



Role of Healthcare Professionals in Yemen Toward Reducing Drug Related Problems. A cross-sectional Analysis

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ABSTRACT

This study assessed the understanding of dentists regarding the appropriate prescription of aminoglycosides and macrolides in Aden, Yemen. We carried out a cross-sectional study, enlisting a total of 150 licensed dentists from both public and commercial dental clinics. The data was gathered throughout the period of October to December 2023. Out of the 150 participants, 57% were men, and 47% had less than 5 years of experience. According to the poll, a large majority of dentists, 72%, use macrolides on a regular basis in their practice. In addition, azithromycin was the most commonly prescribed macrolide, accounting for 18% of total prescriptions. By comparison, aminoglycosides account for only 21% of all prescriptions, and neomycin is quite rare. 13% of persons with penicillin allergies were administered streptomycin, underscoring the necessity for safer alternatives. Dentists typically follow the prescribed time frame of 3-5 days to ensure the appropriate administration of macrolides. The findings indicated that individuals should get instruction on the proper utilization of aminoglycosides and macrolides, be provided with comprehensive information to enable them to make well-informed decisions on their treatment alternatives, and be obligated to adhere to guidelines grounded in empirical evidence from real-life scenarios. Effective antibiotic stewardship practices in Yemeni dentistry require collaboration among dentists, microbiologists, and public health officials. It is recommended to undertake additional research to expand the study's scope and include observational studies and interviews with dentists.

Keywords: Aminoglycosides, Macrolides, Prevalence, Dentists, Yemen.

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INTRODUCTION

A drug-related problem is defined as any event or circumstance involving drug therapy that actually or potentially interferes with achieving desired health outcomes [1]. It is also described as a condition or symptom that arises due to drug therapy [2]. DRPs represent a significant barrier to effective treatment and can adversely impact patient health. Their management is further complicated by systemic issues such as poor governance, rapid population growth, under-resourced health systems, and the lack of comprehensive primary healthcare research and assessment [3]. These challenges highlight the need for focused efforts to assess and mitigate DRPs, particularly within primary healthcare settings.

The negative implications of DRPs on health outcomes are profound. According to the National Coordinating Council for Medication Error Reporting and Prevention, DRPs contribute to increased hospital admissions, prolonged hospital stays, reduced patient satisfaction, and a marked rise in the cost of care, especially for cancer patients [4]. These challenges underscore the importance of preventing DRPs, which not only improves clinical outcomes for patients but also alleviates the financial strain associated with extended or complex treatments [5, 6]. By addressing these issues, healthcare systems can achieve better resource allocation while ensuring improved patient safety and satisfaction.

Healthcare professionals, including physicians, pharmacists, and nurses, play a pivotal role in the prevention and management of DRPs [7]. Studies have identified disparities in HCPs' knowledge and practices regarding DRPs across different healthcare systems. For example, a study conducted in Saudi Arabia revealed significant gaps in HCPs' knowledge, attitudes, and practices regarding adverse drug reactions (ADRs) and DRP reporting [8]. In contrast, research conducted in the United Kingdom demonstrated that HCPs exhibited a higher level of awareness and more favorable attitudes towards

addressing DRPs and medication errors [9]. These findings emphasize the need for tailored interventions to enhance HCP capabilities, particularly in resource-constrained settings.

Building on previously published data [10], this study investigates the awareness and practices of HCPs regarding DRPs within the Yemeni healthcare context. By examining the knowledge, attitudes, and practices of Yemeni HCPs, the study aims to identify gaps and develop actionable strategies to improve medication safety. Specifically, the research focuses on understanding HCPs' ability to identify, prevent, and manage DRPs, with the ultimate goal of improving patient care outcomes. The findings of this study are expected to contribute to a broader understanding of DRPs and to inform evidence-based interventions tailored to the needs of Yemen's healthcare system.

METHODS

Study Design

A cross-sectional descriptive, mixed study was employed to evaluate the knowledge, attitudes, and practices of healthcare professionals regarding drug-related problems. The study was conducted in various healthcare settings across Aden, Yemen, between January and April 2024.

Study population

The study included 120 HCPs, comprising doctors, nurses, and pharmacists, recruited through convenience sampling. Inclusion criteria required participants to be actively employed in Yemeni healthcare facilities and to provide informed consent. Participants were drawn from both public and private institutions, ensuring a diverse representation of professional experiences.

