Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v29i04.5886

A SYSTEMATIC REVIEW OF NURSES' AND DOCTOR'S KNOWLEDGE, ATTITUDES, AND PRACTICE IN CONNECTION TO PHARMACOVIGILANCE AND ADVERSE DRUG REACTION REPORTING

Dr.naif shujaa Alotaibi[1*], Saif Salem Al Salem[2], Ali Mohammed Alhudaif[3], Abdullah Ibrahim Ayat Al-Anazi[4], Jalwi Jamaan mahammed alqahtani[5], Fisal Jeza Ginan Almutairi[6], Omar Bashir Ma'ad Al-Mutairi[7], Sultan Mohammad Ibrahim AlOrf[8], Sultan mujeri alruqi[9]

[1*]Bariatric surgery, Dammam medical complex Dammam
[2]Surgical technician, King Khaled Hospital in Najran Najran
[3]Dermatology, al diriyah hospital Al Riyadh
[4]Pharmacist, Muhammadiyah PHC, Hafar Al-Batin
[5]Pharmacist, Khurma hospital Altaif
[6]Pharmacist, Al-Artawiyah General Hospital Al-Artawiyah
[7]X-ray teachnation, Alhusso General Hospital Madina
[8]Radiology technician, Riyadh
[9]Al-Ghadeer Primary healthcare center, Administration hospitals King Fahad Hospital Jeddah

***Corresponding Author:** Dr.naif shujaa Alotaibi
*Bariatric surgery, Dammam medical complex Dammam

Abstract

Objective: This study aims to explore aspects of pharmacovigilance and adverse drug reaction (ADR) reporting, including knowledge, attitudes, practice, and perceived barriers from a nurse perspective. Methodology: A systematic review was conducted by searching electronic databases such as MEDLINE, Embase Scopus and Web of Knowledge between January 2010 to October 2020. Original observational studies focusing on Nurses' and Doctor's understanding about pharmacovigilance activities in different healthcare settings were included if they written in English language. Results: From the search process carried out during this period we identified twenty-three qualifying studies that met our inclusion criteria. Findings revealed that while as many as 74.1% of nurses had an awareness regarding definitions related to ADRs only one quarter knew how to fill up an adverse drug reaction reporting form accurately. Further analysis showed most (84%) believe it is important for patient/medicine safety but reportage remained low at just over one-fifth because lack education/training barrier which stood around median percentage value amounting close-to half among all surveyed respondents emerged repeatedly across multiple variables studied here - appropriateness expanding such education interventions through enhancing degree-level courses ought help address these obstacles hampering routine involvement with adequate standardisation measures required ensuring better compliance rates overall especially amongst nursing cohorts globally." Conclusion: Despite favorable attitude towards ADER , there exist considerable gaps within obtained results owing various factors contributing them; thus developing requisite skillsets along training programs extending beyond basic clinical guidelines could be beneficial strategies supporting vigilante scientist endeavours geared achieving improved tracking communicate feedback

loop susceptible populations exposed drugs monitored systematically enabling timely response prevent cause lasting harm overall health infrastructure systems alike taken cognizant imperative stakeholder interests involved ultimately yielding positive gains everyone aerospace .

Introduction

The World Health Organization (WHO) defines an adverse drug reaction (ADR) as an unintended and harmful response to a drug, occurring at typical doses for the prevention, diagnosis or treatment of diseases or physiological modification [1]. ADRs continue to pose serious challenges in public health management due to multiple comorbidities, polypharmacy and new drugs entering the market. They are regarded as one of the major causes leading patients towards morbidity and mortality [2-4], accounting for 5%-10% hospital admissions nationwide[5][6] while increasing care costs by up to 20%, causing longer hospital stays by nearly nine percent [7]

PV, or pharmacovigilance, encompasses the science and actions involved in identifying, assessing, comprehending and preventing adverse effects as well as any other potential drug-related concerns [1]. While PV activities encompass various undertakings such as recognizing medication errors misusage/abuse of drugs , harmful interactions between different medicines along with counterfeit/substandard medications. The primary objective still remains reporting ADRs [8], even though PV systems established by many countries after thalidomide catastrophe focused on continuous monitoring of all clinical pharmaceutical products to generate alerts for newly emerging risks. However these frameworks' robustness is dependent solely on reported rates from healthcare providers[10]

Spontaneous ADR reporting serves as a crucial foundation for monitoring the benefit-to-risk ratio of approved medicines during post-marketing. This process helps to uncover any unexpected, severe or unknown adverse drug reactions that may not have surfaced during pre-market clinical trials or subsequent supervision efforts and enhances our understanding of potential medication risks [8,12]. Therefore it is an effective mechanism in identifying new rare serious events related to ADRs; however underreporting by healthcare providers remains one significant challenge towards this goal [14]. It has been estimated that only 10% of all suspected cases are reported which reinforces the need for greater awareness among medical practitioners regarding ADR prevention measures[15]

To enhance surveillance culture, it is crucial to educate all healthcare professionals on monitoring patients for drug-related difficulties and reporting any issues encountered. Along with physicians and pharmacists, nurses should take an active role in Pharmacovigilance (PV) activities and Adverse Drug Reaction (ADR) reporting. As they administer the majority of drugs in healthcare settings, nurses have a unique position to monitor patients' medication response while also being instrumental when intervening during ADR incidents. Therefore, integrating ADR reporting as part of their daily work responsibilities is ideal; training programs may be necessary towards achieving this goal successfully.

Nurses can significantly improve patient safety by engaging actively in ADR reporting leading to reduced costs associated with treatment complications arising from subsequent medical interventions. However, literature has shown that involvement among nursing staffs could still stand improvement regarding optimal contributions towards effective implementation of EADRS systems [16-22].

Numerous factors influence the frequency of ADR reporting, including national PV programs, regulations and healthcare providers' knowledge and attitudes [23]. Understanding the practices and perspectives that nurses hold on adverse drug reactions (ADR) is integral in developing strategies to enhance patient safety through improved reporting schemes. Therefore, this systematic review aims at examining reported barriers while identifying Nurses' and Doctor's perceptions towards pharmacovigilance (PV)and their engagement in ADR reports..

