ASSESSMENT OF HEALTH CARE PROVIDERS ATTITUDES AND PRACTICES CONCERNING MEDICATION ERRORS IN SAUDI ARABIA

UNDER PEER REVIEW

ABSTRACT

Introduction: Medication errors are one of the leading causes of patients' morbidity and mortality in health care settings

Objective: Assess awareness, attitude and practices of health care providers toward medication errors in Saudi Arabia.

Methodology: Cross-sectional study design was used in the period of three months, from 01 July to 30th November, 2023. participants were selected randomly. 329 health care providers including physicians, pharmacists and nurses working in different hospitals, primary health care centers and private clinics in different regions of Saudi Arabia, participated in the study. Dat was analyzed using Microsoft excel program.

Results: The mean score of good knowledge about medication errors among respondents was 77%, average score of good attitudes toward medication errors among respondents was 72%. 74% of respondents were willing to inform supervisor if they had noticed a medication error. The causes for not reporting medication error were fear of any legal consequences (41%), self-management (23%), busy with work (15%) and did not know whom to inform (21%). Less than half (48%) of study subjects had previously filled an adverse drug reaction form.

Conclusion: Medication errors play a significant role role in the quality of health of our patients. Health care providers in Saudi Arabia have good knowledge and positive attitude toward medication errors. However, medication error reporting is still not sufficiently done.

INTRODUCTION

Medication errors are one of the leading causes of patients' morbidity and mortality in health care settings and considered to be common. Medication errors can lead to unnecessary harm and pain to the patients and may lead to death in some cases. The Agency for Healthcare Research and Quality (AHRQ) defines the medication error (ME) as "an error (of commission or omission) at any step in the pathway that begins with prescription of medication by the clinician and ends when the patient actually receives the medication." [1]"In the United States, medication errors, have been reported to be responsible for 7,000 injuries to patients each year. Also, in United Kingdom, a similar incidence and consequences was reported". [2]

"Medication errors include many types of errors, can occur at any stage of the medication use pathway. However, prescribing errors are the most common subtype of MEs in all healthcare settings". [3]"The percentage of prescribing errors reported ranged from 29% to 56% of all reported MEs in adults". [3] "Previous systematic review of 65 studies reported that prescribing errors accounted for 50% of hospital admissions and 7% of medication orders". [4]

Prescribing error is defined in different ways in previous studies. The definition developed by Dean *et al.* (2000) is the most validated definitions. "He defined prescribing error as the error which occur when there is unintentional, significant reduction in the probability of treatment being timely and effective; or increase in the risk of harm when compared to generally accepted practice as a result of prescribing decision or prescription writing process". [5] It can also be further defined as "a failure in the prescription writing process by a physician that leads to a wrong instruction about one or more of the normal constituents of a prescription." [15]"The normal constituents of the

UNDER PEER REVIEW

prescription include the identity of the recipient, the identity of the drug, dose, route, timing, formulation, frequency and duration of administration". [6]

"The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP), which includes 27 national organizations, suggests that MEs are preventable". [7] However, the prevention of medication errors can be challenging, particularly in inpatient settings as the prescription orders are more prone to errors [17] which may result in increased patient care costs due to prolonged length of hospital stay and an increase in the incidence of mortality. [8]

OBJECTIVES OF THE STUDY

- To assess awareness of health care providers about medication errors
- To assess attitude and opinions of health care providers toward medication errors
- To evaluate practices of health care providers toward medication error reporting

LITERATURE REVIEW

"Medication errors can be defined by different classification systems. So, estimating the prevalence of medication errors is difficult. Rates can vary depending on the category used (e.g., patient, prescription or a specific medication). The challenge is compounded by the availability and use of incident reporting systems and variations in health care system organization". [9]

"These issues are reflected in the widely varying prevalence rates of error reported in different regions of the world". [10]"For example, a study from United Kingdom found that 12% of all primary care patients may be affected by a monitoring or prescribing error over the course of a year, and these errors increasing to 38% in those 75 years and older and 30% in patients receiving polypharmacy of five or more drugs during a one-year period. Overall, it is estimated that 5% of prescriptions had prescribing errors". [11]"Another Swedish study found a medication error rate of 42%. However, two-thirds were related to a failure to state the diagnosis on prescriptions and an incorrect dose resulted in only 1% of errors". [12]"A previous study in Saudi Arabia reported that about one-fifth of primary care prescriptions contained errors, but only a small percent was

UNDER PEER REVIEW

considered serious”. [13]“These examples show that medication errors are a global issue not limited to one country. One systematic review conducted with an alternative approach to assessing error rates based on classifying medication usage processes. The review found error dispensing errors accounted for 3% of the errors and failure to review repeat medications at least once at every sixth request in 72% of cases. Problems were also noted at the interface between primary care and secondary care. Recommendation to outpatient to general practitioners were associated with a 77% error rate and discrepancies in medication discharge following hospitalization affected 43% to 60% of items indicating mistakes during transitions of care”. [14]

“Undesirable outcomes include lack of efficacy, adverse drug reactions, drug-drug interactions, suboptimal patient adherence and poor quality of life and patient experience. In turn, these may have consequences on health and economically, including the preventable medication-related hospital admissions, increased use of health services, and death”. [15]“In some countries, it has been estimated that approximately 6-7% of hospital admissions appear to be medication related, 60% of these considered avoidable and thus, potentially due to errors. The problem is likely more pronounced in the elderly, because of multiple risk factors including polypharmacy”. [16]

