ORIGINAL ARTICLE

Incidence of Poly pharmacy among emergency patients at a Tertiary Care Hospital in Karachi: An Ignored Paradigm for Quality Drug Therapy

MUNAWAR KHURSHEED[1], FEROZA PERVEEN[2], NAVEED AHMED[1], RAKSHINDA MUJEEB[1], ASHER FEROZE[1], SHEHRYAR ORAKZAI[1]

[1]Department of Emergency Medicine, Aga Khan University Hospital
[2]Department of Pharmacy, Aga Khan University Hospital

Abstract

Introduction: A prescription containing five or more drugs is likely to result in adverse consequences that may involve hospital admission, falls, and many other complications. Increasing incidence of Poly-pharmacy among patients visiting emergency department (ED, hereafter) calls for a more judicious and cautious approach to prescription with a focus on long-term as well as short-term health care issues.
Objective: To estimate the incidence and current trend of poly-pharmacy among patients (pediatric and adults) visiting ED at a tertiary care hospital.
Methods: This study was a retrospective study in which the patients' data who visited the emergency department of Aga Khan University Hospital (AKUH) was reviewed and analyzed. The duration of the study was between January, 2012 to December, 2012. The detailed clinical records of randomly selected patients were retrieved out of 51,000 patients who visited ED during the period.
Results: A total of 51,000 patients visited ED during the study period, out of those, 372 patients were randomly selected. Poly-pharmacy was common in 69.9% (251) of the patients with elderly population being the most effected age group $P < 0.05$. Males were 51.9 % (193) and adults were 80.4% (295). The most common triage category was P1 40.2% (100). Top most diagnosis was respiratory tract infection and antibiotic was the most prescribed drugs in ED 91% (340).
Conclusion: The perils and problems associated with poly-pharmacy are a subject of interest as poly-pharmacy has been found to be a significant finding among all ED patients.
Keywords: Polypharmacy, Emergency Department, Tertiary Care Hospital, Pakistan

How to cite this article: Khursheed M, Perveen F, Ahmed N, Mujeeb R, Feroza A, Orakzai SH. Incidence of Poly pharmacy among emergency patients at a Tertiary Care Hospital in Karachi: An Ignored Paradigm for Quality Drug Therapy. **Asia Pac J Med Toxicol 2021; 10(3):88-94.**

INTRODUCTION

Polypharmacy refers to the use of multiple medicines by the patient. It is associated with a significant morbidity, mortality and disability especially in elderly population[1, 2]. It has become a norm in current medical practice due to the advent of challenges posed by chronic diseases, rise in elderly population and availability of preventive medicines[2]. Polypharmacy can be sometimes deem appropriate. However, there is a strong association with morbidity and mortality[3]. It is considered as a significant issue which continues to draw the attention of clinicians, policy and guideline developers[4].

Polypharmacy has been identified to impose negative health effects that contribute to potential side effects of a drug, drug-drug interaction, reduced patient compliance and poor drug adherence leading to cognitive impairment and impaired balance resulting in falls[5, 6]. Moreover, it contributes to drug adherence which involves numerous clinical concern cause confusion[7]. The risk of an adverse drug effect is 13% with two medicines while it increases to 58% with multiple (polypharmacy) prescription[8]. Similarly, the incidence of adverse drug interactions (ADIs) also increases[9]. Medication errors are a common observation in all areas of the health care system[10].

Prescriptions in the ED are usually processed in a rush which have the potential to cause medication errors, incorrect medication dose, and failure to detect patient allergy records[11]. The drug delivery sequence begins from receiving prescription followed by transcription, dispensing from a registered pharmacist, administration and monitoring by nursing staff in the end[12]. Certain drugs are considered potentially inappropriate in older patients not only because of the higher risk of intolerance related to pharmacokinetics, pharmacodynamics or drug–disease interactions but also because they are prescribed at too high doses or for extended time period[13]. It is vital to identify patients with inappropriate polypharmacy which has potential to cause adversity and