1. Methods

This review aimed to explore various observational studies related to ADRs [24, 25], and followed the PRISMA guidelines for systematic reviews and meta-analyses [25] in reporting its findings.

Furthermore, it was registered with PROSPERO under CRD42020209145 (accessible at https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD4202%200209145)..

The research team identified appropriate search keywords based on relevant literature and conducted a pilot search in general and specialized databases. To retrieve studies about Nurses' and Doctor's knowledge, attitudes, and practice toward PV and ADR reporting, the Boolean search method was used with specific keywords. The online databases of Web of Knowledge, MEDLINE, Embase, and Scopus were searched from January 2010 to October 2020 while cross-references from bibliographies were also examined to improve coverage. Eligibility criteria required observational studies including survey-based cross-sectional or cohort focusing on Nurses' and Doctor's knowledge regarding PV/ADR reporting across various healthcare settings which had been published in peer-reviewed journals; relevance not related to nursing or lacking concentration upon nurse-specific characteristics concerning these areas resulted in exclusion..

During the study selection process, each step of the systematic review as per the search process was carried out independently by three authors: AM, MSM and MM. The authors obtained article titles, abstracts and full texts during their search process which underwent screening. Results were shared via online discussions among them to decide on subsequent steps for conducting a thorough systematic review. In case of disagreements or diverging views about selecting particular studies in this procedure; another author would join these discussions until consensus is attained among all parties involved concerning inclusion criteria pertaining to selected studies in our research analysis project..

used to assess the quality of selected articles' research process and structure was EQUATOR (Enhancing the Quality and Transparency of Health Research) [26].

Table 1: General characteristics of the included studies.

Authors, year	Country	Study design/full-text appraisal score	Study setting	Sampling method	Sample size
Abdel-Latif and Abdel-Wahab [38]	Saudi Arabia	A cross-sectional questionnaire-based study/22 out of 32	9 hospitals	Random sampling	158
Abu Hammour et al. [40]	Jordan	A cross-sectional questionnaire-based study/24 out of 32	One hospital	Convenience sampling	214
Ahmed et al. [42]	Pakistan	A cross-sectional questionnaire-based study/17 out of 32	One hospital	Unclear	25
Al Rabayah et al. [41]	Jordan	A cross-sectional questionnaire-based study/17 out of 32	One cancer center	Unclear	154
AlShammari and Almoslem [39]	Saudi Arabia	A cross-sectional questionnaire-based study/21 out of 32	Nine hospitals	Random sampling	110
Bepari et al. [28]	India	A cross-sectional questionnaire-based study/18 out of 32	One hospital	Convenience sampling	64
Bogolubova et al. [32]	South Africa	A cross-sectional questionnaire-based study/24 out of 32	Six hospitals	Purposive sampling	183
Danekhu et al. [44]	Nepal	A descriptive, cross-sectional questionnaire-based study/26 out of 32	One hospital	Stratified random sampling	126
Dorji et al. [46]	Bhutan	A cross-sectional questionnaire-based study/21 out of 32	Four hospitals	Census sampling	257
Ekman et al. [47]	Sweden	A cross-sectional questionnaire-based study/25 out of 32	Nurses who are members of the Swedish Association of Health Professionals	Random sampling	453
Ergün et al. [35]	Turkey	A cross-sectional questionnaire-based study/16 out of 32	One hospital	Unclear	321
Ganesan et al. [29]	India	A cross-sectional questionnaire-based survey/18 out of 32	One hospital	Unclear	171

Gordhon and Padayachee [33]	South Africa	A cross-sectional questionnaire-based study/23 out of 32	One hospital	Stratified sampling	230
Güner and Ekmekci [36]	Turkey	A cross-sectional questionnaire-based study/20 out of 32	Online survey	Convenience sampling	67
Hanafi et al. [48]	Iran	A cross-sectional questionnaire-based study/22 out of 32	One hospital	Census sampling	224
John et al. [49]	United Arab Emirates	A cross-sectional questionnaire-based study/25 out of 32	One hospital and one research center	Census sampling	91
Rajalakshmi et al. [30]	India	A cross-sectional questionnaire-based study/15 out of 32	One hospital	Unclear	101
Santosh et al. [45]	Nepal	A cross-sectional questionnaire-based study/18 out of 32	Four hospitals	Unclear	135
Shamim et al. [43]	Pakistan	A cross-sectional questionnaire-based study/21 out of 32	Five hospitals and an orthopedics and medical institute	Unclear	69
Shanko and Abdela [50]	Ethiopia	A cross-sectional questionnaire-based study/26 out of 32	One hospital	Purposive sampling	230
Tandon et al. [31]	India	A retrospective observational, prospective cross-sectional study/18 out of 32	One hospital	Quota sampling	100
Terblanche et al. [34]	South Africa	A cross-sectional questionnaire-based study/21 out of 32	One hospital	Convenience sampling	77
Vural et al. [37]	Turkey	A cross-sectional questionnaire-based study/20 out of 32	One hospital	Census sampling	112

Table 2: The search strategy and results of different phases of the study.

Databases from 2010 to 2020	Total in each database	Title selection	Abstract selection	Full-text appraisal
MEDLINE	1702	12	10	7
Scopus	1529	6	3	1
Embase	794	31	14	11
Web of Science	1377	8	5	3
Manual search/backtracking references	223	5	1	1
Total of databases	5625	62	33	23

The cross-sectional study utilized the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines and Hawker et al.'s criteria, which considered research purpose, knowledge-based structure, methodology quality and process, conclusions and references [27]. The authors' appraisal tool scores from Table 1 were also taken into consideration. Additionally, their discussion helped make informed decisions regarding each study's importance and methodological quality for deciding whether to include or exclude studies during data analysis and synthesis..

The process of collecting and synthesizing data involved the creation of a table by the authors, which included various details such as author name, publication year, study location/design/sample size/setting. This also encompassed information regarding Nurses' and Doctor's knowledge, attitude and practices towards reporting PV & ADR along with barriers impeding ADR reporting. To ensure that this particular tabulation was effective in enabling gathering appropriate data from chosen studies; a pilot test took place comprising four studies conducted by the team themselves..