“Several studies have examined factors associated with medication errors. The Commonwealth Fund International Health Policy survey compared factors associated with patient-reported medication errors across seven countries. In 11% of patients experiencing a medication error, risk factors included cost-related barriers to medical services or medicines, poor coordination of care, multimorbidity and hospitalization”. [17]“Other studies have found that medication errors mostly occur with increasing number of medications, childhood and older age, and specific medications and medications for certain disease states (e.g., immunosuppression, infections, cardiovascular, musculoskeletal, oncology, dermatology, ophthalmology and otolaryngologic conditions,)”[18] Table 1 summarizes some of the key factors associated with medication errors

UNDER PEER REVIEW

Table 1. Factors that are associated with the occurrence of medication errors[11,19]

Category	Factors
Health care professionals associated factors	Inadequate drug knowledge and experience Inadequate knowledge of the patient Lack of therapeutic training Inadequate perception of risk Overworked or fatigued health care professionals Physical and emotional health issues Poor communication between health care professional and with patients
Patient associated factors	Clinical case complexity, including multiple health conditions, polypharmacy and high-risk medications Patient characteristics (e.g., personality, literacy and language barriers)
Work environment related factors	Distractions and interruptions Workload and time pressures Lack of standardized protocols and procedures Insufficient resources Issues with the physical work environment (e.g., lighting, temperature and ventilation)
Medications related factors	Naming Labelling and packaging
Tasks related factors	Repetitive systems for ordering, processing and authorization Patient monitoring (dependent on practice, patient, other health care settings, prescriber)
Computerized information systems	Lack of accuracy of patient records Difficult processes for generating first prescriptions (e.g. drug pick lists, default dose regimens and missed alerts) Difficult processes for generating correct repeat prescriptions Inadequate design that allows for human error
Primary-secondary care interface	Limited quality of communication with secondary care Little justification of secondary care recommendations

UNDER PEER REVIEW

MATERIALS AND METHODS

Study design and duration

This was a cross-sectional study. The study was conducted within three months, 01 July to 30 November 2023.

Study population

A random sample of 329 health care providers including physicians, pharmacists and nurses working in different hospitals, primary health care centers and private clinics in different regions of Saudi Arabia. The inclusion criteria were: licensed and currently practicing healthcare provider, provided informed consent, agree to participate in the study. The study excluded subjects who were unwilling to participate and did not agree to provide consent. Participants who gave incomplete responses were also excluded from the analysis.

Data Collection tool

Health care providers were approached and requested to fill the structured closed ended self-administered questionnaire which was developed from literature review to collect relevant information (attached in the appendix 1)

The questionnaire included four parts:

- First part included questions to obtain demographic characteristics of study subjects.
- Second part included questions pertain to the fundamental knowledge regarding medication errors and interventions used in prevention and management of medication errors.
- Third part included questions pertaining to practices of study subjects toward reporting system for medication errors.
- Fourth part included questions pertaining to attitudes and opinions of study subjects toward medication errors.

All participants were asked to provide complete answers to the questions.

UNDER PEER REVIEW

3.5. Data processing and Statistical Analysis

All data were categorized, tabulated and analyzed using Microsoft excel program. Frequency and percentages were calculated for each variable and presented as figures (bar graph and pie chart).

RESULTS

Demographic characteristics of study subjects

Among the respondents, 61% were in the age group (20-30 years) and 22% between 31 and 40 years. (Demographic characteristics of study subjects represented in figure 1), 67% of study respondents was females, according to professional category; pharmacists represented 53%, nurses represented 16% and physician represented 19%. Majority of the study respondents (56%) had less than 5 years of practice, 58% work in hospitals and 17% work in private clinics.

knowledge of study subjects about medication errors and interventions used to prevent and manage medication errors

When the participants were asked if they understood the term medication errors; 81% responded yes,

When asked if they understood the relevance of the term medication error; 79% responded yes, 76% had good knowledge of the categories of medication errors, figure 2 represent details of knowledge of study subjects about medication errors and interventions used to prevent and manage medication errors. 76% of study subjects were aware of the various interventions to prevent medication errors and 73% were aware of how to proceed if medication errors occur. The mean score of good knowledge about medication errors among respondents was 77%.

Attitudes of study subjects toward medication errors

When the respondents were asked ‘’Do you recommend the presence of medication error guidelines in hospitals-clinics and care units is important”; 65% answered with yes. When asked ‘Do you recommend integrated approach toward training and education about the medication error in medical institute and the general public?; 81% answered

UNDER PEER REVIEW

with yes. When asked 'Do you think your institute should form an independent body for reporting medication errors?'; 64% answered with yes, (table 4 represent attitudes of study subjects toward medication errors. When asked 'Should proper recommendations be instituted in the areas of organization, legislation, regulation and resources to improve surveillance and safe rationale use of drugs?'; 78% answered with yes. When asked 'Do you recommend standardized implementation of proper maintenance of data regarding medication error and rational use?'; 77% answered yes. Overall, the average score of positive attitudes toward medication errors among respondents was 72%.

Practices of study subjects toward reporting system for medication errors.

