



## **Knowledge, Attitudes and Practices Survey of Medication Safety among Community Pharmacists in Aden-Yemen**

**Mohammed Alshakka<sup>1</sup>, Wafa Badulla<sup>2</sup> and Mohamed Izham Mohamed Ibrahim<sup>3\*</sup>**

<sup>1</sup>Section of Clinical Pharmacy, Department of Pharmaceutics, Faculty of Pharmacy, University of Aden, Aden, Yemen.

<sup>2</sup>Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Aden, Aden, Yemen.

<sup>3</sup>Department of Clinical Pharmacy and Practice, College of Pharmacy, QU Health, Qatar University, Doha, Qatar.

### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. All authors managed the analyses of the study and the literature searches. All authors read and approved the final manuscript..*

### **Article Information**

DOI: 10.9734/JPRI/2021/v33i23A31405

#### Editor(s):

(1) Dr. Ana Cláudia Coelho, University of Trás-os-Montes and Alto Douro, Portugal.

#### Reviewers:

(1) Md. Ashraf Islam, Imam Abdulrahman Bin Faisal University, Saudi Arabia.  
(2) Satish Babulal Jadhav, R.B. Attal Arts, Science & Commerce College, Georai, India.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/65655>

**Original Research Article**

**Received 02 February 2021**

**Accepted 09 April 2021**

**Published 14 April 2021**

### **ABSTRACT**

**Introduction:** All health professionals' participation is essential for ensuring quality and successful national post-marketing surveillance programs. This study aimed to assess the knowledge, attitudes, and practices (KAP) among Yemeni community pharmacists (CPs) regarding medication safety in a poor-resource setting.

**Methods:** A survey was conducted among CPs in Aden governorate. The tool comprised of demographic profile, knowledge, attitude, and practice aspects of medication safety. The survey also studied the opinion about the future and benefits of Adverse Drug Reaction (ADR) reporting in Yemen. The data collected was analyzed using descriptive statistics such as frequencies, percentages, and means (SD).

**Results:** A total of 450 CPs were enrolled in the study. Most of the participants were males (75%) with a bachelor's degree (91.9%) and between 3-6 years of experience (28%). The majority of CPs

\*Corresponding author: E-mail: mohamedizham@qu.edu.qa;

had good knowledge regarding the perception and objectives of Pharmacovigilance (PV) and ADRs. Approximately 41% of participants knew the purpose of PV as an essential system for public health and safety concerning drug use. Additionally, the Yemeni pharmacists had a positive attitude towards the reporting system. Approximately 84% of responders admitted that PV is the responsibility of the pharmacists. The majority of the participants (80%) declared no reporting form available at their workplace. According to CPs, 59% said that relevant authorities do not widely promote ADR reporting in Yemen, and 57% replied that the patient's lack of information is an obstacle in the reporting system. Approximately 89% of the CPs believed that reporting ADRs would improve patient safety.

**Conclusions:** The CPs have a positive attitude towards PV and an acceptable degree of knowledge. However, the practice level should be upraised.

*Keywords: Pharmacovigilance; medication safety; behavior; pharmacy practice; community pharmacists.*

## 1. INTRODUCTION

Adverse drug reactions (ADRs) are a critical health matter [1]. Various publications have documented the issue of Adverse Drug Reactions (ADRs). Approximately 3.2-7% of acute hospital admissions are due to ADRs [2,3]. ADRs result in extended hospitalization and increased morbidity, mortality [4] and hospital costs [5]. Every year, more than 770,000 people suffer or die from ADRs [6]. According to a meta-analysis carried out in the United States, ADRs accounted for the fourth and sixth most common death causes [7]. A study from Iran indicated that approximately 11.8% of patients had suffered at least one ADR [8]. In another report from Iran, approximately 16.8% of the patients had experienced at least one ADR, and 2.9% of ADRs were fatal [9]. A study from South India reported an incidence of ADRs of 9.8%; approximately 3.4% was the reason for hospital admission, and 3.7% appeared during hospitalization [10]. A retrospective study in Saudi Arabia revealed that 54% of ADRs could be prevented. The annual incidence ranged from 0.07% in 1993 to 0.003% in 1999 [11]. In Nepal, the occurrence of ADRs was 0.9%. Severe ADRs were reported in 0.9% of males and 10.8% of females [12].

