Assessment of Medication usage in Geriatric Wards in a Teaching Hospital

Zakir Khan[1,2,*], Junaid Khan[3], Shaista Zafar[4], Asghar Khan[5], Faiz Ullah Khan[1,6], Sohail Kamran[1], Muhammad Kamran[1], Muhammad Nasir Jamal[1], Bazgha Khan[7]

[1]Department of Pharmacy, Quaid-i-Azam University, Islamabad, PAKISTAN.
[2]Institute of Health Sciences, Department of Pharmacology (Pharmacovigilance), Çukurova University, Adana, TURKEY.
[3]Department of Medicine, Dow Medical College, Karachi, PAKISTAN.
[4]Department of Surgery, Pakistan Institute of Medical Sciences, Islamabad, PAKISTAN.
[5]Department of Medicine, Khyber Teaching Hospital, Peshawar, PAKISTAN.
[6]Department of Pharmacy Administration and Clinical Pharmacy, School of Pharmacy, Health Science Centre, Xi'an Jiao tong University, CHINA.
[7]Department of Pharmacy, Lahore College for Women University, Lahore, PAKISTAN.

ABSTRACT

Introduction: Evaluation of medication usage pattern is crucial for the better patient care, particularly for the geriatric who often have experience with multiple therapy and problems. This study was conducted to investigate the medication usage in elderly patients through a validated World Health Organization (WHO) indicators. **Methods:** A retrospective crossectional and non-interventional study was conducted in the geriatric outpatient departments in a teaching hospital (Islamabad, Pakistan). The patients aged ≥60 years visiting the geriatric medical outpatient and emergency department from September 2018 to April 2019 were selected through random systematic sampling technique. The collected information was evaluated according to the WHO recommendations. **Results:** A total of 3,792 drugs were prescribed (average drug per prescription = 5.2 (Range 4-8) in 720 elderly patients. Out of these, antimicrobials were prescribed in 76.4% ($n = 550$), at least one injectable medication in 63.9% ($n = 460$), generic prescribing in 30% ($n = 1141$) and prescribing from National essential list/hospital formulary in 95.8% ($n = 3634$) of the prescription. A statistically significant difference was observed between prescribing practices and WHO optimal values ($P < 0.001$). The most frequently prescribed class of antimicrobials was cephalosporins (65.3%) and ceftriaxone (41%), ciprofloxacin (13.6%) and cefuroxime (10.7%) were the most commonly used antibiotics. **Conclusion:** The major problems identified in this study were polypharmacy, low generic prescribing, higher usage of antimicrobials and injectable. A special attention is required by the healthcare authorities for the better care of the geriatric patients.

Key words: Geriatrics, Antimicrobials, Audit, Health care, Outpatient, Pakistan.

INTRODUCTION

The Rational Drug Use (RDU) of medications consist of appropriate prescribing, dispensing and utilization of therapeutic agents by the patients for diagnose, treat, mitigation and prevention of disease.[1,2] The most common causes of inappropriate prescribing are polypharmacy, self-medication, inappropriate use of antimicrobials, misuse of injectable and lack of interest or prescribing according to the standard treatment guidelines.[1] According to World Health Organization (WHO) report, more than 50% of all drugs are inappropriately prescribed or dispensed in health care settings.[1,3] Such

practices responsible for the increase adverse effects of therapy, emergence of resistance, healthcare cost.[1,3-5]

The supervision rational use of antimicrobial has environmental, economic and clinical implications.[6] It was noted that at least one antimicrobial is prescribed to 30-50% of all hospitalized patients, that is responsible for more than 30% of hospital budget.[7,8] Similarly, it is estimated that 20-50% of antimicrobials are utilized irrationally that affect quality of health services provided, increase treatment cost and increase chances for Adverse Drug Reactions (ADRs).[7] It was

also reported that antimicrobial utilization is responsible for one quarter (25%) of total ADRs.[7,9] The estimated economic burden of Antimicrobial Resistance (AMR) in outpatients was $400 million to $18.6 billion in United States (US).[10]