*Correspondence to: Feroza Perveen, Senior Pharmacist, Aga Khan University Hospital Karachi, Pakistan, National Stadium Rd, Sindh 74800
Email: feroza.parveen@yahoo.com, Tel: 923002834513

poor health outcomes[2]. A recent study on the incidence of polypharmacy in Malaysia reported 12.5% cases which is an alarmingly high figure in terms of medication regimen[14] .Another study from India reported that polypharmacy is norm and more than 50% prescription having three or more medications[15]. Although a number of epidemiological studies investigating the role of polypharmacy among patients presenting to different hospital has been almost exclusively conducted for the geriatric populations, they have been limited to the developed countries.

There is little evidence of polypharmacy in Asian countries including Pakistan that caters to a large portion of patients in the EDs. The aim of this study was to understand the current practice of prescribing medication in ED in a low-income setting and to determine the factors associated with polypharmacy.

METHODS

The present research was a retrospective study conducted at Aga Khan University Hospital (AKUH) Karachi, Pakistan, a 700 plus bedded, Joint Commission International (JCI) accredited tertiary care center providing health care facilities.

Study Design and Population:

The required data of this study was collected from patients who visited the ED of Aga Khan University Hospital, Karachi (AKUH) during January to December 2012. Using a simple random sampling method, the detailed clinical records were retrieved out of 51,000 patients who visited ED during that period. The prescribing from admission till discharge of all patients were reviewed through physician order entry (POE). The data was extracted and filtered for 5 or more medications. Other required data which includes patient's demographic information, reason for visit, vitals, clinical presentation, medication information (dosage and duration of treatment), triage category, ED length of stay and their disposition (admitted, discharge, LAMA or expired) were extracted from medical records.

A representative sample of 267 was employed in this study 50% of whom used poly-pharmacy as a prescribing norm for the patient (adult and pediatric). The study assuming a confidence level of 95% and was bound on 5% of error. We further inflate sample size to 35% in order to handle the missing data in multiple variables, so the final sample size was increased to 370.

Patients with Polypharmacy:

In this study, we used the definition of Polypharmacy proposed by Sabzwari who defined the term as the concurrent use of five or more different medications[16]. For each patient, the previous and current medications may collectively be five or more which will be considered as polypharmacy. Previous medications are those medicines that the patient was prescribed earlier before coming to the ED. While current medicines are those that are prescribed in the ED during present visit. Topical preparations are excluded from the defined polypharmacy criteria. For instance, ointments, ear/eye drops, and enemas, since they are non-systemic drugs that act within the intestinal lumen without reaching systemic circulation. Also, the data of patients with inaccurate or illegible medication information in the clinical records was excluded from the current study.

Medication classification by Anatomical Therapeutic Chemical (ATC):

Drugs involved in the polypharmacy criteria were coded into various drug classes according to Anatomical Chemical (ATC) classification based on WHO-ATC Index 2005[17]. The ATC classification system has divided all drugs into several groups according to their specific action on different organ or system and their (chemical, pharmacological and therapeutic) properties.

Analysis

Descriptive statistics were used to describe the patient's demographics. Chi-square ($\chi 2$) was used for categorical data to see the association between groups and t-test for continuous data. Moreover, predictors like Gender, Area, Age, Weight, Height and vital signs etc. were used to see their relationship with the dichotomous outcome that is use of polypharmacy.

RESULTS

The data collected from a simple of 372 patients were analyzed meticulously. Male and females were equally distributed (n= 193, 52% versus n= 179, 48%) and the mean age of the participants was (42.1 ± 25.2) years. Triaging of the patients was done using Emergency Severity Index (ESI) which is a five-level ED triage algorithm. It provides clinically relevant stratification of patients into five groups from 1 (most urgent) to 5 (least urgent) on the basis of acuity and resource needs[18]. Most of the patients came under P1 category (n= 100, 40.2%) followed closely by P3 (n= 95, 38.2%) and rest in P2 and P4 (n= 46, 18.5% and n=8, 3.2%) respectively. See table 1.