No health setting is immune from ADRs; hence pharmacovigilance (PV) becomes an essential aspect of ensuring the safe use of medicines in any healthcare setting. According to the WHO, the definition of PV is "the science and activities relating to the detection, assessment, understanding, and prevention of adverse effects or any other possible drug-related problems" [13]. ADRs' current monitoring system was established after the tragedy of thalidomide ADRs in the 1950s [14].

Therefore, the reporting of common ADRs post marketing is of great advantage. The incidence of ADRs and other drug-associated problems varies between different countries. These issues might be attributed to the differences in diseases, prescribing practices, heredities, diet and culture. Drug manufacturing procedures that have an impact on drug quality, content, distribution, usage, indications, and dosing, as well as the use of other or medicines (herbal or traditional) are considered related factors that might cause specific toxicological problems for a drug when used alone and/or in combination with other drugs [14].

Continuous monitoring and reporting of ADRs are considered the backbone for their early detection. ADR detection is the building block of PV and inclusive systems for maintaining patient safety. In a poor-resource setting like Yemen, the reporting was expected to reach up to 4100 reports per 25 million individuals per year. The countries with the best reporting rates should report on at least 200 cases per 1,000,000 individuals annually, as stated by the WHO. Nevertheless, only 10% of serious ADRs are reported [15]. The reporting system in Yemen is not working perfectly due to insufficient coverage and knowledge about ADRs and PV's role in improving health services among several healthcare professionals and a lack of information on how, where, and to whom to report ADRs. All these obstacles have resulted in a poor patient safety situation; thus, many patients could die from an ADR every year [16]. According to Al-Worafi [17], many challenges are facing Yemen related to the overall pharmaceutical sector, e.g., system, education, research, medication safety issues, despite the great efforts by the Supreme Board of Drugs and Medical Appliances (SBDMA) and the Ministry of

Public Health and Population to improve medication safety practices [17]. There is a lack of information regarding the level of knowledge, attitude, and practice of CPs towards ADR reporting and PV in Yemen. Thus, this study was carried out in Aden city to assess the Yemeni CPs' knowledge, attitudes, and practices towards medication safety. It was intended to identify the knowledge gaps, beliefs, and behavioral patterns that may indicate needs, problems, and barriers to assist plan and implement interventions such as education and training activities.

## 2. METHODS

### 2.1 Study Design

The design of the study was a cross-sectional descriptive study. This design is the most convenient for conditions in which environment, time, and resources are restricted. This KAP survey was carried out to collect information on what is known, 'what is thought', and 'what is done' about medication safety, an aspect of pharmacovigilance. The study was performed among CPs in Aden governorate from April 2020 to July 2020. The CPs were selected because they are the most health care workers who have essential roles in pharmacovigilance. The relevance of selecting Aden city is that it is not in conflict like in other governorates, and it is the center of the pharmacists and community pharmacies.

### 2.2 Study Population, Sample and Sampling Method

The study involved health professionals who worked as CPs. Due to the security and safety issues due to conflict and Covid-19 pandemic, the study was only conducted in Aden. It has a total population of 987,904, where 550,602 people live in the city of Aden (<https://populationstat.com/yemen/aden>). The target respondent was CPs in charge of a pharmacy, and the respondent was excluded if he/she showed a lack of willingness to participate in the study or was on leave during the study. The study participant selection and sampling method are described below. A total of 450 CPs took part in our research. The following sampling formula was used:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

where n= sample size,  
Z= Z statistic for a given level of confidence; at 95%, the conventional value is 1.96.  
P= expected prevalence or proportion (in decimal representation; e.g., for 50% prevalence, P= 0.5), and d=precision (in decimal representation; e.g., for 5% precision, d=0.05). Assuming a dropout rate of 30%, final n=450.

The researchers used convenience sampling to select the respondents due to the difficulty of having a sampling frame. All of them resided in Aden city. Respondents with different education levels were selected for this study.