Data Collection Tool

This study employed a self-administered, 20-item survey specifically designed for the research. The survey was developed by Salma L. Alsulmai [11] and modified and translated into Arabic by the licensed translation office. To ensure the validity and reliability of the instrument, a two-step approach



was implemented. First, content validity was addressed by presenting the items to three medical experts for feedback. Their evaluations focused on the clarity, relevance, and comprehensiveness of the questions in capturing the intended constructs. Second, a pilot study was conducted in December 2023 with a randomly selected sample of 30 participants (excluded from the final analysis) to assess the instrument's reliability. The data collected during the pilot study was analyzed using SPSS software to calculate Cronbach's Alpha coefficient, a measure of internal consistency reliability. According to DeVellis [12], a Cronbach's Alpha value exceeding 0.7 indicates a reliable research instrument suitable for large-scale data collection. The pilot study yielded a Cronbach's alpha of 0.891, demonstrating the questionnaire's high level of reliability and its suitability for the main study.

The survey content was based on established frameworks for DRP preparedness and was adapted to the Yemeni context. It consisted of three sections:

a) Knowledge (8 items): assessed HCPs' understanding of DRPs, including their ability to identify potential emergencies, comprehend key elements of their facility's DRP, and recognize their individual roles and responsibilities within the plan

b) Attitudes (6 items): gauged HCPs' feelings towards DRPs, including their perceived importance, confidence in implementing the plan, and any concerns or anxieties regarding disaster preparedness

c) Practices (6 items): Explored HCPs' self-reported actions related to DRPs, including participation in training drills, familiarity with communication protocols during emergencies, and overall approach to DRP implementation

Data Collection:

The survey was distributed face to face to participants. Informed consent was obtained before participants began the survey. The survey employed a mix of multiple-choice, Likert scale, and open-ended questions to capture both quantitative and

qualitative data. Quantitative data was analyzed using descriptive statistics (frequencies, percentages).

Data Analysis

Data were analyzed using SPSS version 26. Descriptive statistics summarized the study population and DRP prevalence.

Ethical Approval

The study adhered to ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the relevant institutional review board in Yemen, University of Science and Technology. Participation was voluntary and anonymized. All aspects of the study protocol were reviewed and authorized by the Research Ethics Committee number: MEC No. (MEC/AD011).

RESULTS

The final sample included 120 HCPs representing various healthcare disciplines. Descriptive statistics were used to present participant demographics as shown in Table 1. The gender distribution was nearly equal, with males comprising 63 participants (52.5%) and females contributing 57 (47.5%). Notably, the majority of healthcare professionals (HCPs) fell within the younger age group, with 71 participants (59.2%) being under 25 years old. Regarding professional background, pharmacists represented the largest group with 58 participants (48.4%), followed by general practitioners (GPs) at 16 (13.3%). The primary work setting for HCPs was private hospitals, with 109 participants (90.8%). Finally, most participants reported having less than five years of experience, totaling 62 (51.4%).

Analysis of table 2 revealed that the majority of HCPs demonstrated adequate knowledge and awareness of DRPs (80.49%). Conversely, a minority of HCPs reported a lack of awareness (8.51%). Interestingly, a neutral response regarding DRPs was identified in 11.0% of HCPs.

A high level of agreement (118 participants; 98.33%) was observed among HCPs regarding the statement, "Healthcare provider decisions should be



under investigations in order to reduce errors." Notably, there were no instances of disagreement

with this statement (0%). Furthermore, a significant majority of participants

Table 1: Demographic Characteristics of HCPs n=120

Variables	Frequency (%)		
Gender	Males	63 (52.5 %)	
	Females	57 (47.5 %)	
Age	≤ 25	71 (59.2 %)	
	> 25	49 (40.8 %)	
Year of Experience	< 5 years	62 (51.4 %)	
	5-10 years	26 (21.8 %)	
	> 10 years	32 (26.8 %)	
Hospital / Pharmacy Setting	Private	109 (90.8 %)	
	Public	11 (9.2 %)	
HCPs Type	Doctors	GP	16 (13.3 %)
		Specialist	6 (5.0 %)
		Consultant	9 (7.5 %)
	Pharmacists	58 (48.4 %)	
	Nurses	31 (25.8 %)	

(116; 96.66%) endorsed the concept of research facilitating information about DRPs. However, responses regarding medication reporting practices revealed a discrepancy. Only 45 participants (37.5%) agreed with the statement concerning their responsibility to

report medication errors, while 42 participants (35.0%) disagreed with the notion that medication errors, if identified before reaching the patient, do not require reporting. More details about other answers of HCPs are presented in Table 2.