The medicines prescribed to the patients were between five to seven or more, in number (n= 251, 70%). The mean hospital stay was 9.71 ± 6.94 hours and the majority stayed greater than six hours in the hospital (n= 123, 59% versus n=85, 41%). Most of them were sent home after the treatment from ED (n= 194, 53.6) followed by admission to hospital (n= 99, 27.3%). There was significant number of patients which was left against medical advice (LAMA) n= 47, 13% and remaining were expired (n= 14, 3.9%) as depicted in table 1.

The results indicated that the most frequent diagnosis made in ED was respiratory tract infection (n= 61, 16.4%) followed by gastroenteritis and others (See table 2). Antibiotics were prescribed in 91.6 % of the cases followed by, Pain killers, and proton pump inhibitors were almost equally distributed among thirty percent of the case (See figure 1). 5-6 medicines were prescribed in almost half of the patients (n=188, 52.4%) followed by 3-4 medicines (n=83, 23.1%) as shown in Table 1.

Table 3 shows the use of poly-pharmacy among patients based on their age, groups, gender, number of complaints and triage level. Poly-pharmacy found to be common in all groups with no difference between male (n=130, 71%) and female (n=121, 69%).

Table 1. Demographic Characteristics of Patients (n=372)

Variables	n	%
Gender		
Male	193	51.9
Female	179	48.1
Total	372	100.0
Age (in years)		
Peads group	*72*	*19.6*
< 1 years	22	6.0
1-5 years	28	7.6
6-15 years	22	6.0
Adult group	*295*	*80.4*
16-24 years	30	8.2
25-44 years	64	17.4
45-59 years	86	23.4
60+ years	115	31.3
Mean ± SD; n=367	*42.1 ± 25.2*	--
Total	367	100.0
Triage Category		
P1	100	40.2
P2	46	18.5
P3	95	38.2
P4	8	3.2
Total	249	100.0
Poly Pharmacy		
Yes	251	69.9
No	108	30.1
Total	359	100
Number of Medicines Prescribed		
1-2	25	7.0
3-4	83	23.1
5-6	188	52.4
7+	63	17.5
Total	359	100
Length of Stay in ER		
<= 6 hours	85	40.9
> 6 hours	123	59.1
Mean ± SD; n=208	*9.71 ± 6.94*	--
Total	208	100
Patient Disposition		
Discharged	194	53.6
Admitted	99	27.3
LAMA	47	13.0
Expired	14	3.9
5(others)	8	2.2
Total	362	100

Table 2. ED Diagnosis (n=386)

ED Diagnosis	Responses	Percent of Cases
Resp. tract infection	61	16.4
Acute Gastritis/ Gastro-enteritis	32	8.6
Acute Coronary Syndrome	27	7.3
Injuries	27	7.3
UrinaryTract Infection/Hematuria	23	6.2
Sepsis/septic shock	19	5.1
Road Traffic Accident/Trauma	18	4.8
Fever/Viral fever/Enteric Fever	12	3.2
Hepatitis/cirrhosis	11	3
Stroke	11	3
Others	141	36
Total	386	

There was a significant difference noted with respect to age groups and triage level. Poly-pharmacy was higher in patients with age group of thirty and above (n= 179, p 0.002) and those who triaged P1-P2 category as (n= 114, p 0.037).

DISCUSSION

The emergency department (ED) of the tertiary care hospitals are usually overcrowded with sick patients and this problem gets worse when the ED is in a developing country where both human and financial resources are very limited. Similar situation applies to our ED which is state of art department of tertiary care hospital located in Karachi, Pakistan, a developing country, where patients across the country come to seek medical care.

In the present research found very limited data for incidence of poly-pharmacy from Asian region in our study. The degree of Poly-pharmacy (69.9%) was near to that reported by Abrams et al in 1998 (72.8%)[19]. However, the rate of poly-pharmacy was 72% in patients examined by Toshikazu Abe et al [20]. Research shows that excessive poly-pharmacy is associated with worse outcomes related to patient's condition[21].