### 2.3 Tools Development and Validation

A KAP questionnaire was used in the study to evaluate the knowledge, attitudes and practices of the CPs towards medication safety. The researchers adapted a survey tool from a study by Hallit et al. [18]. The author granted permission to use the survey tool. These questions were initially in English and then translated to the local language, Yemeni-Arabic. The linguistic validation process was carried out to ensure the intended meaning was maintained. We also checked the face and content validity. The contents were relevant to the key questions to be answered. The local language questions were framed to minimize bias and best reflect knowledge, attitudes, and practices. The pilot study was conducted on 20 community pharmacists, and a consultant of five experts was performed to ensure face and content validity.

Cronbach's alpha for the coefficient of reliability (or consistency) reported a value of 0.076, which is considered acceptable.

### 2.4 Outcome Measures and Operational Definition

The study measures the CPs' knowledge, attitudes and practices regarding medication safety. The operational definitions for these terms are as follows: [19]

Knowledge: "Knowledge is a set of understandings, knowledge, and science." It is also one's capacity for imagining, one's way of perceiving. Knowledge of a health behavior considered to be beneficial, however, does not automatically mean that this behavior will be followed. The degree of knowledge assessed by the survey helps to locate areas where

information and education efforts remain to be exerted.

**Attitude:** Attitude is a way of being, a position, but sometimes involves leanings or “tendencies”. Attitude is an intermediate variable between the situation and the response to the situation. It helps explain how among the possible practices for a subject submitted to a stimulus, that subject adopts one practice and not another. Attitudes are not directly observable in practice; thus, it is a good idea to assess them. Interestingly, numerous studies have often shown a low and sometimes no connection between attitude and practices.

**Practice:** Practices or behaviors are the observable actions of an individual in response to a stimulus. This practice is something that addresses the concrete with actions. For health practices, one collects information on tobacco or alcohol consumption, the practice of screening, vaccination practices, sporting activities, sexuality, etc.

**The ADR:** According to the WHO, is “any response to a drug that is noxious and unintended and that occurs at doses used in humans for prophylaxis, diagnosis, or therapy, excluding failure to accomplish the intended purpose” [20].

## **2.5 Data Collection**

The data were collected by hand-distributing of a structured, standardized paper questionnaire to the respondents in different areas of Aden. The pharmacy students helped in collecting the responses from the CPs. Types of data that were collected were dependent on the survey objectives and questions to be answered.

## **2.6 Data Analysis**

The data collected from the questionnaires were analyzed using the Statistical Package for Social Science (SPSS®) version 21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.). Frequency counts were checked for all the variables. Due to the study's explorative nature, descriptive statistics such as frequencies, percentages, and means (SD) were used in the analysis of the data.

## **3. RESULTS**

### **3.1 Sociodemographic and Socio-economic Characteristics of the Participants**

Approximately 75% of the participants were male. The largest age group of the CPs was 20-30 years (66%), followed by 31-40 years (29%). The working experience as a community pharmacist was high between 1-3 years (28%) and 3-6 years (30%). Most of the CPs were employees (76%). Most of the CPs (98%) practiced in pharmacies that were located in the urban area. Approximately (84%) worked in independent pharmacies. The highest number of patients seen per day was between 10-50 (48%). Additionally, most CPs worked more than 40 hours per week (60%). The other characteristics are summarized in Table 1.

### **3.2 Knowledge Concerning PV**

The information obtained about knowledge of PV from the CPs is represented in Table 2. The results regarding PV's definition indicated slightly higher percentages reporting the definition of PV as “detection, assessment, understanding, and prevention” (36%). Approximately 41% of participants knew the purpose of PV was to improve public health and safety regarding drug use. Additionally, an ADR was defined as “The noxious, unintended response to a drug” (35%), “The serious side effect of a medicinal product” by 33% of the respondents. Only 10% indicated that an ARD was “The adverse event of a drug due to its use outside the terms of marketing authorization.” Nearly 50% of the pharmacists thought that ADRs appear due to the use of OTC drugs, and 39% believed all mentioned drugs could cause them. Sixty-eight percent of the participants (n=308) thought that ADRs could be due to drug-drug interactions.