Table 2: Knowledge and Attitude and Practice of HCPs Towards DRPs n=120

No	Questions	Agree Frequency (%)	Neutral Frequency (%)	Disagree Frequency (%)
1	I would ask patient/supervision in detail about illness, patient & family history	104 (86.6 %)	11 (9.16 %)	5 (4.16 %)
2	I would do precise physical & laboratory test before prescribe medicine.	87 (72.5 %)	7 (5.83%)	26 (21.6%)
3	I would not prescribe unnecessary medicine.	96 (80.0 %)	12 (10.0 %)	12 (10.0%)
4	I would prescribe medicine according to guidelines	111 (92.5 %)	4 (3.33 %)	5 (4.16 %)
5	I have fully comprehension of pediatric medicines	79 (65.83 %)	28 (23.33 %)	13 (10.8%)
6	I encourage other health care providers to report DRPs	107 (88.33%)	11 (9.16 %)	3 (2.5 %)



7	I would review the medication and its dose before dispensing	113 (44.17%)	4 (3.33 %)	3 (2.5 %)
8	I would check drug-drug interaction before administration.	112 (93.33%)	5 (4.16 %)	3(2.5 %)
9	I would check the prescription if meat guidelines.	96 (80.0%)	15 (12.9 %)	9 (7.5 %)
10	I would monitor patient if receive the medication properly.	86 (71.66%)	23 (19.16 %)	11 (9.16%)
11	I would stop the medication immediately if patient face ADR.	109 (90.83%)	0 (0.0 %)	11 (9.16%)
12	I would rectify if I notice DRPs by using suitable measures	109 (90.83%)	5 (4.16 %)	6 (5.0 %)
13	I believe I have good knowledge of when a medication error should be reported.	109 (90.83 %)	11 (9.16 %)	0 (0.0 %)
14	I have excellent realization of food & drugs that interact with medications.	88 (73.33 %)	23 (19.16 %)	9 (7.5 %)
15	Medication error should be reported in order to become an opportunity for improving care.	108 (90.0 %)	7 (5.83 %)	5 (4.16 %)
16	Medication errors do not need to be reported if detected before reaching the patient.	68 (56.66 %)	10 (8.33 %)	42 (35.0%)
17	It is not my responsibility to report medication It is not my responsibility to report medication	45 (37.5 %)	8 (6.66 %)	67 (55.83)
18	Workload (shift change, double shift and overtime) can contribute to medication errors	95 (79.16 %)	18 (15.0 %)	7 (5.83 %)
19	I advocate researches on DRPs and facilitate information reaching for researchers	116 (96.66 %)	3(2.5 %)	1 (0.8 %)
20	Healthcare provider decisions should be under investigations in order to reducing errors	118 (98.33 %)	2(1.66 %)	0 (0.0 %)

DISCUSSION

This study is particularly significant as it seeks to address deficiencies in HCP knowledge and practices related to DRPs, thereby paving the way for targeted interventions. By addressing the unique challenges faced by Yemeni HCPs, this research aims to develop culturally and resource-sensitive strategies to optimize medication safety. Furthermore, enhancing HCP awareness and practices is expected to significantly reduce the prevalence of DRPs, ensuring better health outcomes, particularly for pediatric patients in Yemen.

Our study investigated the knowledge and attitude of HCPs towards DRPs, which revealed that HCPs demonstrated a relatively high level of awareness

and knowledge regarding DRPs, which is a similar result to a study conducted in the UK [9]. In contradiction to the study conducted in Saudi Arabia, which showed a lack of knowledge, positive attitudes, and practices [8]. Our finding was an encouraging result, suggesting that Yemeni HCPs are recognizing the potential for medication errors and complications in this vulnerable population. With a baseline of awareness established, future interventions can focus on strengthening knowledge and translating it into improved practices. Strategies such as targeted educational programs, implementation of standardized medication protocols, and fostering a culture of patient safety communication within healthcare teams could all contribute to a reduction in DRPs. Our result also



suggests that Yemeni HCPs recognize the value of a thorough history-taking process in providing optimal care for hospitalized pediatric patients.

This approach offers several potential benefits, including improved diagnosis, as a detailed history can reveal valuable clues not immediately apparent during a physical examination, leading to a more accurate diagnosis and targeted treatment plan. It also facilitates the identification of risk factors by understanding a patient's past medical and family history, which can help uncover potential risks for medication interactions, complications, or underlying genetic conditions. Additionally, it enables personalized care by using knowledge of the patient's background and experiences to tailor a more individualized approach that considers their unique needs and preferences.