With regard to gender, we found that there was no significant difference between males and females concerning poly-pharmacy. It means that gender did not significantly affect the presence of poly-pharmacy. 69% of females in our study were found with poly-pharmacy. This finding was in tune with the percentage reported by Toshikazu Abe et al (i:e 61%)[20].

Moreover, when we compared poly-pharmacy with different age groups, we observed that poly-pharmacy was most common in elderly group (31%) as shown in Table 1. This finding was also proven by international studies[22].

In our study, most patients with Poly-pharmacy were elderly >60 years of age[23]. The risk of Poly-pharmacy causing Drug-Drug Interaction (DDI) are even higher in older population as most of elderly are suffering from multiple diseases and they need to take multiple medicine for treating these diseases.

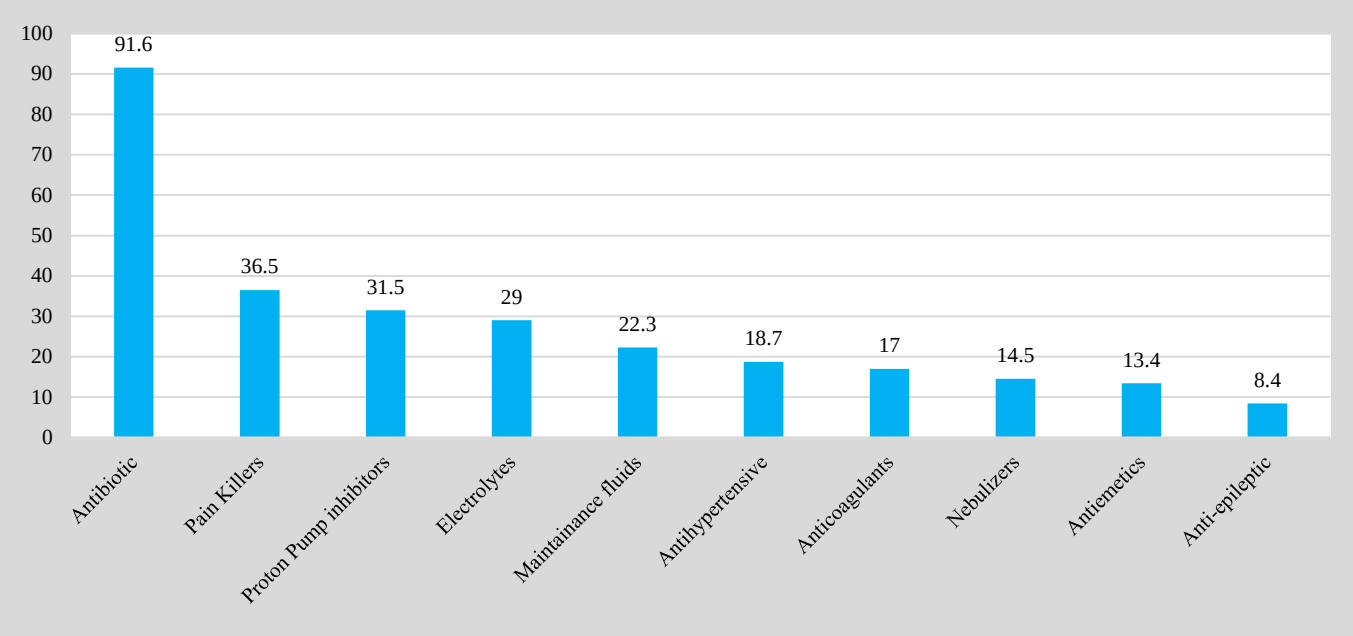

Figure 1. Percentage (%) of top 10 Medicine Prescribed by its Type (n=372)