### **3.3 Attitude towards PV**

The results on the attitude of the CPs towards PV are outlined in Table 3. The majority of the pharmacists stated that they have come across ADRs throughout their work at the pharmacy (62%). Most of the workers (87%) declared that the pharmacists are in charge of reporting ADRs, and approximately (87%) insisted that this activity must be compulsory. Approximately 84% of the participants admitted that the responsibility belonged to the pharmacists, and approximately 65% felt that physicians should also be

responsible. Slightly more than half of the pharmacists (63%) depended on the drug information leaflets to obtain the corresponding ADR information, 53% of the CPs used the drug website, and 41% of them used books. Regarding the answers concerning the challenges encountered during the reporting of the ADRs, approximately 53% reported the need for training and lectures to define ADRs better.

Approximately 43% are challenged by time constraints/workplace pressure and have difficulty judging the occurrence of ADRs, and (36%) do not know how to report an ADR. Most of the pharmacists (80%) admitted that the Supreme Board of Drug and Medical Appliance (SBDMA) should promote pharmacovigilance, whereas (61%) stated that this was the responsibility of the Ministry of Public Health.

**Table 1. Sociodemographic and socioeconomic characteristics of the participants**

<b>Factor</b>	<b>Number</b>	<b>(%)</b>
<b>Gender</b>		
Male	339	75
Female	111	25
<b>Age</b>		
20-30	298	66
31-40	132	29
41-50	17	4
51-60	3	1
>60		
<b>Pharmacy type</b>		
Independent pharmacy	377	84
Pharmacy chain	73	16
<b>Your experience as a community pharmacist (duration)</b>		
Less than 6 months	51	11
6 months to 1 year	48	10
1 year to less than 3 years	115	26
3 years to less than 6 years	125	28
6 years to less than 12 years	80	18
More than 12 years	31	7
<b>Job status</b>		
Employer/Manager	110	24
Employee	340	76
<b>Educational Level (highest)</b>		
Bachelor	408	90.7
PharmD	40	8.9
Masters	1	0.2
PhD	1	0.2
<b>Approximate number of patients seen per day in the pharmacy</b>		
<10	49	11
10-50	214	48
51-100	120	27
>100	67	15
<b>Working hours per week</b>		
1-16 hours per week	25	6
17-31 hours per week	63	14
32-40 hours per week	92	20
More than 40 hours per week	270	60
<b>The geographic location of the practice</b>		
Rural	9	2
Urban	441	98

**Table 2. Knowledge of the CPs concerning PV**

Item	Number	%
<b>PV is:</b>		
The science of Adverse Drug Reaction reporting	103	23
The science of understanding the safety of drugs	97	20
The detection, assessment, understanding, and prevention	151	36
The science of identifying predisposing risk factors related to ADR	99	21
<b>The purpose of PV is/are to:</b>		
Improve public health and safety in relation to the use of medicines	187	41
Improve patient care and safety in relation to the use of medicines	121	27
Assess the benefit, harm, effectiveness, and risk of medicines in Phase 4 Clinical Studies	139	32
<b>Adverse drug reaction (ADR) is:</b>		
The noxious, unintended, response to a drug	155	35
The untoward medical occurrence in a patient administered a pharmaceutical product	98	22
The serious side effect of a medicinal product	151	33
The adverse event of a drug due to its use outside the terms of marketing authorization	45	10
<b>Do you think ADR is related to:</b>		
OTC drugs	225	50
Herbal drugs	11	2.4
Vaccines	11	2.4
Blood products	25	6
All of the above	178	39
<b>Do you think that an ADR could be due to:</b>		
drug-drug interactions	308	68
drug-food interactions	16	4
drug exercise	123	28

### 3.4 ADR Reporting in the Workplace (Practice)

Concerning whether the respondents had observed ADR cases in their practice, nearly (49%) responded with yes, and approximately (37%) said no. Only 25% of the CPs (n=55) reported the ADRs to their institute's HOD and (13%) to the SBMDA. The majority of the participants (84%) declared no reporting form available at their workplace. Most of them (69%) responded with no when asked if their workplace provides information regarding the reporting procedure. Meanwhile, 57% of them felt that they did not have enough training in ADR reporting.

