



---

## Analysis of Prescriptions for Various Effects of Polypharmacy

Mojahid Ul Islam<sup>1</sup>, Berhanu Tadesse<sup>2</sup>, Vijender Singh<sup>3</sup>, Tesfaye Achalu<sup>4</sup>

<sup>1</sup>School of Pharmacy Sharda University, Greater Noida, UP, India  
mojahidui@yahoo.com9582447947

<sup>2</sup>School of Allied Health Sciences Sharda University, Greater Noida, UP, India

<sup>3</sup>Dean, School of Pharmacy Sharda University, Greater Noida, UP, India

<sup>4</sup>School of Allied Health Sciences Sharda University, Greater Noida, UP, India

**Abstract** Polypharmacy defined as the use of multi medication at the same time and also use the medication in excess than clinically needed. Even if there is a benefit of polypharmacy in the treatment of chronic diseases most time its disadvantage overweight. Polypharmacy is known as inappropriate use of medication that is overprescribing in a response of complex comorbidity leading to undesirable outcomes which need necessitate effective study, monitoring, and evaluation medicine use. Aim of the review to Analysis of prescriptions for various effects of polypharmacy different setting. Methods: A literature search has been performed using PubMed (August 2013-August 2018) and used the term polypharmacy effects. The search was limited to English-language articles. Bibliographies of published reviews were also screened for potentially relevant studies. The inclusion criteria for articles to be included in this review were the effect of polypharmacy and related articles. The full text was reviewed and excluded those that again did not correspond to the type of the study eligible for our review, inclusion and exclusion criteria. Result: DDI and ADE are the most common effect of polypharmacy and also Non adherence to medication, Economical burden to higher mortality, increase hospitalizations rates common effects. From observed polypharmacy in about 94% contain DDI and minimum one to 25 potential drug-drug interaction in single prescription. Most of prescription (n=205) had 5-7 harmful drug-drug interaction. About 98% patient had at least 1 day exposed to 5 distinct genetic drugs and 68.2% of patients had at least 1 day exposed to greater or equal to 10 distinct genetic drugs. Among PDDI identified 0.8% was CI and 51.1% were major PDDI. Total of 20.3% of the older primary care attenders experienced polypharmacy and variation in rate of polypharmacy was mainly found at prescriber level and given the possible adverse outcomes. Conclusions: This review project shows that various effect of polypharmacy on patient and DDI and ADE were main problem identified in various studies. Occurrence of DDI and ADE directly and indirectly Cause increase hospitalization, economic burden. Although not all drug interactions are clinically significant. It is impossible to remember all the known important drug interactions. All age group affected by polypharmacy however elder were most affect due to comorbidity. The review show that Poly pharmacy was observed in different setting but it frequently occurs in hospitalized patients.

**Keywords** Analysis, Prescriptions, Polypharmacy

---

### Introduction

Polypharmacy is the use of two or more medication and also it is the number of medication used in excess than that of medication needed. The word “poly” is derived from the Greek word meaning more than one and that



“pharmacy” referring to the Greek word for drug “pharmacon” [1]. Polypharmacy is defined by the World Health Organization as “The administration of many drugs at the same time or the administration of an excessive number of drugs”. Unfortunately, there is no standard cut point with concern to the number of medications that are decided upon for the meaning of polypharmacy [1].

Even though, most of studies have connected at least five endorsed prescribed drugs as the onset of polypharmacy. Elder people are quickly increasing in number throughout the world in both developed and developing countries, and among this group, multiple chronic and deteriorating disorders are highly prevalent [2]. Polypharmacy has been a persistent problem in considerable for older persons. The use of extra numbers of drugs is worrying in many habits to older patients [3].

Aging is related with numerous physiological changes for example, changes in body conformation and decrease in kidney and liver roles, can fundamentally change pharmacokinetic and pharmacodynamics properties. Variation of age-related pharmacokinetics and pharmacodynamics influences older adults to drug-related problems such as adverse drug reactions (ADRs), drug-drug interactions, and drug-disease interactions [4]. Study show that Self-medication is a potential reason of polypharmacy and the availability of various over-the-counter drugs, particularly potentially inappropriate medications for older people, aggravate this problem [5]. Different issues identified with medication use incorporate low proficiency by and large or low wellbeing education specifically. Extra contributing components incorporate miscommunication or misconception doctor arranges because of psychological brokenness, and mixing up medications as a result of similitude fit as a shape or color, the two of which can emerge all the more frequently in more established aged groups [5]. Although these estimates are remarkable in their own accurate, they devalue the degree of potential adverse events that outcome from polypharmacy as it is often difficult for investigators, patients and healthcare providers to express the difference between adverse drug effects and symptoms, such as nausea, dizziness or even death that may reflect progression of an underlying disease [6].