Table 3. Use of Poly-pharmacy among Patient by Different Factors

	Poly Pharmacy			P-value
	Yes	No	Total	
Gender				
Male	130 (70.7)	54 (29.3)	184	0.755
Female	121 (69.1)	54 (30.9)	175	
n	251	108	359	
Age Group				
<=5 years	30 (61.2)	19 (38.8)	49	0.68
6-15 years	11 (50.0)	11 (50)	22	
16-29 years	29 (58.0)	21 (42)	50	
n	70	51	121	
Age Group				
30-59 years	88 (72.1)	34 (27.9)	122	0.10
60+ years	91 (81.3)	21 (18.8)	112	
n	179	55	234	
Number of Presenting Complaints				
One	166 (68.0)	78 (32.0)	244	0.328
Two	75 (75.8)	24 (24.2)	99	
More than Three	9 (64.3)	5 (35.7)	14	
n	250	107	357	
Triage Level				
P1 – P2	114 (79.2)	30 (20.8)	144	0.037
P3 – P4	68 (67.3)	33 (32.7)	101	
n	182	63	245	

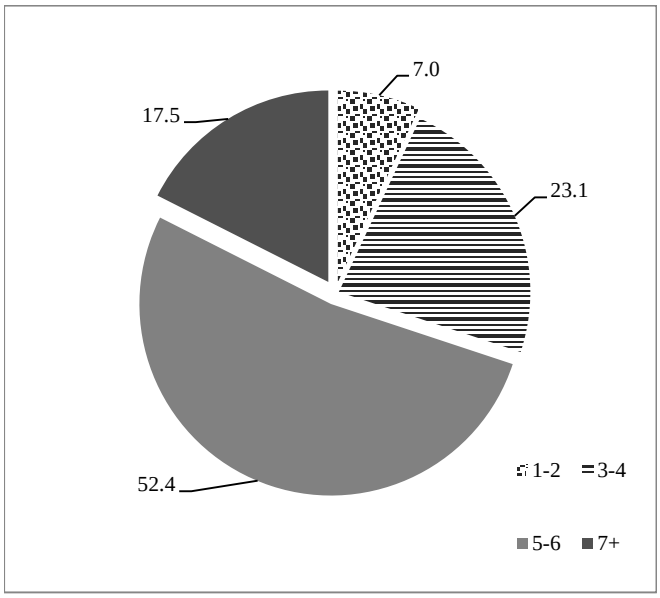

Figure 2. Number of Drugs (different active substances)

Some of these medicines were prescribed by physicians and some may be taken as over the counter by elderly patients and that increases the risk of DDI[22]. The results of this study are comparable to those of Baumgartner in which elderly population received the greatest number of medicines[24].

As we conducted our study in ED, we examined the relationship between presenting complaints and Triage category with poly-pharmacy as well[18]. As for the numbers of complaints, no association was found with poly-pharmacy. But it was found to have strong association with triage category as patients who are critical and belong to triage category P1-P2 114 (79.2 %) were identified to have a strong association with poly-pharmacy as shown in Table 3. To the best of our knowledge, to date, these important factors were not reported or mentioned in the available literature in this domain. Further studies may require to investigate these factors in more detail.

In our study, three most common ED Diagnosis were respiratory tract infection 61(16%) followed by acute gastro enteritis 32 (9%) and acute coronary syndrome (ACS) 27 (7%). The percentage of respiratory cases were almost similar to the study conducted by Krishna Pandey where 14% of cases had respiratory tract infection although in his study the respiratory cases were not the most common disease reported[25]. The reason for more respiratory cases were probably due to smoking and exposure to air pollution of susceptible individuals. Moreover, acute gastro enteritis 32 (9%) was the second most common diagnosis found in our study. The most likely reason would be an increase in number of GI related diseases due to consumption of contaminated water, unhealthy living life style such as eating junk food and anxiety[25, 26]. The third significant disease reported in our study was acute coronary syndrome and that was in contrast with Barot PA et al[27] and by Krishna Pandey who reported ACS as the number one diagnosis as raised by 21.79% and 26% of the patients in their studies. The reason for that difference is unclear, yet one probable reason might be that the patients with ACS in our study preferred to go to government based cardiac tertiary care centers for their care where all care is provided free of charge.