Regarding whether the workplace encouraged the reporting of ADRs, the participants' responses were distributed nearly equally between yes and no. Regarding the problems encountered while reporting ADRs in the workplace, 59% answered that ADRs reporting in Yemen is not widely promoted by the relevant authorities, and 57% replied that a lack of

information provided by the patient is an obstacle in the reporting system. The detailed findings on practice can be found in Table 4.

### 3.5 Patient Safety and Response to Mistakes

Seven questions were developed to ask the respondents if they recognize the relationship between the response to mistakes and patient safety. Sixty-four percent of the participants reported that they had attempted to determine what problems in the work process led to the mistake. Fifty-four percent indicated that the pharmacy helps staff learn from their mistakes, while 46% declared when the same mistake keeps happening, they change the way they do things. More information is shown in Table 5.

### 3.6 The Future of ADR Reporting in Yemen

Regarding the future of the ADR reporting system in Yemen (see Table 6), 57% of the CPs supported the patients' direct reporting instead of healthcare professionals. The majority of the

participants (80%) envisaged the role of information technology in facilitating ADR reporting and maintaining an online program or website for reporting ADRs. Around (81%) of the CPs believed that Yemen's relevant authority should maintain an online program or website like other countries bearing records of the ADRs reported throughout the nation. Approximately (52%) thought that the online program/website should be freely accessible to everyone. About 75% of the participants believed that the information related to reporting ADRs should be provided compulsorily to pharmacists at their workplace.

### 3.7 Benefits of Reporting ADRs

The benefit of reporting ADRs was also evaluated in this study (see Table 7). The majority of pharmacists (66%) believed that reporting ADRs did not cause inconveniences in the working environment. Similarly, (89%) believed that reporting ADRs would improve patient safety. Additionally, 77% of the participants trusted that the reporting of ADRs was an effort by health institutions to indicate quality care provision to the patients.

**Table 3. Attitudes of the CPs regarding PV**

Item	Number	%
<b>Have you ever come across an ADR?</b>		
Yes	284	62
No	106	24
Neutral/do not know/does not apply	59	14
<b>In your opinion, is the pharmacist in charge of reporting an ADR?</b>		
Yes	393	87
No	57	13
<b>Do you think ADR reporting should be a compulsory activity for you?</b>		
Yes	389	87
No	41	9
Neutral/do not know/does not apply	20	4
<b>Who among the listed is/are responsible for reporting an ADR? (Multiple answers possible)</b>		
Physician	294	65
Pharmacist	377	84
Patient	197	44
Family	0	0
None of the above	16	4
<b>What are the sources of information that you usually use? (Multiple answers possible)</b>		
Internet sites	239	53
Electronic reference	84	19
Book	184	41
Medical journals	65	14
Companies	45	10
Drug information centers	86	19
Drug information leaflets	285	63
<b>What might be the challenge(s) for you to report an ADR? (Multiple answers possible)</b>		
I do not know how to report an ADR	161	36
Time constraints/workplace pressure, Difficulty to judge about the occurrence of ADR	193	43
Need for training, lectures to better define an ADR	237	53
<b>In your opinion, what is/are the organizations in Yemen that should promote pharmacovigilance Practice? (multiple answers possible)</b>		
Supreme Board of drug and medical appliance	360	80
Ministry of Public Health	274	61
Academic Institutions	76	17
Health Care Institutions	129	29

**Table 4. ADR reporting in the workplace (practice)**

<b>Item</b>	<b>Number</b>	<b>%</b>
<b>Did you observe any ADR cases in your practice?</b>		
Yes	222	49
No	166	37
Not true	58	14
<b>If yes, then to whom have you reported</b>		
HOD of your institute	55	25
Drug manufacture	19	9
Government of Yemen	4	2
SBMDA	28	13
Other	127	58
<b>Is ADR reporting form available at your workplace?</b>		
Yes	49	11
No	377	84
Not sure	24	5
<b>Does your workplace provide information regarding the procedure?</b>		
Yes	93	21
No	309	69
Not sure	48	10
<b>Do you feel that you are adequately trained in ADR reporting?</b>		
Yes	96	21
No	254	57
Not sure	97	22
<b>Does your workplace encourage you to report an ADR?</b>		
Yes	214	48
No	191	42
Not sure	45	10
<b>Which of the problems do you face while reporting ADRs in your work place?</b>		
Lack of information provided by the patient	256	57
The pharmacist doesn't have enough time	134	30
Unaware of the existence of a national ADR reporting system	89	20
Unaware of the need to report an ADR	71	16
ADR reporting in Yemen is not widely promoted by relevant authorities	266	59
Fear of facing legal problems	89	20
Others	88	20