On other hand Prescribing more than one anti-infection agents was normally experienced demonstrating the event of polypharmacy. Intercessions over prescription anti-infection agents, utilization of non-generic drugs, lacking labeling of medications are important to enhance balanced medication use. Standard treatment guidelines, hospital formulary, and educational intervention become essential to modify this behavior to benefit the patient [7].

The frequency of polypharmacy and conceivably improper prescriptions use were exceptionally high among the investigation populace observing of patients under polypharmacy since it can prompt a higher number of medication related issues and expanded clinic stay [8]. An expansive part of the Pediatric Intensive Care Unit (PICU) patients are presented to significant polypharmacy and numerous patients are presented to different potential medication interaction (PDDIs) [9]. Patients taking numerous meds experience special pharmacotherapy. Customized medicate recommending methodologies and close checking of patients taking medications with potential medication sedate connections (DDIs) are keys to ideal restorative outcome [10].

The rate of unfriendly medication responses (ADRs) because of polypharmacy is alarmingly high. The basics related with ADRs are modifiable [9]. Although there are significant gaps in the proof base on how best to think about more established elders with diabetes polypharmacy ought to be limited. On the off chance that a glycemic target can't be effectively accomplished, the most fitting course might be to change the glycemic target instead of increase treatment [11].

High rate of polypharmacy (76.3%) is now fragile, older gathering with numerous comorbidities. Sexual orientation and age did not significantly affect polypharmacy, however comorbidity and having a cardiovascular finding on confirmation did. Endeavors ought to be made to enhance medicine use and limit unseemly polypharmacy [12].

### **Effects of Polypharmacy**

Polypharmacy has many negative results explicitly the weight of taking different meds has been related with more prominent social insurance costs and an expanded danger of unfriendly medication occasions (ADEs), drug interactions, drug non-adherence, increment hospitalization.



**Increased Healthcare Costs:** We easily understand that taking multi drugs can cause more cost to be invest individual patient and additively to health system whole. Whereas the proper use of drugs may lead to decreases hospitalization in addition to this inappropriate medications use also increase frequency of hospital visit and more health care services. Polypharmacy the utilization of wrong medication use adds to social insurance expenses to both the patient and the human services framework. An investigation led in Sweden revealed that those taking at least 5 meds had a 6.2% expansion in doctor prescribed medication use and those taking at least 10 prescriptions had a 7.3% increment [13].

**Adverse Drug Events:** An examination demonstrates that Polypharmacy is normal among more seasoned people going to essential consideration and the best variety in its rates was seen at the recommended dimension. It was related with multimorbidity in all practices, and moreover, being female sexual orientation and treated via prepared family doctors in people in general division. As polypharmacy might be fitting in patients with multimorbidity, further examinations ought to be embraced to investigate the fittingness of multi-sedate regimens. By and by, ordinary survey of polypharmacy at the prescriber level is valuable to recognize patients in danger of wrong meds and conceivable related unfriendly impacts.

Study done in 2005 shows, that over 4.3 million human services visits were ascribed to an ADE. It has been accounted for that up to 35% of outpatients and 40% of hospitalized older experience an ADE. Moreover, roughly 10% of crisis room visits are credited to an ADE. In a populace based examination, outpatients taking at least 5 prescriptions had a 88% expanded danger of encountering an ADE contrasted with the individuals who were taking less meds. In nursing home occupants, rates of ADEs have been noted to be twice as high in patients taking at least 9 meds contrasted with those taking less. Another examination assessing impromptu hospitalizations in more established veterans found that a patient taking in excess of 5 prescriptions was right around multiple times as liable to be hospitalized from ADE. As one may expect, basic medication classes related with ADEs incorporate anticoagulants, NSAIDs, cardiovascular prescriptions, diuretics, anti-infection agents, anticonvulsants, benzodiazepines, and hypoglycemic drugs [2, 7-8].

#### **Drug-Interaction:**

Studies have detailed the examination of medication to tranquilize cooperations Potential for DDIs was available in 706 out of 751 (94%) medicines with polypharmacy. At least one potential DDI to the greatest 25 potential DDIs could be distinguished in a solitary solution in the 706 medicines. The vast majority of the remedies (n = 205) had 5– 7 unsafe DDIs [10].