The drug use indicators are validated and recommended parameters developed by the WHO and these indicators too much informative, more achievable, less likely to vary over time and place.[3,5] The elderly patients are among the largest consumers of drugs.[11] The periodic assessment about rational utilization of drug usage is crucial for the better health care of this special population. Furthermore, no previous research on this topic was conducted among older patients in selected wards and health care setting. Considering these problems, this study was, aimed to assess the medication usage pattern in geriatric medical outpatient wards and emergency wards using the validated WHO drug use indicators.

MATERIALS AND METHODS

Study design and setting

The study was in accordance with declaration of Helsinki. A retrospective cross-sectional and non-interventional study was conducted to assess the rational usage of medications through WHO indicators. The geriatric Medical Outpatient Department (MOD) and Emergency Ward (ED) of tertiary care teaching hospital at Islamabad, Pakistan were selected during September 01, 2018, to April 30, 2019. The study was conducted ethically and accepted by the Ethical/Institutional review boards from the concerned hospital.

Inclusion criteria

All the patients aged ≥60 years attending the selected departments were included in this study analysis.

Exclusion criteria

The prescriptions of patients that containing missing information, illegible hand writing and only medical supplies like glove and syringe were excluded.

Sample size

The determination of sample size was in accordance with the recommendation of WHO methodology which has been tested in many countries. According to the WHO recommendation a minimum sample size of at least 600 encounters/prescriptions of the patients should be required for conducted a cross-sectional study describing treatment practice.[12] A total of 703 elderly patients (360 from each ward) were selected through random systematic sampling technique for comparison purposes.

Outcome measures

WHO Prescribing indicators

The ideal standards for prescribing care indicators were assumed from former studies.[1,4,5] The prescribing indicators includes;

1. The average drugs prescribed per prescription (optimal value: 1.6-1.8).

2. The percentage of prescriptions containing antimicrobials (optimal value: 20.0-26.8%).

3. The percentage of prescriptions containing injectable (optimal value 13.4-24.1%).

4. The percentage of drugs prescribed by generic name (optimal value: 100%),

5. The percentage of drugs prescribed from the National Essential Medicine List (NEML)/hospital formulary[13] (for which the optimal value is: 100%).

Antimicrobial usage pattern

Antimicrobial utilization pattern was also investigated. World Health Organization/Anatomical Therapeutic Chemical (WHO/ATC) classification system[14] was used for most common classes and combination of antimicrobials.

Statistical analysis

Different statistical tools were applied for the data analysis. Descriptive statistics (like mean, frequency and percentages) and inferential statistics (like student *t*-test) were used to analyze and present data. The analysis was performed by using statistical tool SPSS. v22. The statistically significant p value was considered as less than 0.05. The final data was presented by using tabular format.

RESULTS

Prescribing indicators

Each collected prescription was assessed according to the WHO prescribing indicators methodology. About 3,792 drugs were prescribed to all patients. The average drugs per prescription was 5.2 (Range 4-8). Out of which 550 (76.4%) prescriptions were consisting of antimicrobials and 460 (63.9%) prescription having at least one injectable medication. About 1141 (30%) drugs were prescribed by generic name in all selected prescriptions with the lowest value observed in MOD (23.7%). A total of 3634 (94.2%) drugs prescribed from NEML/formulary (Table 1).

Table 1: WHO drug use indicators in geriatric wards (*n*=720).