In order to simplify examination and comprehension, the proportion of affirmatory and precise replies (with reversed responses as needed) pertaining to nursing professionals' understanding, mindset, and conduct concerning PV and ADR reporting was evaluated. Afterwards, these positive percentages were combined together to calculate a median value with an interquartile range (IQR). Due to discrepancies in demographics surveyed, methodologies employed for analysis purposes, along with

diverse findings obtained from different research studies; conducting a meta-analysis was determined not feasible..

2. Results

Table 2 displays the outcomes of the database search process. Using predetermined keywords, a total of 5625 articles were obtained. After removing irrelevant and duplicate titles and conducting abstract and full-text reading phase, twenty-three studies were chosen for data analysis and synthesis. The selected articles' methodological quality was evaluated during the full-text appraisal phase, but none was deemed unacceptable based on theoretical conceptual framework or research design criteria that led to exclusion from this study's review selection processes.

.Figure 1 depicts the flow chart of the research assembled in compliance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, obtainable at this location.

Table 1 displays the general characteristics of the selected studies (n=23). All publications were written in English and released between 2010 to 2020. The included studies originated from various countries, including four from India [28-31], three each from South Africa [32-34] and Turkey [35-37], two apiece from Saudi Arabia [38,39], Jordan[40,41], Pakistan[42,43] and Nepal[44 &45]. One study was sourced per Bhutan for this research work.[46]; one publication each came out Sweden,[47] Iran,[48] UAE ,[49]. The notation for Ethiopia is [50].

With the exception of one study utilizing a retrospective observational, prospective cross-sectional approach [31], all studies utilized a questionnaire-based cross-sectional design. The majority of studies (excluding three: 36, 41, and 47) were predominantly conducted in hospital settings with participation from various healthcare professions; limited involvement was observed for nurses in only a few instances [30,37,47-49]. In total across selected studies there were 3672 nurse participants. Evaluation tools commonly assessed knowledge as well as attitudes and practices regarding pharmacovigilance and adverse drug reaction reporting.

The main results of this review have been provided distinctively for Nurses' and Doctor's level of knowledge, attitude, behavior in relation to PV activities and ADR reporting as well as their perceived barriers.

The assessment of Nurses' and Doctor's understanding of PV activities and ADR reporting involved six points: defining PV, defining ADRs, familiarity with ADR reporting, recognition of the form for documenting ADR reports, awareness about the national system on PV and having undergone training related to these topics. However, four studies examined in this analysis did not provide data pertaining to knowledge-based questions [30, 31 ,41 ,47].had a median percentage of 34.0% (IQR: 25.3-49.5) in their knowledge and understanding of ADR and PV definitions.

Respectively, 74.1% (with an interquartile range of 55.2-81.2) had certain knowledge about ADR reporting while half of the nurses (50%) demonstrated understanding with an IQR ranging from 44.2 to 82.6; surprisingly only a small percentage of them- merely26 .3%, possessed awareness concerning ADR reporting form and this was found within an IQR bracketing between16 .6 -54 .6%. Moreover, it transpired that there was significantly low level of familiarity regarding national pharmacovigilance system as just31 · 6 %(with Arranging from15 –5to50 -). Approximately39 %of these medical personnel appear already trained towards PV and AD Reporting.(IQR Accordingly...:4 ;07 –33 - top end equals32).

(Table 3).

Table 3: Nurses ' knowledge,attitude,andpracticetowardpharmacovigilanceandADRreporting.

Author	Domains																			
	Knowledge(%yes)							Attitude(%yes)						Practice(%yes)						
	PV definition	ADR definition	Knowledge ofADR reporting	Awareness ofADR reporting form	Awareness ofthe national PVsystem	Receiving training aboutPV andADR reporting	ADRreporting importantfor patient/medicine safety	ADR reportingisa professional commitment	ADR reporting is necessary	ADR reporting shouldbe mandatory	ADR reporting shouldbe voluntary	Fearof legal liability following ADR reporting	Advising patients on possible ADR	Historyof encountering apatientwith ADR	History ofADR reporting
Abdel-Latif andAbdel-Wahab [38]			99.3		27.2								73.4		
AbuHammour etal.[40]	36.0	79.0	50.0				89.7	74.8				34.6			
Ahmedetal.[42]			60.0	28.0										72.0	72.0
AlShammariand Almoslem[39]					16.0					70.0					21.0
Beparietal.[28]	26.6					89.1		4.7	45.3						
Bogolubova etal.[32]				23.6	68.0	81.4			76.6						21.5
Danekhuetal.[44]	46.0	54.8		6.3	14.3		59.5								
Dorjietal.[46]			55.6	85.2											
Ekmanetal.[47]															14.0
Erginetal.[35]	60.0				36.0		75.0				91.0			41.0	21.0
Ganesanetal.[29]				54.0	36.0	5.0		67.0							25.0
Gordhonand Padayachee[33]			46.4					88.9							
Günerand Ekmekci[36]						22.4							43.3		
Hanafi etal.[48]	32.1		34.8	20.1								37.1			
Johnetal.[49]		83.5			49.5		87.9							82.4	8.8
Rajalakshmi et al.[30]							90.0					50.5	39.6	73.2	28.7
Santoshetal.[45]			80.0		57.8			77.8	63.0						36.3
Shamimetal.[45]			42.0	24.6	10.1	55.1		68.1						62.3	66.7
Shankoand Abdela[50]	21.7			56.5	52.6			58.2			72.2		63.9	44.3	58.2
Tandonetal.[31]															4.1
Terblanche etal.[34]						1.3		78.0		83.1	6.5				8.0
Vuraletal.[37]		74.1	50.0						70.5						8.0
Median(IQR)	34.0 (25.3-49.5)	74.1 (55.2-81.2)	50.0 (44.2-82.6)	26.3 (16.6-54.6)	31.6 (15.5-50.2)	38.7 (4.0-73.2)	84.6 (71.1-89.7)	71.4 (60.4-77.9)	66.7 (49.7-75.0)	76.5	72.2 (39.3-81.6)	37.1 (35.8-43.8)	53.6 (40.5-71.0)	67.1 (43.4-75.5)	21.2 (8.6-41.7)

ADR:adversedrugreaction;IQR:inter quartilerange;PV:pharmacovigilance.