The questionnaire assessed participant's responses to reporting medication errors. 74% of the respondents said that they would inform supervisors pf medication errors when they occurred. 15% will said that they will try to solve the problem, while 6% responded that they will not inform any body and 5% will not take any corrective action if they noticed a medication error. figure 3 represents practices of study subjects toward reporting medication errors.

The causes for ignoring medication errors were fear of any legal consequences (41%), self-management (23%), busy with work (15%) and did not know whom to inform (21%). Less than half (48%) of study subjects had previously filled an adverse drug reaction form, 53% previously received specific training in the area of medication error management.

Opinions of study participants toward what they believe to be factors that are responsible for medication errors

67% of study subjects think that drug packaging is part of the reasons for medication error, 56% think that drug information in the labels was not clear enough and might lead to medication error, (Table 3), 65% think that pediatric population medication error is particularly more common, 59% think that patient should receive counseling to avoid medication error or irrational use of medications by pharmacists.

Participants sources of information on medication errors

UNDER PEER REVIEW

Participants were requested to mention their sources of information on different causes of medication errors. Less that half of the participants responded that they got information on drug-drug interactions from Books (45%). Others stated that their sources of information was mobile applications (25%). These were the main source of information about drug-drug interaction. Similarly, Books (43%) and mobile applications (25%) were the main source of information about drug dosing among study subjects, Figure 4.

