. It is classified into two, minor PP is concurrent use of 2 to 4 drugs and 5 or more drugs are major PP. Out of 1003 prescriptions 403 (40.18%) prescriptions were found to be minor PP and 600 (59.82%) prescriptions were major PP.

(d) PP Vs Gender: The PP were classified according to gender. In 403 minor Poly pharmacy prescriptions, 227 (56.33%) were males and 176 (43.67%) were females. Out of 600 major Poly pharmacy 443 (73.83%) were males and 157(26.17%) were females [Table 2].

(e) PP Vs Age: The Poly pharmacy prescription were classified according to age. Among 403 minor PP, 24 (5.96%) were up to 18 years, 316 (78.41%) were between 19-60 years and 63 (15.63%) were above 60 years of age. Among 600 Major PP prescriptions, 20 (3.33%) prescriptions were up to 18 years age, 524 (87.33%) prescriptions were found in between 19-60 years and 56 (9.33%) prescriptions above 60 years of age [Table 3].

(f) PP Vs Hospital stays: The association of PP and hospital stay was analyzed and results are tabulated in Table 4. In both Minor and Major PP hospital stay less than one week found more 64.02% and 49.33% respectively. In 1-2 weeks hospital stay category Major PP prescription (45.5%) is more than minor PP (29.03%). More than 2 weeks of hospital stay for Major PP was 5.17% and for minor PP 6.95%[Table 4].

(g) Quantitative Estimation of Therapeutic Categories of Prescriptions: The collected prescriptions were classified according to the British National Formulary and the number of prescriptions in each category was given in Table 5. In total number of prescription cardiovascular 26.62% (n=267), infections 22.23% (n=223) and GI system 17.75% (n=178) accounted for major part of total number of prescription [Table 5].

(h) Category of Drug Vs Number of drug prescription: Quantitative estimation of number of drug prescribed in each category was analyzed (Table 6). It shows that, the highest 22.69% (N=983) of drugs belonging to infectious agents, followed by 21.02% (911) of drugs belonging to Nutritional products, then Gastrointestinal System20.61%(893), Cardiovascular System18.07%(783), Respiratory System 8.98%(389), Central Nervous System4.64%(201), Endocrine System1.04%(45), Obstetrics and Gynecology1.04%(45), Skin Preparations0.97%(42), Musculoskeletal System 0.95%(41) [Table 6].

(i) Therapeutic class Vs PP: The assessment of PP in each therapeutic class was carried out and the prevalence of PP was estimated (Table 7). The results shows that Major PP is more prevalent in Cardiovascular system diseases (31.5%) followed by infectious diseases (23.67%)[Table 7].

(j) Therapeutic class Vs Age group: The conception of therapeutic class of drug by different age group was studied. The patient prescribed with cardiovascular drugs 26.89% (n=32) and gastrointestinal drugs 10.08% (n=12) were more often involved in the PP among the elderly population (≥61 years of age), while infectious 23.21% (n=195) and cardiovascular drugs 27.98% (n=235) were prominent among young individuals exposed to PP. In children (≤18 years of age) infections 36.36% (16) and GI diseases 25% (11) were prominent [Table 8].

(k) Therapeutic class Vs Hospital stays: Duration of treatment varies with severity of disease. Our result shows the heterogeneous data with respect to duration of therapy and therapeutic category of drugs. Prevalence of short term therapy was high with gastrointestinal and infectious diseases whereas long term therapy was prominent with cardiovascular and respiratory diseases [Table 9.1]. Major PP is more affected the hospital stay of Central Nervous System disorders and Respiratory Diseases [Table 9.2].

Table 1: Demographic details

Variable		Number of Prescriptions
Gender	Male	670 (66.80%)
	Female	333 (32.20%)
Age	Up to 18 years	44 (4.39%)
	19-60 years	840 (83.75%)
	>60 years	119 (11.86%)
Hospital Stay	Less than a week	554 (55.23%)
	1-2 week	390 (38.88%)
	More than 2 week	59 (5.88%)
Polypharmacy	2-4 drugs	600
	≥5 drugs	403

Table 2: Polypharmacy Vs Gender

Variable	Number of prescription			
Number of drugs	Male	Female	Total	Percentage
2-4	227	176	403	40.18%
≥5	443	157	600	59.82%

Table 3: Polypharmacy Vs Age

Number of drug prescribed	Age Group	Number of prescription	Percentage
2-4	≤18	24	5.96%
	19-60	316	78.41%
	≥61	63	15.63%
≥5	≤18	20	3.33%
	19-60	524	87.33%
	≥61	56	9.33%

Table 4: Polypharmacy Vs Hospital stay

Variable	Length of Hospital stay				
Number of drugs	1 week	1-2 week	>2 week	Total	Percentage of total prescription
2-4	258 (64.02%)	117 (29.03%)	28 (6.95%)	403	40.18%
≥5	296 (49.33%)	273 (45.50%)	31 (5.17%)	600	59.82%