Prescribing care indicators	Geriatric wards		Total	P value	WHO Ideal/optimal values
	ED	MOD			
Total number of medicines	1981	1811	3792	-	-
Range of medicines	4-8	4-8	4-8	-	-
Degree of polypharmacy *n* (%)					
Prescriptions of 4 drugs	31 (8.6%)	62 (17.2%)	93 (12.9%)	-	-
Prescriptions of 5 drugs	163 (45.3%)	245 (68%)	408 (56.7%)	-	-
Prescriptions of 6 drugs	127 (35.3%)	35 (9.7%)	162 (22.5%)		-
Prescriptions of 7 drugs	32 (8.9%)	16 (4.5%)	48 (6.6%)	-	-
Prescriptions of 8 drugs	7 (1.9%)	2 (0.5%)	9 (1.2%)	-	-
Prescribing indicators					
Mean drugs per prescription	5.5	5	5.2	0.001	≤ 2 (1.6–1.8)
Antimicrobials prescriptions	323	227	550		
% of prescription with antimicrobials	89.7%	63%	76.4%	0.001	20.0–26.8%
Prescriptions containing injections	264	196	460		
% of prescription with injections	73.3%	54.5%	63.9%	0.001	13.4–24.1%
% of drugs prescribed with generic	35.9% (*n*=711)	23.7% (*n*=430)	30% (*n*=1141)	0.001	100%
% of drugs prescribe from EML and WHO Model List	96.9% (*n*=1920)	94.6% (*n*=1714)	95.8% (*n*=3634)	0.001	100%

Abbreviations: ED- Emergency department; MOD-Medical outpatient department, *n*- Number; % percentage.

Table 2: Details about prescribed antimicrobials in the geriatric wards (*n*=550).

Antimicrobials	ATC code	Frequency (%)		Total *n* (%)
		ED	MOD	
Ceftriaxone	J01DD04	132 (40.9)	94 (41.4)	226 (41)
Ciprofloxacin	J01MA02	33 (10.2)	42 (18.5)	75 (13.6)
Cefuroxime	J01DC02	41 (12.7)	18 (7.9)	59 (10.7)
Amoxicillin and enzyme inhibitor	J01CR02	30 (9.3)	22 (9.7)	52 (9.4)
Cefazolin	J01DB04	27 (8.3)	25 (11)	52 (9.4)
Amoxicillin	J01CA04	9 (2.8)	12 (5.3)	21 (3.8)
Cefoperazone and Sulbactam	J01DD62	18 (5.6)	0 (0)	18 (3.3)
Azithromycin	J01FA10	13 (4)	4 (1.7)	17 (3)
Amikacin	J01GB06	8 (2.5)	0 (0)	8 (1.4)
Metronidazole	J01XD01	4 (1.2)	3 (1.3)	7 (1.3)
Erythromycin	J01FA01	0 (0)	6 (2.6)	6 (1)
Cefradine	J01DB09	4 (1.2)	0 (0)	4 (0.7)
Ampicillin	J01CA01	4 (1.2)	0 (0)	4 (0.7)
Vancomycin	J01XA01	0 (0)	1 (0.4)	1 (0.1)
Total	-	**323 (100)**	**227 (100)**	**550 (100)**

Abbreviations: ATC- Anatomical Therapeutic Chemical classification; ED- Emergency department; MOD -Medical outpatient department; %- percentage.

Pattern of antimicrobials

About 550 (76.45%) geriatric patients received antimicrobials and with higher rate of prescribing in ED (89.7%). Out of these cephalosporin's (*n*=359; 65.3%) was the most commonly prescribed class of antimicrobials. Ceftriaxone was the most frequently prescribed (41%) antimicrobial, followed by Ciprofloxacin (13.6%) and Cefuroxime (10.7%). The combination usage of antimicrobial therapy was also observed (Table 2).

DISCUSSION

It is well known fact that, inappropriate usage of medications responsible for the adverse effects in patients and also an emerging problem throughout the globe.[7,15] This study evaluated the prescribing practices among Pakistani geriatric patients in two wards in a main referral hospital. The geriatric MOD and ED are often the first point of contact for the geriatric population in

any healthcare system. These findings provide useful information about geriatric health care and assess health system of Eastern Mediterranean region country like Pakistan. Research on this topic was rare in Pakistan, therefore, this study provides a baseline data for improving the healthcare system and giving information on managing the therapy for geriatric population at local and international level.