UNDER PEER REVIEW

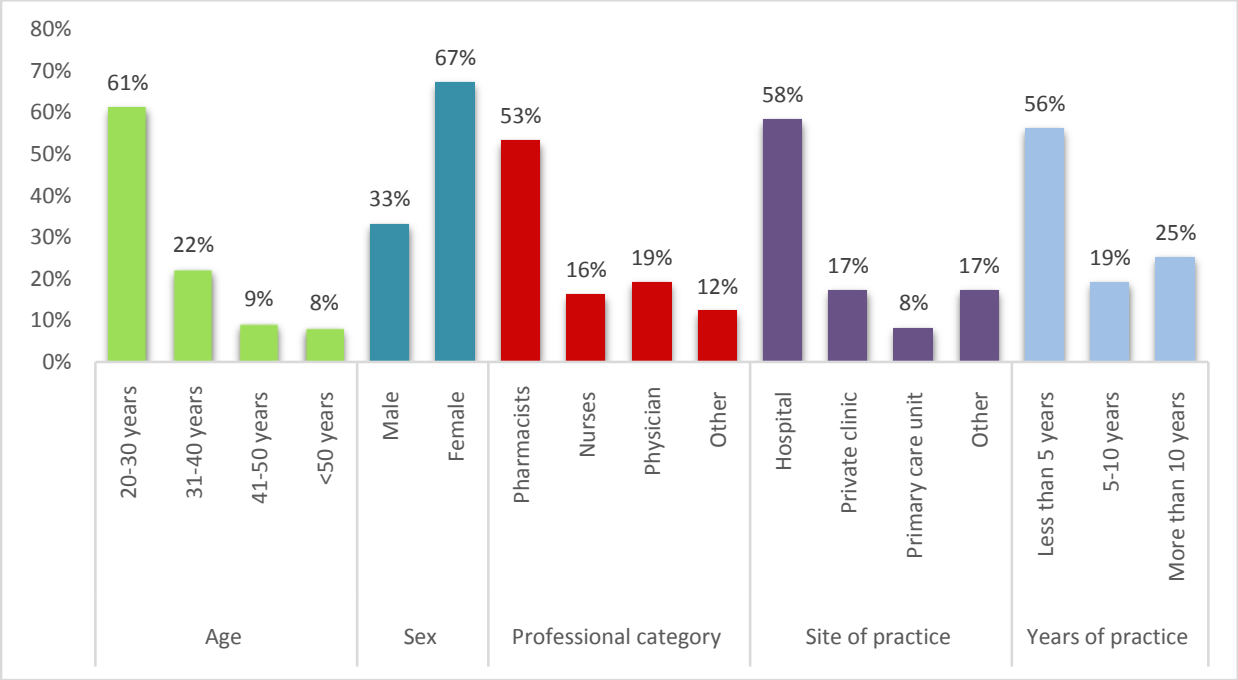

Figure 1. Demographic characteristics of study subjects

UNDER PEER R

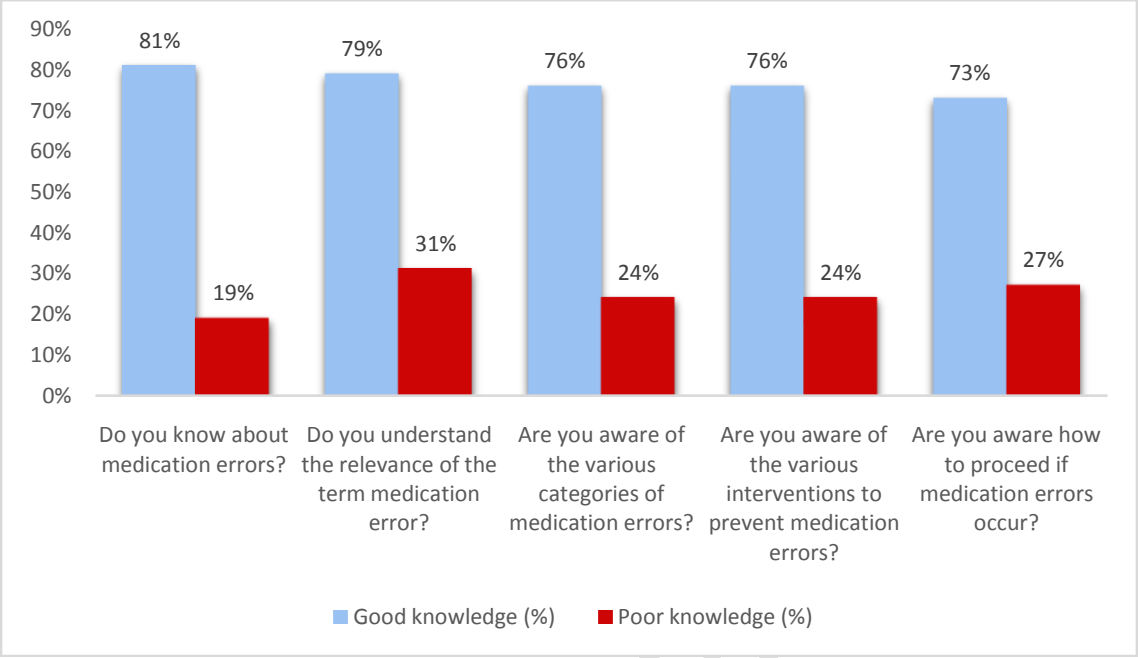

Figure 2.a. knowledge of study subjects about medication errors and interventions used to prevent and manage medication errors

UNDER PEER RE

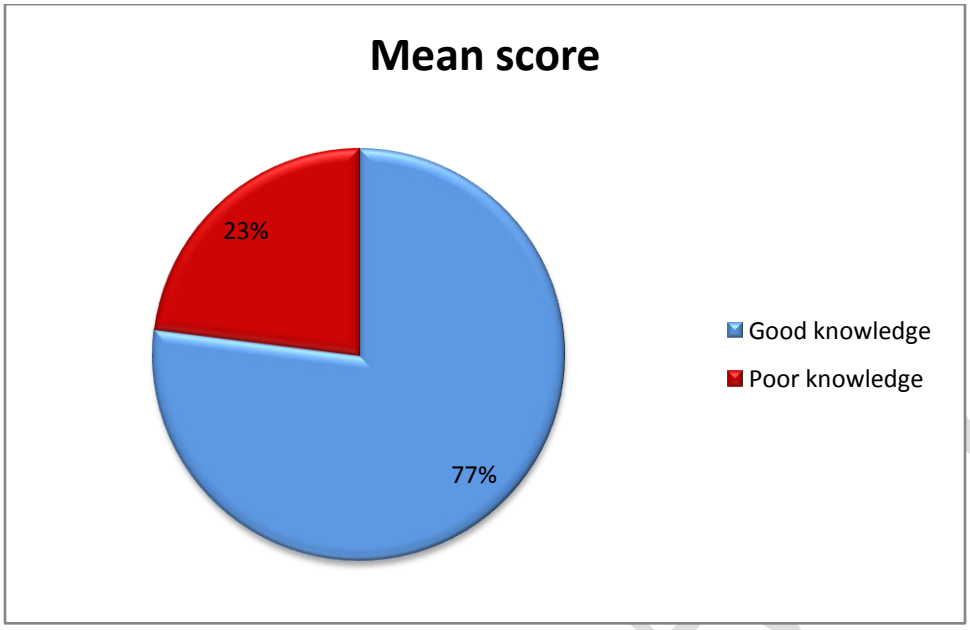

Figure 2.b. Average score of knowledge of study subjects about medication errors and interventions used to prevent and manage medication errors

UNDER PEER REVIEW

Table 2. Attitudes of study subjects toward medication errors

Questionnaire items	Positive attitude		Negative attitude	
	n	%	n	%
Do you recommend the presence of medication error guidelines in hospitals-clinics and care units is important?	212	65%	117	35%
Do you recommend integrated approach toward training and education about the medication error in medical institute and the general public?	260	81%	69	19%
Do you think your institute should form an independent body for reporting medication errors?	212	64%	117	36%
Should proper recommendations to be instituted in the areas of organization, legislation, regulation and resources to improve surveillance and safe rationale use of drugs?	252	78%	77	22%
Do you recommend standardized implementation of proper maintenance of data regarding medication error and rational use?	248	77%	81	28%
Mean score	237	72%	92	28%