Table 5: Quantitative Estimation of Therapeutic Categories of Prescriptions

Therapeutic class	Number of prescription collected	Percentage
Cardiovascular System	267	26.62%
Infections	223	22.23%
Gastrointestinal System	178	17.75%
Respiratory System	144	14.36%
Central Nervous System	120	11.96%
Endocrine System	23	2.29%
Musculoskeletal System	21	2.09%
Dermatology	11	1.10%
Obstetrics and Gynecology	16	1.60%

Table 6: Category of Drug Vs Number of drug prescription

Drug Category	Number of drug	Percentage
Infectious Agent	983	22.69%
Nutritional products	911	21.02%
Gastrointestinal System	893	20.61%
Cardiovascular System	783	18.07%
Respiratory System	389	8.98%
Central Nervous System	201	4.64%
Endocrine System	45	1.04%
Obstetrics and Gynecology	45	1.04%
Skin Preparations	42	0.97%
Musculoskeletal System	41	0.95%

Table 7: Therapeutic class Vs Polypharmacy

Therapeutic class	Minor Polypharmacy (2-4 drugs)	Percentage (%)	Major polypharmacy (≥5)	Percentage (%)
Cardiovascular System	78	19.35	189	31.50
Infections	81	20.10	142	23.67
Gastrointestinal System	97	24.07	81	13.50
Respiratory System	73	18.11	71	11.83
Central Nervous System	44	10.92	76	12.67
Endocrine System	11	2.73	12	2.00
Musculoskeletal System	12	2.98	9	1.50
Dermatology	7	1.74	4	0.67
Obstetrics and Gynecology	Nil	Nil	16	2.67

Table 8: Therapeutic class Vs Age group

Variable	Age		
Therapeutic class	**≤18(n=44)**	**19-60(n=840)**	**≥61(n=119)**
Cardiovascular System	Nil	235(27.98%)	32(26.89%)
Infections	16(36.36%)	195(23.21%)	12(10.08%)
Gastrointestinal System	11(25.00%)	143(17.02%)	24(20.17%)
Respiratory System	2(4.55%)	126(15.00%)	16(13.45%)
Central Nervous System	8(18.18%)	89(10.60%)	23(19.33%)
Endocrine System	Nil	17(2.02%)	6(5.04%)
Musculoskeletal System	2(4.55%)	16(1.90%)	3(2.52%)
Dermatology	5(11.36%)	3(0.36%)	3(2.52%)
Obstetrics and Gynecology	Nil	16(1.90%)	Nil

Table 9.1: Therapeutic class Vs Hospital stays (Minor Polypharmacy)

Variable	Length of hospital stay for Minor Polypharmacy		
Therapeutic category	**≤1 week(n=258)**	**1-2 week(n=117)**	**≥2 week(28)**
Cardiovascular System	52(20.63%)	23(19.66%)	3(10.71%)
Infections	58(23.02%)	17(14.53%)	6(21.43%)
Gastrointestinal System	70(27.78%)	17(14.53%)	10(35.71%)
Respiratory System	32(12.70%)	38(32.48%)	3(10.71%)
Central Nervous System	18(7.14%)	22(18.80%)	4(14.29%)
Endocrine System	9(3.57%)	Nil	2(7.14%)
Musculoskeletal System	12(4.76%)	Nil	Nil
Dermatology	7(2.78%)	Nil	Nil
Obstetrics and Gynecology	Nil	Nil	Nil

Table 9.2: Therapeutic class Vs Hospital stays (Major Polypharmacy)

Variable	Length of hospital stay for Major polypharmacy		
Therapeutic category	**≤1 week(n=296)**	**1-2 week(n=273)**	**≥2 week(n=31)**
Cardiovascular System	89(30.07%)	96(35.16%)	4(12.90%)
Infections	76(25.68%)	60(21.98%)	6(19.35%)
Gastrointestinal System	39(13.18%)	40(14.65%)	2(6.45%)
Respiratory System	26(8.78%)	39(14.29%)	6(19.35%)
Central Nervous System	36(12.16%)	29(10.62%)	11(35.48%)
Endocrine System	9(3.04%)	1(0.37%)	2(6.45%)
Musculoskeletal System	9(3.04%)	Nil	Nil
Dermatology	4(1.35%)	Nil	Nil
Obstetrics and Gynecology	*8(2.70%)*	*8(2.93%)*	*Nil*

DISCUSSION AND CONCLUSION

Poly, of Greek origin, is simply defined by Webster as "many, several, much, multi, containing an indefinite number." Attaching this prefix to the word 'pharmacy' implies many pharmacies, and is devoid of any moral value[29-30]. The use of population based information in the health service research is increasing in the western countries because of availability of administrative data and the cost of data access[31,32]. The recent growth in the specialty of Pharmacoepidemiology has thus been enhancing of population based prescription databases study.