The top three drugs prescribed in our study were antibiotics, pain killers and PPI which is almost the same as those found in a regional study in India by Balushi K et al. The most likely reason would be similar complaints in the same socioeconomic setup of patients in both studies where infection is most common reason to visit ER followed by Gastritis/gastroenteritis and body-ache/musculoskeletal pain[28, 29].

In this study, it was also found that antibiotics were the most frequently prescribed medicines to patients admitted to ED (91.6%). It was very close to the percentage reported by Karishna Pandey 93.6%[25]. The most probable reason behind this is that in ED antibiotics are empirically prescribed to manage the presumed sepsis/infection and to control severity of illness as the diagnosis was not confirmed during initial couple of hour after ED arrival, while the percentage is 30% in developed countries which is much lower in comparision to our study. This may be due to more systematic and protocol driven care and/or less numbers of infectious cases in ED in developed countries[30, 31]. This highlights the need to develop some strategies to decrease the unnecessary use of antibiotics which ultimately decrease the prevalence of antibiotics resistance in developing countries which has been alarming over the past decade. To optimize medicine use in ED it is necessity to implement antibiotic stewardship to avoid the irrational use of broad-spectrum antibiotics which ultimately affects the cost of therapy.

Our study reported 8.6% of patients visited ED due to GI related problems like Gastritis/Gastroenteritis but interestingly 31% of patients received PPI in ED. This may be because beside gastritis, PPI was given as prophylaxis against peptic ulcer diseases in patients who were on NG feeding or receiving NSAID or Aspirin or it may be used for the patients who did not need such cares[25, 26, 31].

Pain killers were among the top three prescribed medicine in our ED. A significant number of the patients in our study were elderly, and we knew that most of the elderly do suffer from chronic pain and have habits to take multiple pain killers including NSAIDS at home to control their symptoms. This is quite possible that many of them either visits ED due to onset of new pain or exaggeration of chronic pain as their primary complaints; they may have also come to ED with some other reasons with body aches as secondary complaint and received analgesia during their ED visits[28, 32]. Another important reason due to which patients receive analgesia in ED is injury and trauma such as road traffic accidents, falls, animal bite etc.[33]. As per the USA data injuries and trauma are top most reasons to visits ED. Although this number has dropped in last few years, significant percentage of cases are elderly who have taken multiple comorbid and multiple medications at home. This approves that providing safe and effective analgesia at times is not easy task[34, 35].

The majority of the patients with poly-pharmacy in our study stayed in ED for more than 6 hours but further analysis

did not find any correlation between higher numbers of drugs with LOS.

This finding is in contrast with that of Rakesh Patidar where LOS is directly related to poly-pharmacy[28, 31].

Our study highlights the need to pay due attention to the implementing poly-pharmacy. Physicians need continuous education and knowledge about the drug, its dosing, interactions and side effects. They should check already existing medication before prescribing new ones. Evaluation of patient's compliance and adherence with the therapy is also one of the important considerations.

The limitations of this study are that it was retrospective chart review, patients with inaccurate or illegible medication information in the clinical records were excluded from analysis. Also, the data gathered from those patients who are shifted from emergency to other wards/ICU/CICU were excluded.

CONCLUSION

Nowadays, poly-pharmacy is a widespread problem all around the world. The results of this study showed the importance of poly-pharmacy as independent risk factor for adverse health outcomes after an ED visit. Health care systems are now becoming more complex and it's very important to have strong coordination with physicians, pharmacists and patients to ensure more patient centered approach.

The result of this study highlights the importance of strategies that must be implemented to optimize medication use at the EDs. In the current climate of ED overcrowding, boarding of admitted patients in ED and more elderly patients with multiple comorbidities, the need of pharmacist in ED would be of potential benefit to the process of identifying drug interactions.

There is a lack of data in the region regarding poly-pharmacy in Emergency patients. Our study highlighted that poly-pharmacy is the subject of interest among all ED patients. Moreover, further study are needed to disseminate the findings of the problems associated with poly-pharmacy.