Table BarrierstowardADRreportingbythenurses.

	BarrierstoADRreporting(%)											
Author,year	Lackof access toADR forms	Lackof time	Lackof knowledge/ training	Lackof motivation/ feedback	Confidentiality/ legal problem	Uncertaintyin diagnosis	Lackof information provided bypatients	Lackof promotion bythe authorities	Difficulty in filling theform	Lackof importance	Notmy responsibility	Well known ADRs
Abu Hammour etal.[40]		57.053.0	4:		34.6		68.248.1			25.2		
Ahmed etal.[42]			36.0			52.0			36.020.0			
AlRabayah etal.[41]	7.027.033.019.0					2.0				6.0	17.0	
Bepari etal.[28]			12.5		9.4	23.4				54.7		
Danekhu etal.[44]		0.844.4					15.938.9					
Ekman etal.[47]	39.030.051.0					37.0						56.0
Ergün etal.[35]	38.040.052.0				53.0	27.0			36.036.0			
Günerand Ekmekci[36]		3.010.5				14.9					14.9	
John etal.[49]		33.045.1				49.5						31.9
Rajalakshmi etal.[30]			50.416.8			32.6				18.8		
Shamim etal.[43]	59.455.049.2					26.1						
Tandon etal.[31]			91.0			82.0			88.091.0			
Mqdian IQR	38.5 (14.7-50.2)	31.5 (9.0-51.2)	47.1 (33.7-51.7)	17.9	34.6 (22.0-43.8)	29.8 (21.2-50.1)	42.043.536.0			25.2 (18.8-57.7)	15.943.9	

ADRs:adversedrugreactions.

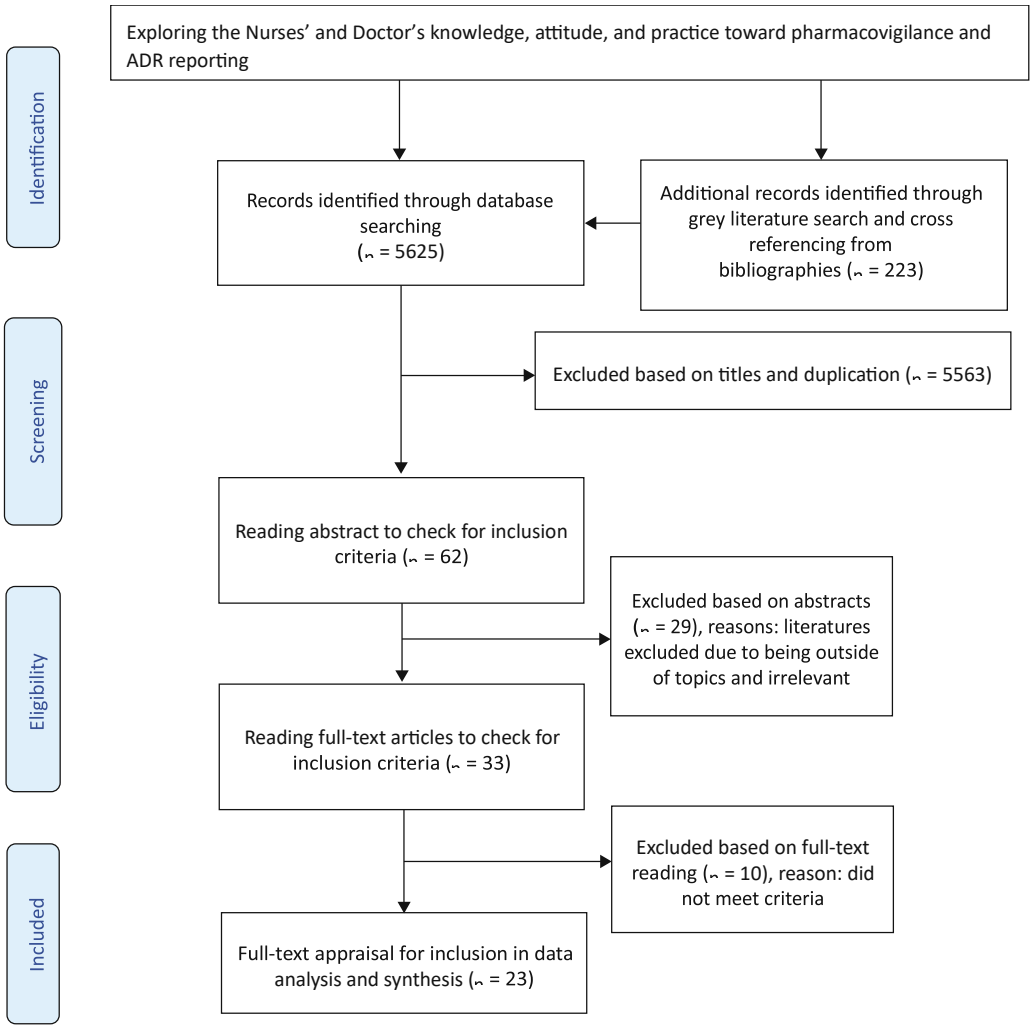

Figure 1: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA (available here)).

Assessment of Nurses' and Doctor's Attitudes towards PV Activities and ADR Reporting included six factors: recognition of the importance of ADR reporting for patient safety, commitment to professional responsibility via ADR reporting, acknowledgement that it is necessary to report any adverse reactions caused by medication use, determining whether such reports are mandated or voluntary in nature and assessing legal liabilities which may arise following an instance. Out of 23 studies analyzed within this review process; seven did not provide information on attitude domain items developed therein (31, 36, 38 ,41 ,42 ,46 &47).

The results showed that a majority of nurses, 84.6% (IQR: 71.1-89.7), recognized the importance of ADR reporting for patient and medicine safety. Additionally, many felt it was a professional obligation with 71.4% (IQR:60.-77-9) seeing it as such and an even larger percentage at 76.5 % believing mandatory requirements should be put in place for reporting. As far legal concern stemming from reporting adverse effects were concerned; fear existed amongst only about less than half or 37.l% (lQR :35.B -43 .8%)of respondents seen Table3).