A sum of 305 medicines (97.75%) in older patients had DDIs when contrasted with 401 solutions (91.34%), with DDIs in patients <60 years old. This finding is rational with aftereffects of different investigations portraying an expansion in polypharmacy corresponding to age. Department wise, 403 solutions from the drug office had DDIs when contrasted with 159 from a medical procedure and 144 from orthopedics [10].

#### **Medication Non-adherence**

Adherence to polypharmacy The World Health Organization (WHO) characterizes drug adherence as the degree to which an individual's conduct - taking medicine, following an eating regimen, as well as executing way of life changes, relates with concurred proposals from a human services supplier [2]. Non-adherence portrays the patient who does not or just in part pursue the treatment courses of action recently concurred with the specialist. Medicine adherence (the patients' utilization of the correct medication in the right portion at the correct interim), which is a key factor related with the adequacy of every single pharmacological treatment is fundamental in the treatment of the old [2]. Prescription taking conduct is unpredictable and includes patient, doctor, and procedure parts. Expanding adherence may biggerly affect wellbeing than enhancement in explicit restorative treatment [2]. Identification of non-adherence is testing and requires explicit aptitudes. If not perceived, the non-adherence can prompt a portion expansion of the underlying prescription or the expansion of a second medication, in this manner expanding the



hazard for ADRs, expanded crisis visits, hospitalizations, lower personal satisfaction and expanded human services costs [2].

## Result

Investigation done in India shown that sum of 5424 prescriptions was gathered from the three divisions and broke down amid the examination time frame.

### Investigation of polypharmacy

Out of 5424 prescriptions 13.85% were seen to have polypharmacy with most astounding rates saw in the Department of Medicine. The middle time of patients was  $55.60 \pm 13.86$  (range, 10– 108 years). Four hundred and seventy-six patients were male (63.4%) and 275 (36.6%) were females. Level of old patients (age at least 60) was 41.5% when contrasted with 58.5% of patients with age <60 years.

All out number of medications per medicine went from least of 5 to limit of 16 drugs, with a normal of  $7.96 \pm 1.75$ . Five hundred and ninety-six medicines contained 6– 9 medications for every remedy. In excess of ten medications for each medicine were seen in 79 remedies.

### Examination of drug– sedate collaborations

Potential for DDIs was available in 706 out of 751 (94%) solutions with polypharmacy. At least one potential DDI to a greatest 25 potential DDIs could be distinguished in a solitary solution in the 706 remedies. A large portion of the remedies (n = 205) had 5– 7 destructive DDIs.

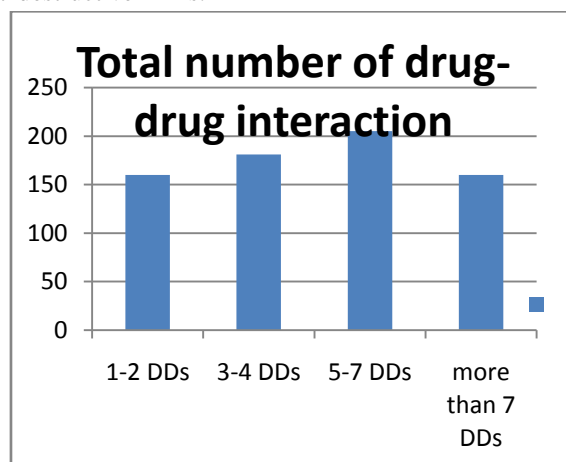


Figure 1: Group of patients as per number of drug–drug interactions PDDI was occurring in 706 out of 751(94%) prescription with polypharmacy. A smallest of one PDDI to extreme 25 PDDI was identified in a single prescription in 706 prescriptions. Most of prescription (n=205) had 5-7 dangerous DDIs

Analysis in article 1 Table 2 shows potential Drug-Drug interaction and frequency it was occurred and mechanism of DDI

Table 1: Common potential DDIs where combinations are contraindicated

Drug-Drug interaction	Frequency	Severity	Mechanism of DDI
Carbamazepine/Tramadol	6	Major	PK/PD
Benzodiazepines/Olanzapine	2	Major	PD
Ranolazine/Phenyntion	11	Moderate	PK
Ivabradine/Ranolazine	1	Major	PD
Amiodarone/Ondansetron	1	Major	PD
Artesunate/ Ondansetron	1	Major	PD
Prazosin/Tamsulosin	3	Major	PD



**Table 2:** Number of DDIs where combination needs monitoring - Category C

Drug- interaction	Drug	DDIs where in drug therapy needs to be monitored Category C				Total
		DDI no present	1 or 2 DDIs	3 to 5 DDIs	More than 5 DDIs	
Present		18 (2.5%)	218 (30.9%)	273 (38.7%)	197 (27.9%)	706
Absent		45 (100%)	0	0	0	45
Total		63 (8.4%)	218 (29.0%)	273 (36.4%)	197 (26.2%)	751

Study done in USA shown appears, there were an aggregate of 54,549 hospitalizations of children <18 years-old at the time of admission to the PICUs in 42 children's hospitals throughout the United States in 2011. The median age was 3 years, 23.4% patients were infants <1 year old, 55.8% were males, and 51.7% were white, Respiratory System diseases and innate irregularities were among the most widely recognized judgments. The length of stay in ICU ran from 1 to 768 days, with a middle of 3 days.