Author's Contribution:

MK is primary author of study & participated in the design of the study, in depth literature review, drafting and finalizing of the paper. FP participated in depth literature review, data analysis, drafting introduction and discussion part of the manuscript, also coordinated with the team members to finalize the article. RM conceived the idea of study and participated in the literature review, data collection and writing methodology section of the paper. AF participated in the data analysis and sample size calculation. NA participated in drafting introduction and result section of the paper. OS conducted the literature review and participated in drafting of the paper. Finally, all authors read and approved the final manuscript.

ACKNOWLEDGEMENT

We would like to thank department of Pharmacy and Emergency medicine Aga Khan University Hospital for facilitating this project. We would also like to acknowledge all team members who supported to accomplish this project especially Mr. Ameer for reviewing manuscript.

Conflict of interest: None to be declared.

Abbreviations:	
AKUH	Aga Khan University Hospital
ED	Emergency Department
JCI	Join Commission International
POE	Physician order entry
ATC	Anatomical therapeutic chemical
ACS	Acute coronary syndrome
GI	Gastrointestinal
PPI	Proton pump inhibitors
LAMA	Leave against medical advice
P1	Triage category, life threatening
P2	Triage category, Critical
DDI	Drug-Drug Interaction
NSAID	Non-steroidal anti-inflammatory drugs
NG	Nasogastric

REFERENCES

1. Mair A, Wilson M, Dreischulte T. Addressing the Challenge of Polypharmacy. Annual review of pharmacology and toxicology. 2020;60:661-81.
2. Masnoon N, Shakib S, Kalisch-Ellett L, Caughey GE. What is polypharmacy? A systematic review of definitions. BMC geriatrics. 2017;17(1):230.
3. Kaufman G. CONTINUING PROFESSIONAL DEVELOPMENT. Polypharmacy: the challenge for nurses. Nursing Standard. 2016;30(39).
4. Payne RA. The epidemiology of polypharmacy. Clinical medicine. 2016;16(5):465.
5. Al-Amin MM, Zinchenko A, Rana MS, Uddin MMN, Pervin MS. Study on polypharmacy in patients with cardiovascular diseases. Journal of Applied Pharmaceutical Science. 2012;2(12):53.
6. Hajjar ER, Cafiero AC, Hanlon JT. Polypharmacy in elderly patients. The American journal of geriatric pharmacotherapy. 2007;5(4):345-51.
7. Jyrkkä J, Enlund H, Korhonen MJ, Sulkava R, Hartikainen S. Polypharmacy status as an indicator of mortality in an elderly population. Drugs & aging. 2009;26(12):1039-48.
8. Rankin A, Cadogan CA, Patterson SM, Kerse N, Cardwell CR, Bradley MC, et al. Interventions to improve the appropriate use of polypharmacy for older people. Cochrane Database of Systematic Reviews. 2018(9).
9. Gallagher LP. The potential for adverse drug reactions in elderly patients. Applied Nursing Research. 2001;14(4):220-4.
10. R M. To be a Pharmacist in Pakistan. The express tribune. 2013:(col. 2013).
11. Selbst SM, Fein JA, Osterhoudt K, Ho W. Medication errors in a pediatric emergency department. Pediatric emergency care. 1999;15:1-4.
12. Croskerry P, Shapiro M, Campbell S, LeBlanc C, Sinclair D,