Prescribing indicators

The average drugs per prescription was 5.2. This value was much more higher than the standard WHO value of 1.6-1.8[5] average drugs per prescription. The mean drugs per prescription shows significant difference between geriatric ED and MOD wards (*P*=0.001). Similarly, the studies conducted outside of Pakistan also reported lower value of average number drugs per prescription, for example, 4.8 in Ghana,[16] 3.9 in Afghanistan,[17] 3.1 in Indonesia[11] and 2.34 in Ethiopia.[1] Whereas, the higher number of drugs per prescription were reported in India (5.6).[18] The higher number of drug prescribing in this study may be due to inadequate professionals' competency, lack of training programmes, limited or no availability of clinical pharmacist, incentives to the prescriber, modified nature of system for delivering healthcare, variation in socioeconomic status, morbidity and mortality.[1,4,19]

Antimicrobial percentage per prescription was 76.45% (63-89.7%) which was also higher than WHO standard value (20.0-26.8%).[5] The higher value was observed in geriatric ED (89.7%) as compared to MOD (63%). This value was higher than the studies conducted in other developing countries like India 39.6%,[20] Nigeria 28.1%[21] and Indonesia (23.45%).[11] These results emphasized to prescribe antimicrobials in control. The reasons behind higher antimicrobials prescribing may be due to cultural, patient demands and prescriber belief in antimicrobial prescription.[4]

This study showed that 63.9% of prescriptions comprised of at least one injectable product. These value was higher than studies conducted in Indonesia (0%).[11] Kuwait (9.1%),[22] Egypt (9.9%)[15] and Afghanistan (17%).[17] Possible causes for the over utilization of injections could be (i) physician and patient confidence on injection and their belief for its effectiveness (ii) use of injection in seriously ill patients for prompt action. Injections are very costly formulation that needs qualified and practically proficient personnel for administration. Additionally, contaminated injections can potentially endanger for the health of patients due to possibility of pathogens transmission, like hepatitis, HIV/AIDS and blood-borne diseases.[4,15]

The generic prescribing was at a level of 30% with the lowest value was recorded in MOD (23.7%). Similarly, the recent finding was lower than the studies carried out in Ethiopia (98.7%),[4] Indonesia (98.09%),[11] Timor-Leste (92%)[23] and Nigeria (49.3%).[21] Furthermore, our finding was higher than the studies carried out in Andorra (6%)[24] and Ludhiana India (25%).[25] The brand prescribing results in increase complexity of recalling medications, accessibility and additional meaningless cost.[1,5]

About 95.8% of drugs were prescribed from NEML/formulary with statistically significant p-value between geriatric wards (*P*=0.001). Our result was supported by the studies conducted in Ethiopia (96.6%),[4] Egypt (95.4%),[15] Lao People's Republic (86.2%)[26] and Indonesia (83.07%).[11] However, lower value as compared to this study was also reported in Serbia (70%)[27] and India (66%).[25] WHO issued EML to ensure rational prescribing, like using an optimal drug? these drugs are cost-effective, easily available and accessible as compared to brands of drug.[7,15]

Pattern of antimicrobial

With reference to antimicrobial prescribing, it is evident that antimicrobials was consumed at a greater rate among geriatrics population in the developing countries.[7,11] In this study, different types of antimicrobials were prescribed. The most frequently prescribed class of antimicrobial was cephalosporins (65.3%). At a national level these findings was align with a study conducted in the Bahawalpur, Pakistan.[7] Similarly, the study conducted in Saudia[28] also stated that cephalosporin's was the most regularly prescribed class of antimicrobials in their health care settings.[29]

In case of individual antimicrobial, ceftriaxone (41%) shared the maximum percentage amongst all the antimicrobials. However, a finding of an Indian study reported that cefixime (37.98%) and ceftriaxone (7.97%) were commonly prescribed in their health care settings.[30] It was obvious from the literature that pattern of prescription of antimicrobial is on peak with variation in type and quantity. The trend of multi-drug therapies are developing due to the high possibility of antimicrobial resistance and lack of development of sophisticated antimicrobials.[4,7]

Limitations

First, it was retrospective study therefore any direct evaluation of reasons about non-adherence to the guidelines was not evaluated. Second, this study was conducted in two geriatric wards in a single health care setting. Therefore, the results might not be globalized

to the other wards, local and international health care settings. Third, the causes of irrational use of drugs can't be extracted from these findings. However, these results aid useful information to the growing literature of medication usage and health care system among geriatric patients in developing countries.