A sum of 1,008 novel nonexclusive medications were directed. Beneath the 12 most basic prescription exposures in rank request, stratified by 3 fundamental age gatherings (newborn children, youngsters, and youths, since examples among patients inside these age ranges were comparable). Generally, the predominance rate for the main 10 normal managed medications were acetaminophen (56.1% of patients), fentanyl (48.9%), midazolam (47.4%), ranitidine (46.1%), heparin (44.4%), morphine (43.8%), potassium chloride (34.1%), furosemide (33.8%), lidocaine (30.6%), and epinephrine (29.5%). A total table of the predominance rate with 95% certainty interims (CIs) of all medications utilized in the accomplice, stratified by patient age.

**Table 3:** Potential ADE

Drug-Drug combination	Potential ADE	Scientific Evidence	Number of patients Exposed	%(95% CI)
Dexamethasone Rocuronium	+ Decrease effectiveness, prolonged muscle weakness and myopathy	rocuronium Fair	4.076	7.47(7.24-7.70)
Furosemide +ketorolac	Decreased diuretic and antihypertensive efficacy	Good	3.163	5.80(5.60-6.00)
Aspirin De+ Furosemide	Decreased diuretic and antihypertensive efficacy	Good	3.054	5.60(5.40-5.80)
Methylprednisolone Rocuronium	+ Decrease effectiveness, prolonged muscle weakness and myopathy	rocuronium Fair	2.756	5.05(4.86-5.24)
Midazolam Sevoflurane	+ Potentiation of anesthetic effect	Fair	2.483	4.55(4.38-4.73)
Heparin + Vitamin A	Increase risk of bleeding	Good	2.483	4.55(4.37-4.73)



**Table 4:** 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
Methyl dopa	2	0.57

### Discussion

This investigation demonstrates that Polypharmacy is generally observed in hospitalized patients and conveys a high danger of DDIs and drug– disease interactions. These may cause unsafe impacts, insufficient helpful impacts, portion missing, overdosing, DDIs, and unfavorable medication responses (ADRs). World Health Organization restrains the normal number of medications per encountered to be between 1.4– 2.4 [14].

In first article 5424 prescription of patients admitted in medicine, surgery, and orthopedic wards, and orthopedic wards of Goa Medical College from July 2011 to June 2012. Polypharmacy was seen in 751 (13.85%) solutions with most extreme rates saw in the Department of Medicine. Numerous patients (n = 596) had 6– 9 medications endorsed and 79 remedies had super-polypharmacy (in excess of ten medications for each medicine). This can be clarified by the way that conceded patients have a huge number of comorbidities, are overseen by authorities, and need a various number of medications for prevention and control of the disease.

A prospective, observational examination from the cardiology office in an emergency clinic from South India announced a frequency of 30.67% of potential DDIs [15].

Predominance of polypharmacy is exceptionally high among geriatric population in the examination site. The investigation augmented the outcomes of polypharmacy and was intently connected with numerous comorbidity and progressive age [9].

As per chance rating, the examination broke down the DDIs into X, D, C class as indicated by mixes that ought to be stayed away from, that ought to be changed, or that ought to be checked, separately. Medications engaged with potential DDIs in our examination incorporated a few medications which are every now and again utilized in essential consideration, for example, headache medicine, and stomach settling agents, beta-blockers, 3-hydroxy-3-methylglutaryl-coenzyme reductase inhibitors, and calcium channel blockers, angiotensin-changing over protein inhibitors, Ondansetron, and H2 blockers. Different DDIs included medications frequently utilized together with ordinary medications, for example, calcium salts and iron salts.

Recognized an aggregate of 543 novel generic medications in this associate could have potential cooperated with different medications directed simultaneously. With 75.2% of all ICU patients presented to somewhere around one PDDI; the examination demonstrates that an aggregate of 1,332,168 PDDI exposures.