Moreover, our study's finding indicated that HCPs strongly agree with advocating for research on DRPs, and facilitating information access for researchers is an encouraging sign. This finding was in line with one study conducted in India by Iqbal MJ et al. [13]. The study included a total of 50 HCPs and concluded that pharmaceutical care services, e.g., drug information and research evaluation of DRPs offered by pharmacists, helped in optimizing drug therapy and patient care. Our result suggests a recognition among Yemeni HCPs of the importance of ongoing research in improving medication safety for patients.

This collaborative approach offers several potential benefits, including improved understanding of drug-related problems (DRPs) through research that identifies the most prevalent types, contributing factors, and effective strategies for prevention and mitigation. It also supports the development of evidence-based practices, enabling healthcare professionals to make clinical decisions based on the latest research and best practices for DRP prevention. Additionally, research findings can guide the creation of targeted interventions specifically designed to address the most common DRPs within the Yemeni context.

On the other hand, the results of this study also determined that HCPs in Yemen strongly disagreed with the statement, "It is not my responsibility to report medication errors," which was a positive indicator. This result was supported by another research study done in Saudi Arabia [8] and concluded a huge lack of the reporting of medication errors, knowledge about medication error stages, and training on medication errors. It suggests a sense of professional accountability and commitment to patient safety among Yemeni HCPs. Reporting medication errors (DRPs) is a crucial component of improving medication safety in healthcare settings. Several key benefits exist: a) improved patient outcomes: Identifying and reporting DRPs allows for timely intervention and rectification, potentially preventing adverse patient outcomes, b) systemic improvement: Data collected through DRP reporting can be used to identify recurring issues and implement preventative measures, ultimately reducing the overall incidence of DRPs and c) enhanced patient safety culture: A culture of open communication and commitment to reporting errors fosters a more vigilant approach to medication safety within the healthcare system.

Strengthening HCP knowledge in pediatric pharmacotherapy is paramount. Deficiencies in areas like age-specific dosing, drug interactions, and the complexities of pediatric medication administration can contribute to DRPs. Implementing targeted training programs focused on these specific areas can equip HCPs with the necessary expertise to optimize medication regimens and minimize the risk of errors.

LIMITATIONS OF STUDY

Incorporating a qualitative component to explore HCPs perspectives on DRPs and barriers to medication safety could provide valuable insights for targeted interventions. This study did not assess the specific outcomes of DRPs, nor did it identify medication types with a higher risk of DRPs. These aspects should be considered for future research.



However, it is important to acknowledge some limitations. Firstly, self-reported knowledge through surveys might not always reflect real-world practice. Secondly, the specific details of HCP knowledge, such as depth of understanding and ability to identify specific DRP types, were not explored in this study. Further research utilizing objective assessments or scenario-based evaluations could provide a more comprehensive picture of HCP knowledge application. Despite these limitations, our findings suggest a potential foundation for positive change.

CONCLUSION

Our data reveal a positive response from HCPs regarding DRP awareness, suggesting a promising foundation for implementing interventions aimed at mitigating and reducing DRPs in this setting. However, a positive aspect emerged: a high level of knowledge and attitude among HCPs regarding DRPs. This aligns with the growing recognition of the importance of medication safety and signifies a strong foundation for implementing interventions to reduce DRPs.

RECOMMENDATIONS

A larger sample size can be collected. A prospective, interventional study to test the pharmacist's role in decreasing the number and severity of DRPs is also recommended in order to provide more accurate results. Doing the study over a longer time can help in increasing the sample size to get more accurate results.

Future research efforts should be directed towards

a) Understanding Gender Disparity: In-depth studies are required to unpack the reasons behind the association between gender and DRPs. This could involve analyzing medication prescribing patterns for boys and girls, exploring potential sex-based differences in pharmacokinetics, and investigating potential gender bias among HCPs.

b) Targeted Interventions: Based on the specific types of DRPs identified in this study, targeted

interventions can be designed and implemented. These interventions could encompass developing evidence-based clinical guidelines, implementing computerized physician order entry (CPOE) systems with robust drug interaction alerts, or incorporating pharmacists into medication review processes to optimize medication safety and

c) Enhancing HCP Knowledge and Skills: While the current level of knowledge and attitude among HCPs is encouraging, ongoing educational programs can further enhance their skills in managing DRPs effectively. These programs could focus on practical strategies for DRP identification, evidence-based interventions for prevention and resolution, and effective communication with patients and families regarding medication use.

Disclaimer

The article has not been previously presented or published and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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