UNDER REVIEW

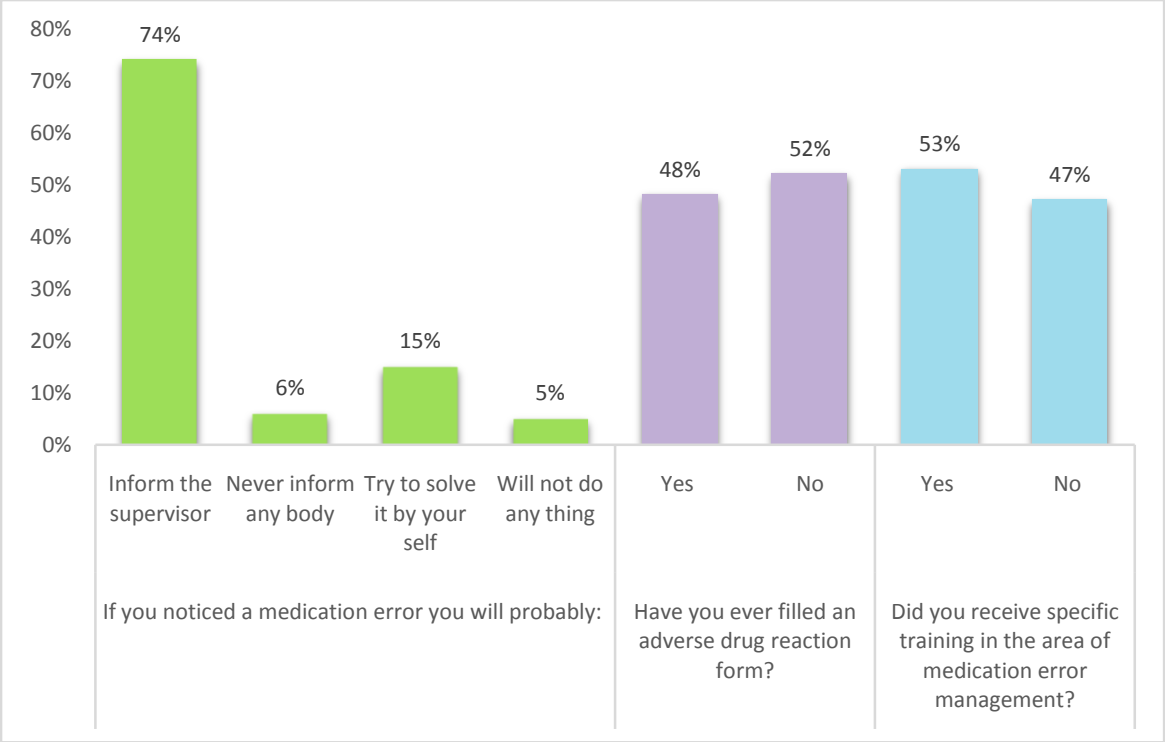

Figure 3.a. Practices of study subjects toward reporting system for medication errors.

UNDER PEER

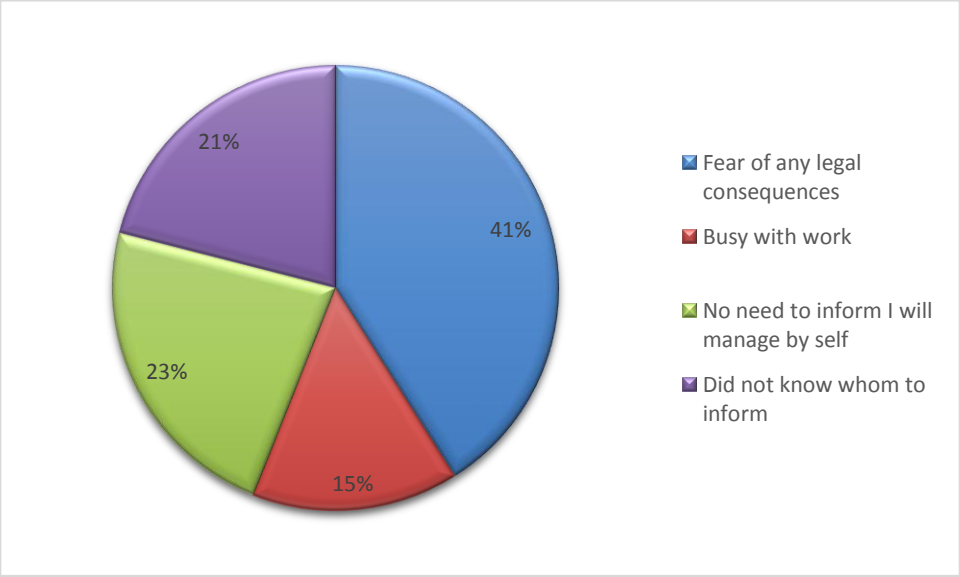

Figure 3.b. Causes of ignoring medication error

UNDER PEER REVIEW

Table 3. Opinions of study subjects toward medication errors

	Categories	n	%
Do you think the drug packaging is part of the reason for medication error?	Yes	222	67%
	No	107	33%
Do you think the drug information in the labels was not clear enough and might lead to medication error?	Yes	184	56%
	No	145	44%
Do you think pediatric population medication error is particularly more common?	Yes	212	65%
	No	117	35%
You think the patient should receive counseling to avoid medication error or irrational use by:	The pharmacist	192	59%
	The physician	40	12%
	The nurse	23	7%
	Any of the health care providing team member	58	18%
	No need for counseling	13	4%