Before the introduction of computer in healthcare information on the exposure was predominantly obtain from interview, questionnaires or medical records, which implied a risk of recall bias which may occur when group of patients being compared differ in their ability to recall antecedent exposure to event. The demographic data of our study shows that 66.80% (N=670) of male population and 33.20% (N=333) female population were enrolled and out of the total enrolled patients age group 19-60 year patients 83.75% (N=840) were dominant than other age group.

PP is the concurrent use of 2 or more categories of drugs. In this study we used prescriptions of patients for the estimation of incidence and prevalence of PP. Some authors have used the term Co-pharmacy to characterize the appropriate and necessary combination of drugs, and only used the term PP for the inappropriate drug combinations. However, it can sometimes be

difficult to decide whether a certain combination of drugs is appropriate or not. Yvonne Koh et al (2005) conducted a retrospective cross-sectional study was performed and found out that an increased number of medications were associated with higher risk for patients with Drug Related Problems (DRP) on admission. Our study also supports the earlier reports[33].

Roshlm et al (1999) retrieved data from Odense Pharmacoepidemiology database and he reported that an average day 8.7% was exposed to minor PP and 1.2% to major PP[34]. In our study we found minor PP (67%) and major PP (33%). PP is more prevalent in the age group 19 to 60 years (83.75%). McMillan et al, (1986) had analyzed prescription by using computer based prescription retrieval system and he found that elderly population was significantly linked to Polypharmacy[35]. Reason may be increase in the prevalence of disease and change in physiology or increase in the number of elder population. Our study also shows similar results.

In the most of the studies of PP female sex and high age have been predictors of Polypharmacy, but few studies showed no correlation. Mont mat et al (1992) summarized the study conducted that PP, the inappropriate use of multiple drug regimens, has a significant impact on the health of elderly individuals[36]. Kang Sim et al (2004) found PP was associated with male gender [odds ratio (OR) 1.24, 95% confidence interval (CI) 1.06, 1.46, $P<0.01$], advanced age $t=-7.81$, d.f. = 2396, $P<0.001$[37]. We found a higher prevalence of drug use among the men than women and adults are more prone to PP. Our study report is similar to that of Mont mat et al (1992).

In our study we found that the length of hospital stay has shown an increase in Major PP compare to Minor PP. Lars Bjerrum et al (1999) conducted a PP study in 13,349 patients and found that, individuals exposed to minor PP the median length of an episode was 20 days (range 1-365 days) and for major PP 13 days (range 1-365 days)[38]. Bjerrum et al(1999) analyzed the occurrence of multiple drug use in the population and identify particular to PP by using Odense Pharmacoepidemiological database and he reported that on a random day 8.3% of population were exposed to minor PP and 1.2% to major Polypharmacy[38]. Cardiovascular and analgesic drugs were often involved in PP among elderly while asthmatic, psychotic and anti-ulcer drugs were predominant[39]. Similarly in our data also showed that cardiovascular drugs and gastrointestinal drugs were more often involved in the PP among the elderly population, while infectious and cardiovascular drugs were prominent among young individuals exposed to PP. Our study confirms the earlier findings.

PP was a frequent condition in Indian population especially among elder population[40]. PP mainly depends on the type of the disease and co-morbid conditions. The majority of drug users exposed to PP exhibited a very heterogeneous pattern of drug combination and mostly individual subject to major PP had their own unique drug combination, differ from all other drug users. The use of medication to disease condition is necessary, but unnecessary load of drugs to patient will increase the safety problems. PP can be avoided by sharing the decisions for making treatment goals and plans[41]. The medication regimen can be simplified by eliminating pharmacological duplication, decreasing dosing frequency and regular review of drug regimen. The goal should be to prescribe the least complex drug regimen for the patient as possible while considering the medication problems, symptoms and off course the cost of therapy[42].

The guidelines obtained from study on PP and as per the knowledge of authors for reduce the problem are ask patients to bring all medicines to counseling center (the brown bag approach), restrict *pro re nata* prescribing, select a drug that may treat more than one condition, check for contraindications and potential drug interactions before prescribing a drug, start with low doses and titrate dose according to effect, monitor for adverse reactions, educate the patient about the drug therapy and teach the patient to prioritize the currently used drugs, routinely check and encourage compliance, periodically simplify the therapeutic regimen and stop drugs if possible, place limits on the duration of drug prescribing and future research could focus on medication assessment methodology as well as targeting high-risk groups for adverse drug effects for intervention. General Practitioners drugs especially for multiple medication users. When issuing prescriptions, doctors should consider the possibility of PP and its predictors. In addition to disease, specific predictor knowledge of non-specific disease determinants such as poor subjective health and medication disagreement may facilitate good prescribing underrate the number of prescribed.

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