The most widely recognized medications engaged with PDDI were midazolam (associated with 12.7% of all PDDIs), fentanyl (12.6%), morphine (11.2%), furosemide (9.9%), headache medicine (8.1%), lorazepam (6.7%),





phenobarbital (5.5%), heparin (5.5%), enalapril (4.3%), and spironolactone (4.2%). Seventy-five percent of patients had  $\geq 1$  PDDI paying little mind to seriousness level, 8.4% had  $\geq 1$  contraindicated PDDI, 68.8% had  $\geq 1$  major PDDI, 57% had  $\geq 1$  moderate PDDI, 19% had  $\geq 1$  minor PDDI.

### Conclusion

This review project shows that various effect of polypharmacy on patient and DDI and ADE were main problem identified in various studies. Occurrence of DDI and ADE directly and indirectly Cause increase hospitalization, economic burden. Although not all drug interactions are clinically significant. It is impossible to remember all the known important drug interactions. All age group affected by polypharmacy however elder were most affect due to comorbidity. The review show that Poly pharmacy was observed in different setting but it frequently occurs in hospitalized patients.

### References

- [1]. Maher RL, Hanlon J, Hajjar ER. Clinical consequences of polypharmacy in elderly. *Expert Opin Drug Saf*. 2013; 13(1):57-65.
- [2]. Mortazavi SS, Shati M, Keshtkar A, Malakouti SK, Bazargan M, Assari S. Defining polypharmacy in the elderly: a systematic review protocol. *BMJ Open*. 2016;6(3):e010989.
- [3]. Kantor ED, Rehm CD, Haas JS, Chan AT, Giovannucci EL. Trends in Prescription Drug Use Among Adults in the United States From 1999-2012. *JAMA*. 2015;314(17):1818-31.
- [4]. Beadles CA, Voils CI, Crowley MJ, Farley JF, Maciejewski ML. Continuity of medication management and continuity of care: Conceptual and operational considerations. *SAGE Open Med*. 2014; 2:2050312114559261. Published 2014 Dec 9. doi:10.1177/2050312114559261.
- [5]. Zhang X, Zhou S, Pan K, et al. Potentially inappropriate medications in hospitalized older patients: a cross-sectional study using the Beers 2015 criteria versus the 2012 criteria. *Clinical Interventions in Aging*. 2017; 12: 1697-1703.
- [6]. Fulton MM & Riley Allen E. Polypharmacy in the elderly: A literature review. *Journal of the American Academy of Nurse Practitioners* 2005; 17: 123–132.
- [7]. Begum, Mst. Marium et al. Analysis of prescription pattern of antibiotic drugs on patients suffering from ENT infection within Dhaka Metropolis, Bangladesh. *International Journal of Basic & Clinical Pharmacology*. 2017; 6(2): 257-264.
- [8]. Subeesh VK, Gouri N, et.al. A Prospective Observational Study on Polypharmacy in Geriatrics at A Private Corporate Hospital. *J App Pharm Sci*, 2017; 7 (10): 162-7.
- [9]. Viswam, Subeesh & Gouri, N & Beulah, E.T. & Shivashankar, V. (2017). A Prospective Observational Study on Polypharmacy in Geriatrics at a Private Corporate Hospital. *Journal of Applied Pharmaceutical Science*.2017; 7(10):162-167.
- [10]. Khandeparkar A, Rataboli PV. A study of harmful drug-drug interactions due to polypharmacy in hospitalized patients in Goa Medical College. *Perspect Clin Res*. 2017; 8(4):180-186.
- [11]. Lipska KJ, Krumholz H, Soones T, Lee SJ. Polypharmacy in the Aging Patient: A Review of Glycemic Control in Older Adults With Type 2 Diabetes. *JAMA*. 2016; 315(10):1034-45.
- [12]. Al-Hashar A, Al Sinawi H, Al Mahrizi A, Al-Hatrushi M. Prevalence and Covariates of Polypharmacy in Elderly Patients on Discharge from a Tertiary Care Hospital in Oman. *Oman Med J*. 2016;31(6):421-425.
- [13]. Ong SM, Lim YMF, Sivasampu S, Khoo EM. Variation of polypharmacy in older primary care attenders occurs at prescriber level. *BMC Geriatr*. 2018; 18(1):59.
- [14]. Müller M. Polypharmacy, inappropriate prescribing and adverse drug reactions in Austria. *Wien Klin Wochenschr*. 2008; 120: 713–4.
- [15]. Sharma S, Chhetri HP, Alam K. A study of potential drug-drug interactions among hospitalized cardiac patients in a teaching hospital in Western Nepal. *Indian J Pharmacol*. 2014; 46: 152–6.