**Table 5. Patient safety and response to mistakes**

<b>Item</b>	<b>Number</b>	<b>%</b>
When a mistake happens, we try to figure out what problems in the work process leading to the mistake	290	64
This pharmacy helps staff learn from their mistakes rather than punishing them	244	54
When the same mistake keeps happening, we change the way we do	207	46
The way we do things in this pharmacy reflects a strong focus on patient safety	197	44
Mistakes have led to positive changes in this pharmacy	200	44
The staff feel like their mistakes are held against them	126	28
We look at staff actions and the way we do things to understand why mistakes happen in this pharmacy	116	26



**Table 6. The future of ADR reporting in Yemen**

Item	Number	%
<b>Do you support “Direct ADR Reporting” by the patients instead of healthcare professionals?</b>		
Yes	257	57
No	36	36
Not sure	35	7
<b>Do you envisage role of information technology in facilitating ADR reporting in the country (such as use of internet, mobile service etc.)?</b>		
Yes	346	80
No	40	8
Not sure	64	12
<b>Do you think the relevant authority in Yemen should maintain an online program or website like other countries bearing records of the ADRs reported throughout the nation?</b>		
Yes	364	81
No	38	8
Not sure	48	11
<b>Do you think this online program/website should be freely accessible to everyone?</b>		
Yes	232	52
No	165	37
Not sure	63	11
<b>Should information regarding the procedure of reporting ADRs be provided compulsorily to pharmacists at their workplace?</b>		
Yes	338	75
No	61	14
Not sure	51	11

**Table 7. Benefits of reporting ADRs**

Item	Number	%
<b>Do reporting ADRs cause inconvenience in the working environment?</b>		
Yes	100	22
No	299	66
Not sure	51	12
<b>Do you believe reporting ADRs will improve patient safety?</b>		
Yes	401	89
No	18	4
Not sure	31	7
<b>Do you believe reporting ADRs is an effort by health institutions to indicate quality care provided to the patients?</b>		
Yes	346	77
No	38	8
Not sure	66	15

#### 4. DISCUSSION

This study was conducted to evaluate the KAP of CPs, which is considered an essential step to creating awareness about the safety of drugs, the hazard of dispensing banned medicine, the reporting of ADRs, and the importance of PV. The majority of our respondents were male, young age, an employee practicing in an

independent pharmacy, having working experience in a community pharmacy between 1 to 6 years and acquired a bachelor's degree in pharmacy. The extent of the knowledge and attitude of the CPs reflected the practical aspects. In brief, the findings indicated a positive attitude towards PV with a reasonable knowledge level; however, the functional role of CPs should be encouraged and upraised. Generally, in

developing countries and specifically in Yemen, pharmacists are considered healthcare consultants who can be easily assessed and without payment. Most patients prefer to consult CPs about health-related problems, including ADRs. Therefore, there is a demand to involve CPs in the PV system.

The profiles of the CPs, e.g., age, employment status, experience, degree, indicated that they have an adequate level of education and practice. Thus, it is supposed that they might have adequate knowledge suitable for this study. The study also indicated that most of the CPs had good knowledge about the concept of PV and its purpose and the definition of ADRs, and the medical products that may be the leading cause of ADRs. The response rate was comparable with that in a study carried out in Lebanon [21]. Several studies have indicated that pharmacists are considered the health care professionals who have the most comprehensive knowledge of the drugs' pharmacological aspects, so they should play an essential role in the identification, detection, prevention, and management of ADRs [22-25]. Ongoing awareness campaigns should be conducted to install, enhance and increase knowledge among pharmacists. A meta-analysis study in India indicated that approximately 81% of Indian pharmacists were unaware of the country's PV system [26] (See Table 2).