CONCLUSION

The recommended WHO drug use indicators were poor in geriatric population. The major identified problems were polypharmacy, low generic prescribing, over-prescribing of antimicrobials and injectable. These parameters require special attention by healthcare authorities for the improve geriatric health care. To identify the fundamental causes of the problem in these settings, a comprehensive research is needed to be done by keeping this study as basis.

ACKNOWLEDGEMENT

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

WHO: World health organization; **RDU:** Rational drug use; **ADRs:** Adverse drug reactions; **AMR:** Antimicrobial resistance; **MOD:** Medical outpatient department; **ED:** Emergency department; **NEML:** National essential medicine list; **ATC:** Anatomical therapeutic chemical.

SUMMARY

The research summaries that the periodic assessment about rational medication use is required for better health care of geriatric patients. WHO recommended core interventions should be executed on trial basis to develop strategies to accomplish long-lasting benefits for the patients and whole community.

REFERENCES

1. Sisay M, Mengistu G, Molla B, Amare F, Gabriel T. Evaluation of rational drug use based on World Health Organization core drug use indicators in selected public hospitals of eastern Ethiopia: A cross sectional study. BMC Health Serv. 2017;17(1):161.

2. Laing R, Hogerzeil H, Ross-Degnan D. Ten recommendations to improve use of medicines in developing countries. Health Policy Plan. 2001;16(1):13-20.

3. Ofori-Asenso R, Brhlikova P, Pollock AM. Prescribing indicators at primary health care centers within the WHO African region: A systematic analysis (1995–2015). BMC Public Health. 2016;16(1):724.

4. Desalegn AA. Assessment of drug use pattern using WHO prescribing indicators at Hawassa University teaching and referral hospital, south Ethiopia: A cross-sectional study. BMC Health Serv. 2013;13(1):170.

5. World Health Organization (WHO). How to investigate drug use in health facilities: Selected drug use indicators. 1993. [cited 2019 April 6]. Available

from: URL: https://apps.who.int/iris/bitstream/handle/10665/60519/WHO_DAP_93.1.pdf.

6. World Health Organization (WHO). Promoting rational use of medicines: core components—WHO policy perspectives on medicines. 2002. [cited 2018 April 8]. Available from: URL: https://apps.who.int/iris/bitstream/handle/10665/67438/WHO_EDM_2002.3.pdf.

7. Atif M, Azeem M, Sarwar MR, *et al*. WHO/INRUD prescribing indicators and prescribing trends of antibiotics in the Accident and Emergency Department of Bahawal Victoria Hospital, Pakistan. Springer Plus. 2016;5(1):1928.

8. Vlahovic-Palcevski V, Morovic M, Palcevski G. Antibiotic utilization at the university hospital after introducing an antibiotic policy. Eur J Clin Pharmacol. 2000;56(1):97-101.

9. Goossens H, Ferech M, Vander SR, Elseviers M, Group EP. Outpatient antibiotic use in Europe and association with resistance: A cross-national database study. Lancet. 2005;365(9459):579-87.

10. Okeke IN, Laxminarayan R, Bhutta ZA, *et al*. Antimicrobial resistance in developing countries. Part I: Recent trends and current status. Lancet Infect Dis. 2005;5(8):481-93.

11. Abdulah R, Insani WN, Putri NE, *et al*. Pattern of medication use in geriatric patients at primary health care facilities in Karawang, Indonesia. Drug Healthc Patient Saf. 2019;11:1.