UNDER PEER REVIEW

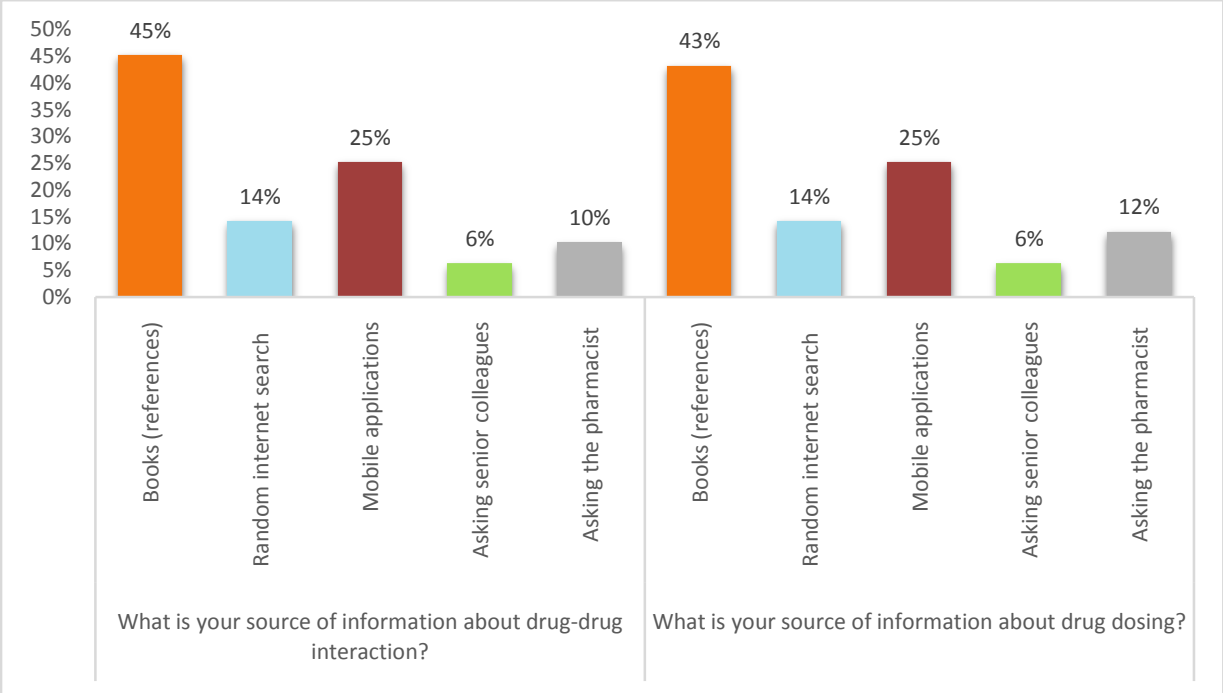

Figure 4. Participants' sources of information on medication errors

UNDER PEER R

DISCUSSION

Medical allegations predominately occur from mistakes made by healthcare professionals including physicians, pharmacists, and nurses.[20] Analyzing awareness and practice of health care professionals may be used to prevent future errors and improve the performance of healthcare professionals. A previous study conducted by Das *et al*.[21] reported that medication errors can result in malpractice claims in 13–25% of cases which occur due to mistakes and lapses of memory. Until now, there's a lack of knowledge and incorrect perception among healthcare providers toward medication errors in healthcare institutions. Tobaiqy and Stewart [22] found that 57% of health care professionals observed 51 errors, and these errors caused patient harm in some cases in Saudi Arabia. Key barriers to reporting medication errors were lack of awareness of reporting policy, unavailability of the reporting forms, workload, and time constraints. We conducted the present study to evaluate awareness, attitude and practice of health care providers toward medication errors.

The results of the present study revealed that 77% respondents had good basic knowledge regarding medication errors. This figures suggests that health-care professionals in Saudi Arabia are aware of medication errors. This result is consistent with a previous study conducted in India that showed that 72% of health care professionals had average or above average basic knowledge of medication errors. [23]

There are several factors which can enhance medication error reporting, e.g., health-care team should be interested in patient safety; providing timely feedback and follow up actions and improvements to reduce future errors; encouraging reporting of near misses; and having a multidisciplinary approach to reporting, etc.[24]Although medication error reporting systems are available and established, they do not meet the objective of reducing medication errors. There is a challenge of eliminating the under reporting of errors even after the establishment of reporting system.[25] 27% of our study respondents were not aware of what to do and how to report if medication errors occur. This result is consistent with a previous study conducted in Saudi Arabia that showed that 52% of health care professionals were not aware of how and where to report errors. [26] Additionally, another study demonstrated a poor knowledgeand awareness of

UNDER PEER REVIEW

pharmacovigilance and adverse drugreactions (ADRs) reporting practice among healthcareprofessionals in hospitals.[27] The main factors reported by study subjects as reasons for not reporting medicatoion errors were fear of legal consequences (41%), did not know whom to inform (21%), self-management (23%) and high work load (15%). Consistently, the factors were associated withpoor practice about error reporting systems. in other studies not reporting errors was due to fear of adverse consequences, tarnishing of reputation, and work overload.[28]

Aljadhey*et al*.[29] conducted a study in Saudi Arabia that showed that medication safety practices were not implemented in many Saudi Arabia hospitals. Only 30% of the 78 hospitals surveyed had a medication safety committee, and 9% of hospitals had a medication safety officer. Additionally, a study in tertiary care hospital in Riyadh showed that medication errors were under- reported. [30]

In our study, some of our participants had poor practices of medication error reporting, Our results revealed a better attitutde towards medication errors when compared to some other studies in other countries. Several studies from different regions including France, Italy, Sweden and United Kingdom showed poor practice of reporting medication errors among health care practitioners, and a poor knowledge of pharmacovigilance and pharmacovigilance centers in hospitals.[31]