Regarding the attitude towards PV, about two-thirds of the pharmacists had encountered ADRs. The majority of the participants had a positive attitude about being the healthcare professional responsible for the reporting of ADRs and more than the fourth-fifth believed that reporting should be a compulsory process. Besides, close to the fourth-fifth of the participants considered reporting ADRs as one of their duties. The result is similar to that from studies in India [27], Korea [28] and other Arab countries [21,29-33]. One study in India revealed that the CPs believed that ADR reporting was the physician's duty [34]. However, a negative attitude was detected among pharmacists in New Zealand [24]. Some studies reported that pharmacists believe that reporting disrupted drug dispensing and was not included among their main duties [35,36]. The current study's positive result might be due to incomplete knowledge on the ADR reporting procedure, as there is no active applied PV system in Aden. This study only reflects attitudes towards PV and ADR reporting, not the actual reporting practice. However, the participants

revealed that they had many challenges that made accessing the reporting system difficult, such as a lack of knowledge about ADR reporting procedures and judgments, the need for training to detect ADRs effectively, and time restrictions in addition to work pressure. Similar challenges have been stated previously; several studies have revealed a positive relationship between knowledge level and reporting behavior [37-42]. Furthermore, a study in Portugal showed that educational courses increased the number of ADR reports 10-fold [42]. Most of the pharmacists depended on drug leaflets to obtain ADR information, followed by the internet and books. However, the drug leaflets provide information on the most common ADRs, and some of the rarer and more severe ADRs are usually not mentioned. Additionally, obtaining information from the internet is not a good idea because not all websites are trustworthy (See Table 3).

Regarding ADR reporting practices, approximately half of the pharmacists reported having observed ADRs. They reported them to different authorities, as shown in Table 4. The outcomes also indicated the unavailability of the reporting system according to around fourth-fifth of the CPs, with slightly more than two-thirds of the CPs indicating that no information is provided regarding ADRs' reporting. Most of the pharmacists felt that they did not have sufficient training, while nearly half of the CPs encouraged the reporting system and around half did not. Several problems were mentioned during the reporting procedures, including the lack of a governmental reporting system and the patient's lack of information.

Additionally, some pharmacists revealed that work pressure prevents proper reporting, which is in line with studies in India [34,43]. Meanwhile, the fear of legal repercussions was one of the problems that face the reporting system in the community pharmacies in Yemen; similar results have been reported in other studies [26,34,43-45]. Patient safety was the prime concern of most participants. The majority of the pharmacists had a considerable awareness of the mistakes that may occur during their duties. They learned from these mistakes to improve the quality of CP services.

Regarding the future of ADR reporting in Yemen, slightly more than half of the participants encouraged the idea of self-reporting by the patients. This finding is comparable to those of

previous studies in India [27], the UK [46] and the Netherlands [47]. Subsequently, the activation of a “spontaneous reporting system” might be an essential factor in the future. Approximately a fourth-fifth of the participants encouraged information technology's role in facilitating ADR reporting in the country. An identical result was found in a study carried out in India [46]. Concerning patient access to an online ADR program/website, nearly half had positive responses. Approximately three-fourths of the CPs believed that reporting procedures should be compulsory.

According to this study, more than a fourth-fifth of the pharmacists believed that reporting ADRs will improve patient safety. A similar finding was reported in other studies [34,43,48]. When asked if ADR reporting causes inconvenience in the working environment, around two-third of the participants, responded 'No'. Some of the CPs also believed that reporting ADRs is an effort by health institutions to indicate the provision of quality care to the patients, which is a positive indication of the acceptance of the ADR reporting concept [49].