.

The study evaluated the practice of ADR reporting among nurses through three indicators: educating patients about potential adverse reactions, prior experience with an ADR incident while treating a patient, and past participation in ADR reporting. However, information regarding these measures was not provided by six studies included in the review (references 28, 33, 41,44 ,46 and 48).

A study revealed that 53.6% (IQR: 40.5-71.0) of the nurses provided guidance to patients about potential ADRs, while only a fraction of them - 21.2% (IQR:8 .6-41 .7)- had reported an ADR, despite encountering such instances in clinical practice at a rate of as high as up to67.l%(I QR :43 .4-75·5)(Refer Table3).

understanding regarding the importance of reporting (42.2%), fear of legal consequences and workload pressure (39.1% each), lack of time (37%) were other commonly reported barriers to ADR Reporting among nurses in the included studies. Similarly, six out of 23 studies provided data on PV barriers faced by nurses [31, 35-38, 41]. The most common barrier was again the lack of knowledge/training (median:52%). Other reasons cited for under-reporting include insufficient understanding about regulations surrounding PV activities(36%), heavy workloads(33%)and a perception that it is not partof their job responsibility.

The next set of barriers to ADR reporting, as shown in Table 4, included patients providing information (42%), limited availability of ADR forms (38.5%), issues regarding confidentiality and legality (34.6%), shortage of time (31.5%) and uncertainty related to diagnosis(29.8%). Other factors were perceived low significance for reporting ADRs by some individuals(25.2%%), lack of motivation or feedback from others(17.%9)and nurses perceiving it not their responsibility report about the adverse effects on drugs.(15..%)

3. Discussion

PV and ADR reporting are significant health concerns globally, with healthcare professionals' knowledge, attitudes, and practices being influential factors. In this systematic review, Nurses' and Doctor's understanding of PV and ADR reporting was examined alongside their attitudes towards it along with the barriers they face when doing so.

Our review has revealed that Nurses' and Doctor's knowledge regarding PV definition, ADR reporting, awareness of the national PV system and ADR reporting forms is below optimal levels. In fact, only 34% of nurses had appropriate understanding of PV definitions; whereas their awareness on pharmacovigilance systems was limited to just over a quarter (31.6%). Our analysis also demonstrated how lack of knowledge strongly affects adverse drug reaction (ADR) reporting while being one key impediment in its implementation [52]. This scenario resonates with another systematic study undertaken across India where an average percentage of around 55.5% healthcare professionals were totally unaware about this program [53]. Similarly,in Ethiopia-based reviews it emerged that among health workers surveyed there existed suboptimal level for both overall awareness at more than two-fifth (~45%) besides actual familiarity conditions stood as low (~41%) towards Adverse Drug Reaction happening[s] therein[54]. Given these findings,it can be concluded suggesting some pragmatic policy measures need introduction aimed at augmenting nursing staff's comprehensive comprehension vis-a-vis National Pharmacovigilance programs & ADCs filing process etc.,..

Based on our review results, nurses displayed better attitudes than knowledge and practice when it came to reporting adverse drug reactions (ADRs) and pharmacovigilance (PV). Despite 71.4% of nurses recognizing ADR reporting as a professional responsibility, their limited understanding of the crucial role they play in PV activities was identified as one reason for low engagement with ADRs [55]. Additionally, over two-thirds of nursing staff emphasized the importance of safeguarding patient/medicine safety through appropriate ADR reporting measures

Nurses and resident doctors held similar views on ADR reporting, with almost equal support for mandatory or voluntary participation. However, studies have shown that relying solely on spontaneous reporting programs can result in low levels of ADR submissions, leading to potential patient harm due to delayed signal detection and underreporting [56][57]. The research conducted by Rehan et al. highlighted the opinion of over half of nurses and resident doctors who believed that PV activities should be made mandatory as a means to enhance patient safety[58]. Another study demonstrated how the absence of such regulations impacted medical staff confidence when clinically encountered with an adverse drug reaction [59], but this is complicated further by subjectivity among healthcare providers regarding accurate identification criteria for an incident requiring submission

through obligatory channels. Therefore it may be beneficial to provide clear guidelines highlighting these benefits (such as increasing medication knowledge) alongside making where referral methods compulsory to help facilitate effective communications between clinicians about any associated risks identified during treatment processes.[60]

Our review has shown that although 67.1% of nurses came across patients who experienced ADRs during their clinical practice, only a small percentage (21.2%) reported these occurrences. Various studies have indicated that many nurses are not adequately trained to recognize and report ADRs [16, 61]. These findings align with Bhagavathula et al.'s systematic review which found that the majority (74.5%) of Indian healthcare professionals including nurses do not report any cases of ADRs [53]. Another systematic review discovered poor reporting practices among doctors where just over half (53.6%) inform patients about possible side effects from medication use [62]. Prior research suggests involving patients in monitoring medications as well as promoting patient safety activities is fundamental for increasing hospitalization safety measures[63] . Thusly, raising awareness amongst patients regarding ADR identification and having them become more involved in medication management could improve reporting rates significantly..

One of the primary issues plaguing PV programs is the underreporting of ADRs, as noted by nurse perspectives in this review. The lack of knowledge and training emerged as a crucial barrier that hindered effective reporting of ADRs. This finding aligns with Varallo et al.'s systematic review where inadequate understanding about completing ADR forms was identified as one among several contributing factors for dwindling reports from nurses [64]. Another systematic study further indicated how some Nurses' and Doctor's misconception regarding their limited pharmacology knowledge restrict them from identifying potential cases leading to reduced incidence information captured [55]. Shockingly, only 38.7% reported receiving prior instruction on both PV practices and handling an adverse response case during treatments or medication usage instances; research shows that providing higher education along with requisite training significantly influences greater deployment concerning identifying possible nuclear responses while carrying out therapeutic interventions/medications administration overall [65-68].

Through nursing education programs, in-service training and clinical experience, nurses have the opportunity to gain knowledge on pharmacology. It is suggested that offering degree-level education for these healthcare professionals as well as providing appropriate educational strategies like high-fidelity simulation, problem-based learning, role modeling, reflection and discussion sessions along with interprofessional education may assist in developing necessary competencies and skills linked to reporting adverse drug reactions (ADRs) & maintaining patient safety [references: 69-71].