When our study subjects were asked about the causes of not reporting medication errors, 21% responded that they did not know whom to inform. This result is similar to some other studies. In the European Union, many healthcare professionals did not know how to report an Adverse Drug Reaction (ADRs). In addition, about 40% of the respondents were not aware of the existence of the national reporting system in Malaysia, and 71% of the healthcare professionals did not have knowledge of the reporting procedure in China.[32]

About 53% of health care providers who participated in our study had received previous training in the area of medication error management which indicated the need for more

UNDER PEER REVIEW

efforts by the Food and Drugs Authority in organizing various training sessions and workshops for health care providers on Pharmacovigilance. Duarte et al, proposed a new educational measures in 2015 which includes hands-on involvement with real cases, thereby placing ADR reporting closer to the daily routine activities of health care teams. [33]

78% of study subjects recommend medication errors reporting policies and guidelines to be instituted in the areas of organization, legislation, regulation and resources to improve surveillance and safe rationale use of drugs. 77% recommended standardized implementation of proper maintenance of data regarding medication error and rational use of medications. Another study conducted by Al-hazmi in Saudi Arabia revealed that more than half (67%) of health professionals stated that reporting of adverse drug reactions should be made compulsory.[55] In Cyprus, in a study conducted by Toklu et al. Showed that an even greater proportion of pharmacists (80%) supported mandatory ADR reporting and proper recommendations to be instituted in every healthcare setting. They also supported the use of appropriate legislation, regulation and resources control to improve surveillance and rationale use of drugs. [34]

In our study, 81% of the study subjects recommended an integrated approach to the training and education of healthcare workers with regards to medication errors in medical institutions and the general public. This was similar to results of a Ugandan study by Kiguba, et al in 2014, where majority of healthcare professionals advocated for sensitization, training and continuous education on pharmacovigilance. [35]

LIMITATION OF THE STUDY

This study might have been affected by recall bias as some of the health care providers ay not recollect accurately if they had encountered medication errors or filled an adverse drug reaction form. Some respondents might have given false information in order to look good or be perceived as being professional. Additionally, the small sample size may limit generalization of the results

UNDER PEER REVIEW

CONCLUSION AND RECOMMENDATIONS

In conclusion, medication errors play a major role in the quality of health of our patients. Health care providers in Saudi Arabia have good knowledge and positive attitude toward medication errors. However, medication error reporting was still not sufficiently done by healthcare proviers. It is well known that medication error reporting is part of the safety practices, but it is still under-implemented. Efforts are required at the national level to increase compliance to efficient reporting of medication errors. Training programs for health care providers regarding the medication error reporting and Pharmacovigilance are needed

Ethical Approval and Consent:

Only the health care providers who consented to participate in the study were enrolled. They were assured that data obtained will be treated as strictly confidential. The study was conducted in compliance with ethical principles of the Helsinki declaration.

UNDER PEER REVIEW

REFERENCES:

1. The Agency for Healthcare Research and Quality (AHRQ). Medication Errors. Available from: https://psnet.ahrq.gov/ primers/primer/23/medication-errors.
2. Ghaleb M, Barber N, Franklin B. Systematic review of medication errors in pediatric patients. Ann Pharmacother2006;40:1766–76.
3. Bates DW, Cullen DJ, Laird N. Incidence of adverse drug events and potential adverse drug events: implications for prevention. JAMA 1995;274:29–34.
4. Lewis PJ, Dornan T, Taylor D. Prevalence, incidence and nature of prescribing errors in hospital inpatients. Drug Safety 2009;320:379–89.
5. Dean B, Barber N, Schachter M. What is a prescribing error? Qual Health Care 2000;9:232–7.
6. Jeffrey KA. Medication errors: definitions and classification. Br J Clin Pharmacol2009;67:599–604.
7. NCC-MERP. The National Coordinating Council for Medication Error Reporting and Prevention: Moving into the Second Decade website: NCC MERP; 2010. Available from: http://www.nccmerp.org/sites/default/files/fifteen_year_report.pdf.
8. Eltaib L, Alzain AA. Targeting the omicron variant of SARS-CoV-2 with phytochemicals from Saudi medicinal plants: molecular docking combined with molecular dynamics investigations. J Biomol Struct Dyn. 2022;0: 1–13. pmid:36369836.
9. Inch J, Watson MC, Anakwe-Umeh S. Patient versus healthcare professional spontaneous adverse drug reaction reporting: a systematic review. Drug Saf. 2012;35:807-18.
10. GandhiTK, Weingart SN, Borus J, Seger AC, Peterson J, Burdick E., et al. Adverse drug events in ambulatory care. N Engl J Med. 2003;348:1556-64.
11. Avery A, Barber N, Ghaleb M, Franklin BD, Armstrong S, Crowe S, et al. Investigating the prevalence and causes of prescribing errors in general practice: the PRACtICe study. London: General Medical Council; 2012.
12. Claesson CB, Burman K, Nilsson JLG, Vinge E. Prescription errors detected by Swedish pharmacists. Int J Pharm Pract. 1995;3:151-6.
13. Khoja T, Neyaz Y, Qureshi NA, Magzoub MA, Haycox A, Walley T. Medication errors in primary care in Riyadh City, Saudi Arabia. East Mediterr Health J. 2011;17:156-9.
14. Garfield S, Barber N, Walley P, Willson A, Eliasson L. Quality of medication use in primary care - mapping the problem, working to a solution: a systematic review of the literature. BMC Med. 2009;7:50.
15. Lina Eltaib1* and Hadir A. Alshammari2. Pattern of Microbial Infections during the First 72 Hours of Neonate Life at Khafji General Hospital Neonatal Intensive