12. Lwanga SK, Lemeshow S. World health organization sample size determination in health studies: A practical manual. 1991. [cited 2019 April 8]. Available from: URL: https://apps.who.int/iris/handle/10665/40062.

13. Pakistan National Essential Medicine List (NEML). 2016. [cited 2019 April 10]. Available from: URL: http://apps.who.int/medicinedocs/documents/s23102en/s23102en.pdf.

14. World Health Organization (WHO). ATC/DDD methodology. 2018. [cited 2019 April 10]. Available from: URL: https://www.who.int/medicines/regulation/medicines-safety/toolkit_methodology/en/.

15. Akl OA, ElMahalli AA, Elkahky AA, Salem AM. WHO/INRUD drug use indicators at primary healthcare centers in Alexandria, Egypt. J Taibah Univ Med Sci. 2014;9(1):54-64.

16. Bosu W, Ofori-Adjei D. An audit of prescribing practices in health care facilities of the Wassa West district of Ghana. West Afr J Med. 2000;19(4):298-303.

17. Ahmad F, Danish A, Rahmani MR. Prescribing practice at private clinics in jalalabad, Afghanistan. INRUD News. 1995;5:21.

18. Akhtar M, Vohora D, Pillai K, *et al*. Drug prescribing practices in paediatric department of a North Indian university teaching hospital. Asian J Pharm Clin Res. 2012;5(1):146-9.

19. Atif M, Sarwar MR, Azeem M, *et al*. Assessment of WHO/INRUD core drug use indicators in two tertiary care hospitals of Bahawalpur, Punjab, Pakistan. J Pharm Policy Pract. 2016;9(1): 27.

20. Karande S, Sankhe P, Kulkarni M. Patterns of prescription and drug dispensing. Indian J Pediatr. 2005;72(2):117-21.

21. Holloway KA, Henry D. WHO essential medicines policies and use in developing and transitional countries: An analysis of reported policy implementation and medicines use surveys. PLoS Med. 2014;11(9):e1001724.

22. Adebayo E, Hussain N. Pattern of prescription drug use in Nigerian army hospitals. Ann Afr Med. 2010;9(3).

23. Awad A, Al-Saffar N. Evaluation of drug use practices at primary healthcare centers of Kuwait. Eur J Clin Pharmacol. 2010;66(12):1247-55.

24. Stanley CA, Nelson M. Medicines prescribing patterns for the treatment of common diseases at community health centres in 3 districts of Timor-Leste. Int J Pharm. 2012;2(3):439-44.

25. Vallano A, Montane E, Arnau J, *et al*. Medical speciality and pattern of medicines prescription. Eur J Clin Pharmacol. 2004;60(10):725-30.

26. Singh S, Dadhich A, Agarwal A. A study of prescribing practices in a tertiary care hospital using WHO core indicators. Asia Pac J Pharm. 2003;16(1):9-14.

27. Jankovic SM, Vasic LM, Maksimovic MR, Cupurdija VB, Kostic IR, Kovacevic ZN. An analysis of drug use indicators in primary care health facilities operating in the city of Kragujevac. General Practice On-line. 1999.

28. Mohajer KA, Al-Yami SM, Al-Jeraisy MI, Abolfotouh MA. Antibiotic prescribing in a pediatric emergency setting in central Saudi Arabia. Saudi Med J. 2011;32(2):197-8.

29. Erbay A, Çolpan A, Bodur H, Çevik MA, Samore MH, Ergönül Ö. Evaluation of antibiotic use in a hospital with an antibiotic restriction policy. J Antimicrob Agents. 2003;21(4):308-12.

30. Khan FA, Nizamuddin S, Salman MT. Patterns of prescription of antimicrobial agents in the Department of Otorhinolaryngology in a tertiary care teaching hospital. Afr J Pharm Pharmacol. 2011;5(14):1732-8.