Numerous studies have indicated that insufficient time [72] and inadequate knowledge regarding the appropriate reporting procedures for suspected adverse drug reactions (ADRs) [73] are widely recognized issues [56]. Furthermore, our study's findings align with evidence indicating that ADR underreporting by healthcare professionals can also be attributed to factors such as a lack of acknowledgement about the significance of these reports [74], uncertainty surrounding ADR diagnosis[75,76], legal concerns or fears related to consequences associated with reporting an issue[77], challenges in navigating report forms[78], and limited accessibility to necessary documentation regarding suspected side effects which has been further supported via additional research.

Enhancing and adjusting these characteristics within healthcare environments may boost the frequency of ADR reporting..

Strengths and Limitations: Our study stands out as the first to globally evaluate Nurses' and Doctor's knowledge, attitudes, and practice towards PV activities and ADR reporting by analyzing 23 studies. Despite this advantage, we acknowledge certain limitations in our research analysis. We only considered studies that exclusively discussed nurses; hence those involving other healthcare professionals were excluded unless a separate sub-analysis was conducted for nursing staff's views on these topics. Also of significance is the restriction imposed concerning language- including English-only works ultimately narrowed down our sources pool considerably. Nevertheless utilising

international search engines with multi-dimensional keywords aided us greatly compiling valuable insights into worldwide perspectives about nurse practitioners' compliance regarding pharmacovigilance practices & adverse drug reaction reports. Furthermore ,to minimize bias during review process intense collaborations within author cohesion comprised close scrutiny& critical considerations allowing reliable outcomes

.

4. Conclusion

This review examined Nurses' and Doctor's knowledge, attitudes, and practice regarding pharmacovigilance (PV) and adverse drug reaction (ADR) reporting. Despite having a positive attitude towards PV and ADR reporting, their competence in these areas was not optimal due to inadequate training. The most prominent obstacle for effective ADR reporting among nurses was the lack of knowledge/training. Given that they play an essential role in PV activities and ADR monitoring, it is crucial to provide them with adequate education at various levels to enhance this competency continuously. To increase the effectiveness of ADR reports from nurses, several interventions can be implemented such as providing access to simplified electronic forms for submitting online reports along with direct motivation through feedback mechanisms or facilitated communication between medical staffs involved so they can work together more effectively on these issues. Further qualitative/quantitative investigations are necessary into how we may engage front-line healthcare providers even more actively when addressing challenges around identifying potential harms resulting from medications.

References

1. Adverse Drug Reaction Reporting, Lee B. Murdaugh, RPh, PhD 1972.
2. Muaed Jamal Alomar, "Factors affecting the development of adverse drug reactions (Review article)," *National Library of Medicine.*, 2014.
3. Rostam Osanlou, Lauren Walker, Dyfrig A Hughes, Girvan Burnside, and Munir "Adverse drug reactions, multimorbidity and polypharmacy: a prospective analysis of 1 month of medical admissions" *National Library of Medicine.*, 2022.
4. Jesús Ruiz-Ramos., "Drug-Related Problems in Elderly Patients Attended to by Emergency Services," *Journal of Clinical Medicine.*, 2023.
5. G. Baker, P. Norton, V. Flintoft et al., "The Canadian Adverse Events Study: the incidence of adverse events among hospital patients in Canada," *Canadian Medical Association Journal.*, vol. 170, no. 11, pp. 1678–1686, 2004.
6. C. Kongkaew, P. R. Noyce, and D. M. Ashcroft, "Hospital admissions associated with adverse drug reactions: a systematic review of prospective observational studies," *Annals of Pharmacotherapy.*, vol. 42, no. 7-8, pp. 1017–1025, 2008.
7. https://www.aha.org/costsofcaring, "The Financial Stability of America's Hospitals and Health Systems Is at Risk as the Costs of Caring Continue to Rise," *April 2023*.
8. M.A. Hadi, C. F. Neoh, R. M. Zin, M. E. Elrggal, and
9. E. Cheema, "Pharmacovigilance: pharmacists' perspective on spontaneous adverse drug reaction reporting," *Integrated pharmacy research & practice.*, vol. Volume 6, pp. 91–98, 2017.
10. M. D. Rawlins, "Pharmacovigilance: paradise lost, regained or postponed?: the William withering lecture 1994," *Journal of the Royal College of Physicians of London.*, vol. 29, no. 1, pp. 41–49, 1995.
11. M. Suyagh, D. Farah, and R. A. Farha, "Pharmacist's knowledge, practice and attitudes toward pharmacovigilance and adverse drug reactions reporting process," *Saudi Pharmaceutical Journal*, vol. 23, no. 2, pp. 147–153, 2015.
12. J. Lexchin, "Is there still a role for spontaneous reporting of adverse drug reactions?," *Canadian Medical Association Journal.*, vol. 174, no. 2, pp. 191-192, 2006.