UNDER PEER REVIEW

Care Unit . Asian Journal of Pharmaceutical Research and Health Care, Vol 12(4), 189-197, 2020 DOI: 10.18311/ajprhc/2020/25739

16. L. Eltaib, S.A. Alanazi, S.E. Ali, Practices and attitudes concerning expiration date, unused, and expired medication disposal, Int J Med Sci Public Health, 9 (7) (2020), pp. 431-438
17. Lu CY, Roughead E. Determinants of patient-reported medication errors: a comparison among seven countries. Int J Clin Pract. 2011;65:733-40.
18. Guthrie B, McCowan C, Davey P, Simpson CR, Dreischulte T, Barnett K. High risk prescribing in primary care patients particularly vulnerable to adverse drug events: cross sectional population database analysis in Scottish general practice. BMJ. 2011;342:d3514.
19. Slight SP, Howard R, Ghaleb M, Barber N, Franklin BD, Avery AJ. The causes of prescribing errors in English general practices: a qualitative study. Br J Gen Pract. 2013;63:e713-20.
20. Ruhl DS, Cable BB, Martell DW. Medication associated with hearing loss: 25 years of medical malpractice cases in the United States. Otolaryngol Head Neck Surg 2014;151:431‑ 7.
21. L. Eltaib & A.A. Alzain (2023) Discovery of dual-target natural inhibitors of meprins α and β metalloproteases for inflammation regulation: pharmacophore modelling, molecular docking, ADME prediction, and molecular dynamics studies, SAR and QSAR in Environmental Research, 34:11, 899-921, DOI: 10.1080/1062936X.2023.2277425
22. Tobaiqy M, Stewart D. Exploring health professionals' experiences of medication errors in Saudi Arabia. Int J Clin Pharm 2013;35:542‑ 5.
23. Sewal RK, Singh PK, Prakash A, Kumar B, Medhi B. A prospective study to evaluate awareness about medication errors amongst health-care personnel representing North, East, West Regions of India. *Int J Appl Basic Med Res*. 2014;4(1):43-6.
24. Force MV, Deering L, Hubbe J, Andersen M, Hagemann B, Cooper-Hahn M, et al. Effective strategies to increase reporting of medication errors in hospitals. J Nurs Adm. 2006;36:34–41.
25. Leape LL. Error in medicine. JAMA. 1994;272:1851–7.
26. Abdel-Latif MM. Knowledge of healthcare professionals about medication errors in hospitals. *J Basic Clin Pharm*. 2016;7(3):87-92.
27. Abdel‑ Latif MM, Abdel‑ Wahab BA. Knowledge and awareness of adverse drug reactions and pharmacovigilance practices among healthcare professionals in

UNDER PEER REVIEW

Al‐ Madinah Al‐ Munawwarah, Kingdom of Saudi Arabia. Saudi Pharm J 2015;23:154‐ 61.
28. Uribe CL, Schweikhart SB, Pathak DS, Dow M, Marsh GB. Perceived barriers to medical-error reporting: An exploratory investigation. J Healthc Manag. 2002;47:263–79.
29. Aljadhey H, Alhusan A, Alburikan K, Adam M, Murray MD, Bates DW. Medication safety practices in hospitals: A national survey in Saudi Arabia. Saudi Pharm J 2013;21:159‐ 64.
30. Alshaikh M, Mayet A, Aljadhey H. Medication error reporting in a university teaching hospital in Saudi Arabia. J Patient Saf2013;9:145‐ 9.
31. Graille V, Lapeyre‐ Mestre M, Montastruc JL. Drug vigilance: Opinion survey among residents of a university hospital. Therapie1994;49:451‐ 4.
32. Eltaib, L. and Mujtaba, M. A. (2021) "Stability Testing of Amoxicillin Nano-suspension as Promising Tool for Drug Delivery System", Journal of Pharmaceutical Research International, 33(60B), pp. 2481–2488. doi: 10.9734/jpri/2021/v33i60B34903.
33. Duarte, M., Ferreira, P., Cavaco, A., & Paula, A. (2015). Community pharmacists' attitudes towards adverse drug reaction reporting and their knowledge of the new pharmacovigilance legislation in the southern region of Portugal: a mixed methods study. *Drugs & Therapy Perspectives*.
34. Al-hazmi, N., & Il, N. (2013). Attitude and Awareness of Adverse Drug Reaction Reporting by Health Professionals in Seven Hospitals in the Holy City of Makkah , Kingdom of Saudi Arabia, *3*(3).
35. Toklu, H. Z., Soyalan, M., Gültekin, O., Özpolat, M., Aydın, M. D., Günay, A. Ç., &Özkum, D. (2016). The Knowledge and Attitude of the Healthcare Professionals towards Pharmacovigilance and Adverse Drug Reaction Reporting in Northern, *4*(1), 1–7.
36. Kiguba, R., Karamagi, C., Waako, P., Ndagije, H. B., & Bird, S. M. (2014). Recognition and reporting of suspected adverse drug reactions by surveyed healthcare professionals in Uganda: key determinants, 1–11.

UNDER PEER REVIEW