Wren P, et al. Profiles in patient safety: medication errors in the emergency department. Academic Emergency Medicine. 2004;11(3):289-99.
13. Spinewine A, Schmader KE, Barber N, Hughes C, Lapane KL, Swine C, et al. Appropriate prescribing in elderly people: how well can it be measured and optimised? The Lancet. 2007;370(9582):173-84.
14. Najjar MF, Abd Aziz N, Hassan Y, Ghazali R, AlRazzaq HAA, Ali Z. Predictors of polypharmacy and adverse drug reactions among geriatric in patients at malaysian hospital. HealthMED. 2010;4(2):273-83.
15. Patel V, Vaidya R, Naik D, Borker P. Irrational drug use in India: a prescription survey from Goa. Journal of postgraduate medicine. 2005;51(1):9.
16. Viktil KK, Blix HS, Moger TA, Reikvam A. Polypharmacy as commonly defined is an indicator of limited value in the assessment of drug- related problems. British journal of clinical pharmacology. 2007;63(2):187-95.
17. Colley CA, Lucas LM. Polypharmacy. Journal of general internal medicine. 1993;8(5):278-83.
18. Gilboy N, Tanabe P, Travers DA. The Emergency Severity Index Version 4: changes to ESI level 1 and pediatric fever criteria. Journal of Emergency Nursing. 2005;31(4):357-62.
19. Abrams WB, Beers MH. Clinical pharmacology in an aging population. Clinical Pharmacology & Therapeutics. 1998;63(3):281-4.
20. Abe T, Tamiya N, Kitahara T, Tokuda Y. Polypharmacy as a risk factor for hospital admission among ambulance-transported old- old patients. Acute medicine & surgery. 2016;3(2):107-13.
21. Salvi F, Rossi L, Lattanzio F, Cherubini A. Is polypharmacy an independent risk factor for adverse outcomes after an emergency department visit? Internal and emergency medicine. 2017;12(2):213-20.
22. Dookeeram D, Bidaisee S, Paul JF, Nunes P, Robertson P, Maharaj VR, et al. Polypharmacy and potential drug–drug interactions in emergency department patients in the Caribbean. International journal of clinical pharmacy. 2017;39(5):1119-27.
23. Fayyaz J, Khursheed M, Mir MU, Khan U. Pattern of emergency department visits by elderly patients: study from a tertiary care hospital, Karachi. BMC geriatrics. 2013;13(1):83.
24. Baumgartner D. Polypharmacy and drug interactions in elderly in-and outpatients: Medizinische Universität; 2009.
25. Pandey K, Khan IA. Drug prescribing patterns in patients visiting the emergency medicine department at a tertiary care teaching hospital: a prospective study. International Journal of Basic & Clinical Pharmacology. 2016;5(1):163-8.
26. Kaur S, Rajagopalan S, Kaur N, Shafiq N, Bhalla A, Pandhi P, et al. Drug utilization study in medical emergency unit of a tertiary care hospital in North India. Emergency medicine international. 2014;2014.
27. Barot PA, Malhotra SD, Rana DA, Patel VJ, Patel KP. Drug utilization in emergency medicine department at a tertiary care teaching hospital: A prospective study. Journal of basic and clinical pharmacy. 2013;4(4):78.
28. Al Balushi K, Al-Shibli S, Al-Zakwani I. Drug utilization patterns in the emergency department: A retrospective study. Journal of basic and clinical pharmacy. 2013;5(1):1.
29. Jung R, MacLaren R. Proton-pump inhibitors for stress ulcer prophylaxis in critically ill patients. Annals of Pharmacotherapy. 2002;36(12):1929-37.
30. Harmeet SR, Nagarani M, Moushumi R. A study on the drug prescribing pattern and use of antimicrobial agents at a tertiary care teaching hospital in eastern Nepal. Indian Journal of pharmacology. 1998;30(3):175.
31. Patidar R, Pichholiya M. Analysis of drugs prescribed in emergency medicine department in a tertiary care teaching hospital in southern Rajasthan. International Journal of Basic & Clinical Pharmacology. 2016;5(6):2496.
32. Sarumathy S. Study of drug utilization pattern in a tertiary care hospital during the inpatient admittance in the emergency care department. 2014.
33. Ahmadi A, Bazargan-Hejazi S, Zadie ZH, Euasobhon P, Ketumarn P, Karbasfrushan A, et al. Pain management in trauma: A review study. Journal of Injury and Violence Research. 2016;8(2):89.
34. DiMaggio CJ, Avraham JB, Lee DC, Frangos SG, Wall SP. The epidemiology of emergency department trauma discharges in the United States. Academic emergency medicine. 2017;24(10):1244-56.
35. Moore BJ, Stocks C, Owens PL. Statistical Brief# 227. Economics. 2012;96(11-12):893-908.