13. J. Sultana, P. Cutroneo, and G. Trifirò, "Clinical and economic burden of adverse drug reactions," *Journal of pharmacology & pharmacotherapeutics.*, vol. 4, Suppl 1, pp. S73–S77, 2013.
14. T. T. le, T. T. H. Nguyen, C. Nguyen et al., "Factors associated with spontaneous adverse drug reaction reporting among healthcare professionals in Vietnam," *Journal of Clinical Pharmacy and Therapeutics.*, vol. 45, no. 1, pp. 122–127, 2020.
15. A. De Angelis, A. Giusti, S. Colaceci, E. Vellone, and R. Alvaro, "Nurses' and Doctor's reporting of suspect adverse drug reactions: a mixedmethods study," *Annali dell'Istituto superiore di sanita.*, vol. 51, no. 4, pp. 277–283, 2015.
16. H. H. Ampadu, J. Hoekman, M. L. de Bruin et al., "Adverse drug reaction reporting in Africa and a comparison of individual case safety report characteristics between Africa and the rest of the world: analyses of spontaneous reports in VigiBase®," *Drug Safety*, vol. 39, no. 4, pp. 335–345, 2016.
17. Danae F. Sfantou, "Importance of Leadership Style towards Quality of Care Measures in Healthcare Settings: A Systematic Review" *National Library of Medicine 2017 Dec; 5(4): 73*.
18. Greta G. Cummings, "The essentials of nursing leadership: A systematic review of factors and educational interventions influencing nursing leadership," *International Journal of Nursing Studies*, 2013.
19. T. Schutte, R. van Eekeren, M. Richir et al., "The adverse drug reaction reporting assignment for specialist oncology nurses: a preliminary evaluation of quality, relevance and educational value in a prospective cohort study," *Naunyn-Schmiedeberg's archives of pharmacology.*, vol. 391, no. 1, pp. 17–26, 2018.
20. A. D. Angelis, L. Pancani, P. Steca et al., "Testing an explanatory model of Nurses' and Doctor's intention to report adverse drug reactions in hospital settings," *Journal of Nursing Management.*, vol. 25, no. 4, pp. 307–317, 2017.
21. N. Haider and F. Mazhar, "Factors associated with underreporting of adverse drug reactions by nurses: a narrative literature review," *Saudi Journal for Health Sciences.*, vol. 6, no. 2, p. 71, 2017.
22. Nadia Hachoumi "Health sciences lifelong learning and professional development in the era of artificial intelligence,"
23. *International Journal of Medical Informatics.*, Volume 178, October 2023.
24. D. Mendes, C. Alves, and M. F. Batel, "Nurses' and Doctor's spontaneous reporting of adverse drug reactions: expert review of routine reports," *Journal of Nursing Management*, vol. 22, no. 3, pp. 322–330, 2014.
25. S. K. Gupta, R. P. Nayak, R. Shivaranjani, and S. K. Vidyarthi, "A questionnaire study on the knowledge, attitude, and the practice of pharmacovigilance among the healthcare professionals in a teaching hospital in South India," *Perspectives in clinical research*, vol. 6, no. 1, pp. 45–52, 2015.
26. E. Aromataris and A. Pearson, "The systematic review," *The American Journal of Nursing*, vol. 114, no. 3, pp. 53–58, 2014.
27. A. Liberati, D. G. Altman, J. Tetzlaff et al., "The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration," *Journal of clinical epidemiology*, vol. 62, no. 10, pp. e1–e34, 2009.
28. "Strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies," 2019 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2034723/. 2007 Oct 20.
29. S. Hawker, S. Payne, C. Kerr, M. Hardey, and J. Powell, "Appraising the evidence: reviewing disparate data systematically," *Qualitative health research*, vol. 12, no. 9, pp. 1284– 1299, 2002.
30. A. Bepari, S. K. Niazi, I. Rahman, and A. M. Dervesh, "The comparative evaluation of knowledge, attitude, and practice of different health-care professionals about the pharmacovigilance system of India," *Journal of Advanced Pharmaceutical Technology & Research.*, vol. 10, no. 2, pp. 68–74, 2019.

31. S. Ganesan, G. Vikneswaran, K. C. Reddy, D. Subrahmanyam, and C. Adithan, "A survey on knowledge, attitude and practice of pharmacovigilance towards adverse drug reactions reporting among doctors and nurses in a tertiary care hospital in South India," *Journal of Young Pharmacists*, vol. 8, no. 4, pp. 471–476, 2016.
32. R. Rajalakshmi, B. V. Devi, T. Prasad, S. Swetha, and B. Dharini, "Knowledge, attitude and practice towards pharmacovigilance and adverse drug reaction reporting among nurses in a tertiary care hospital, Tirupati," *International Journal of Pharmaceutical and Clinical Research*, vol. 9, no. 11, pp. 683–689, 2017.
33. R Rajalakshmi, "Knowledge, Attitude and Practice Towards Pharmacovigilance and Adverse Drug Reaction Reporting Among Doctors' in A Tertiary Care Hospital, Tirupati," *Indian journal of pharmacology*, November 2017, https://www.researchgate.net/
34. S. Bogolubova, N. Padayachee, and N. Schellack, "Knowledge, attitudes and practices of nurses and pharmacists towards adverse drug reaction reporting in the South African private hospital sector," *Health SA Gesondheid: Journal of Interdisciplinary Health Sciences*, vol. 23, pp. 1–9, 2018.
35. Y. Gordhon and N. Padayachee, "Evaluating the knowledge, attitudes and practices of healthcare workers towards adverse drug reaction reporting at a public tertiary hospital in Johannesburg," *International Journal of Africa Nursing Sciences*, vol. 12, article 100191, 2020.
36. A. Terblanche, J. C. Meyer, B. Godman, and R. S. Summers, "Knowledge, attitudes and perspective on adverse drug reaction reporting in a public sector hospital in South Africa: baseline analysis," *Hospital practice.*, vol. 45, no. 5, pp. 238–245, 2017.
37. Y. Ergün, T. B. Ergün, E. Toker, E. Ünal, and M. Akben, "Knowledge attitude and practice of Turkish health professionals towards pharmacovigilance in a university hospital," *International health.*, vol. 11, no. 3, pp. 177–184, 2019.
38. M. D. Güner and P. E. Ekmekci, "Healthcare professionals' pharmacovigilance knowledge and adverse drug reaction reporting behavior and factors determining the reporting rates," *Journal of drug assessment.*, vol. 8, no. 1, pp. 13–20, 2019.
39. F. Vural, S. Çiftçi, and B. Vural, "The knowledge, attitude and behaviours of nurses about pharmacovigilance, adverse drug reaction and adverse event reporting in a state hospital," *Northern clinics of Istanbul*, vol. 1, no. 3, pp. 147–152, 2014.
40. M. M. Abdel-Latif and B. A. Abdel-Wahab, "Knowledge and awareness of adverse drug reactions and pharmacovigilance practices among healthcare professionals in Al-Madinah AlMunawwarah, Kingdom of Saudi Arabia," *Saudi pharmaceutical journal*, vol. 23, no. 2, pp. 154–161, 2015.
41. T. M. AlShammari and M. J. Almoslem, "Knowledge, attitudes & practices of healthcare professionals in hospitals towards the reporting of adverse drug reactions in Saudi Arabia: a multicentre cross sectional study," *Saudi pharmaceutical journal*, vol. 26, no. 7, pp. 925–931, 2018.
42. K. Abu Hammour, F. El-Dahiyat, and F. R. Abu, "Health care professionals knowledge and perception of pharmacovigilance in a tertiary care teaching hospital in Amman, Jordan," *Journal of Evaluation in Clinical Practice*, vol. 23, no. 3, pp. 608–613, 2017.
43. A. A. Al Rabayah, E. M. Hanoun, and R. H. Al Rumman,
44. "Assessing knowledge, attitude, and practices of health-care providers toward pharmacovigilance and adverse drug reaction reporting at a comprehensive cancer center in Jordan," *Perspectives in Clinical Research*, vol. 10, no. 3, pp. 115–120, 2019.
45. A. Ahmed, M. Yousuf, A. A. Nisar-Ur-RAHMAN, A. Ayaz, K. UNAR, and M. RIZWAN, "Evaluations of adverse drug reaction reporting among healthcare professionals in a tertiary care hospital at north part of Sindh Pakistan," *Latin American Journal of Pharmacy*, vol. 36, no. 1, pp. 37–43, 2017.