Based on the observation from this study, there are a few recommendations for improving ADR reporting in Yemen: 1. Every governmental or private hospital should create a PV center for reporting ADRs and save associated data in the database; 2. PV workshops should be carried out to guide pharmacists and other healthcare professionals in distinguishing and reporting ADRs; 3. Self-reporting by the patients should also be encouraged alongside reporting by healthcare professionals; 4. National PV programs should be initiated, and PV specialists should help healthcare professionals; 5. Continuous seminars and training programs should be arranged by PV professionals to enhance the reporting system; 6. There should be a periodic gathering of ADR data from health centers; 7. New technology should be incorporated to facilitate ADR reporting; 8. PV education should be introduced in pharmacy and other health-related facility curricula; 9. Pharmacists should not be subjected to legal repercussions if a mistake is made; 10. ADR reporting should be made compulsory for all pharmaceutical companies and healthcare professionals; and 11. CPs should be able to obtain the required ADR data from the hospital database.

## **5. STUDY LIMITATIONS**

The study could not be conducted in a wider geographical area with a larger sample due to the safety and security reasons mentioned above. Thus, we cannot generalize to the whole population of CPs in the country, even though we believe the findings will be similar. Secondly, due to the nature of a cross-sectional study of KAP, the study might experience social desirability bias.

## **6. STUDY IMPLICATIONS**

The study highlights the awareness and attitudes of CPs towards ADR reporting guidelines and how their behavior could affect the ADR reporting rate. This study provides health care policymakers and planners with valuable data to explore the current ADR reporting status and barriers among CPs. It provides baseline data that can be used in future evaluation or reconstruction plans for the current PV system. The study can be followed up to evaluate further the factors that could affect ADR reporting among healthcare professionals and CPs in particular. The study will determine the actual interventions required to improve ADR reporting by verifying the possible factors leading to underreporting [50]. Information about ADR reporting, such as CPs' basic knowledge, attitudes, perceptions, and barriers, must be assessed, and the needs associated with these factors must be identified.

## **7. CONCLUSION**

In summary, this observational study indicated that Yemeni community pharmacists have a positive attitude and that the degree of knowledge is acceptable but still requires improvement. Despite the positive attitude and the degree of knowledge, several obstacles prevent the proper application of PV and ADR reporting systems in Yemen. This shortcoming can be overcome by education intervention, training, and promoting the PV program. The Ministry of Health and Population, alongside the academic sector, should start applications for education programs to help CPs and pharmacy students acquire the essential concepts and practice regarding PV and reporting systems. Promotion of the role of CPs in future PV systems will help improve patient's healthcare and safety.

## CONSENT AND ETHICAL APPROVAL

The study protocol was endorsed by the Ethics Research Committee of the Faculty of Medicine and Health Sciences, University of Aden. Written informed consent was obtained from all participants who were willing to participate in the study after the objectives, importance, and benefits of the research and voluntary participation were described. They were assured that all the data gathered will be handled with complete confidentiality and used only for research purposes.

## FUNDING

The work has not received any financial support. However, the language editing was supported by Qatar University Student Grant (Grant #: QUST-1-CPH-2020-19).

## ACKNOWLEDGEMENT

The study tool was adopted from the study by Hallit et al. (2018). Thank you to Dr. Souheil Hallit, who has granted permission to use and adapt it. We would like to thank the students (Abdurrahman Mohammed Hussein Nasser, Abdullah Mohammed Saeed Ahmed Dobian, Abdullah Salim Ahmed Babhier, Abdullah Radwan Omer Sheikh, Abdulmoeen Saeed Mana Shafil, Ali Ahmed Ali Ahmed, Arzak Saeed Babo Shanker Lado, Ashraf Abdullghani Mogali Saleh, Atheer Abdullah Mustafa Abdullah, Gamal Abdunnasser Mosaed Saleh, Hiadar Mohammed Nasser Saleh, Ibrahim Mohammed Qahtan Mohsen, Khawlah Mohammed Ali Alsagheer Algallab, Mahmood Mohammed Ahmed Mosaed, Mohammed Mohammed Abdullah Mohsen Alshuaibi, Umkulthom Abdullah Hussein Alawi, Saleh Mohammed Moqbil Ahmed, Saleh Nasser Saleh Mohammed, Shehab Ahmed Mansoor Babakr, Weam Hussein Abdo Alhajir) who have assisted in the data collection. Also, we appreciated the service of AJE in editing the language.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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DOI:<https://doi.org/10.17532/jhsci.2014.183>

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