46. S. Shamim, S. M. Sharib, S. M. Malhi et al., "Adverse drug reactions (ADRS) reporting: awareness and reasons of underreporting among health care professionals, a challenge for pharmacists," *Springer Plus*, vol. 5, no. 1, p. 1778, 2016.
47. K. Danekhu, S. Shrestha, S. Aryal, and P. R. Shankar, *Healthcare professionals' knowledge and perception of adverse drug reaction reporting and pharmacovigilance in a tertiary care teaching hospital of Nepal*, Hospital Pharmacy, 2019.
48. K. Santosh, P. Tragulpiankit, I. R. Edwards, and S. Gorsanan, "Knowledge about adverse drug reactions reporting among healthcare professionals in Nepal," *International journal of risk & safety in medicine*, vol. 25, no. 1, pp. 1–16, 2013.
49. C. Dorji, P. Tragulpiankit, A. Riewpaiboon, and T. Tobgay, "Knowledge of adverse drug reaction reporting among healthcare professionals in Bhutan: a cross-sectional survey," *Drug safety.*, vol. 39, no. 12, pp. 1239–1250, 2016.
50. E. Ekman, G. Petersson, S. Tågerud, and M. Bäckström, "Awareness among nurses about reporting of adverse drug reactions in Sweden," *Drug, Healthcare and Patient Safety*, vol. 4, pp. 61–66, 2012.
51. S. Hanafi, H. Torkamandi, A. Hayatshahi, K. Gholami, and M. Javadi, "Knowledge, attitudes and practice of nurse regarding adverse drug reaction reporting," *Iranian journal of nursing and midwifery research.*, vol. 17, no. 1, pp. 21–25, 2012.
52. L. J. John, M. Arifulla, J. J. Cheriathu, and J. Sreedharan, "Reporting of adverse drug reactions: an exploratory study among nurses in a teaching hospital, Ajman, United Arab Emirates," *DARU: Journal of Pharmaceutical Sciences.*, vol. 20, no. 1, p. 44, 2012.
53. H. Shanko and J. Abdela, "Knowledge, attitudes, and practices of health care professionals toward adverse drug reaction reporting in Hiwot Fana Specialized University Hospital, Harar, eastern Ethiopia: a cross-sectional study," *Hospital Pharmacy*, vol. 53, no. 3, pp. 177–187, 2018.
54. S. A. Khan, C. Goyal, N. Chandel, and M. Rafi, "Knowledge, attitudes, and practice of doctors to adverse drug reaction reporting in a teaching hospital in India: an observational study," *Journal of Natural Science, Biology, and Medicine*, vol. 4, no. 1, pp. 191–196, 2013.
55. A. Vallano, G. Cereza, C. Pedròs et al., "Obstacles and solutions for spontaneous reporting of adverse drug reactions in the hospital," *British journal of clinical pharmacology.*, vol. 60, no. 6, pp. 653–658, 2005.
56. A. S. Bhagavathula, A. A. Elnour, S. Q. Jamshed, and A. Shehab, "Health professionals' knowledge, attitudes and practices about pharmacovigilance in India: a systematic review and meta-analysis," *Plo S one*, vol. 11, no. 3, article e0152221, 2016.
57. A. D. Hailu and S. A. Mohammed, "Adverse drug reaction reporting in Ethiopia: systematic review," *Bio Med Research International*, vol. 2020, article 8569314, pp. 1–12, 2020.
58. Morrison Asiamah, "Spontaneous reporting of adverse drug reaction among health professionals in Ghana", Pub Med Central ., Published online 2022 Jan 20.
59. S. Palaian, M. I. Ibrahim, and P. Mishra, "Health professionals' knowledge, attitude and practices towards pharmacovigilance in Nepal," *Pharmacy practice*, vol. 9, no. 4, pp. 228–235, 2011.
60. E. Hristov, S. Ognyanov, T. Deliyski et al., "Effect of pharmacist involvement on patient reporting of adverse drug reactions in Bulgaria," *Journal of Advanced Research in Pharmaceutical Sciences and Pharmacology Interventions*, vol. 2, no. 2, pp. 1– 6, 2019.
61. H. Rehan, R. K. Sah, and D. Chopra, "Comparison of knowledge, attitude and practices of resident doctors and nurses on adverse drug reaction monitoring and reporting in a tertiary
62. care hospital," *Indian journal of pharmacology.*, vol. 44, no. 6, pp. 699–703, 2012.
63. J. Liu, Z. Zhou, S. Yang et al., "Factors that affect adverse drug reaction reporting among hospital pharmacists in Western China," *International Journal of Clinical Pharmacy*, vol. 37, no. 3, pp. 457–464, 2015.
64. S. Gautron, J. Wentzell, S. Kanji, T. Nguyen, D. Kobewka, and D. E. Mac, "Characterization of serious adverse drug reactions in hospital to determine potential implications of mandatory reporting," *The Canadian journal of hospital pharmacy*, vol. 71, no. 5, pp. 316–323, 2018.

65. A. De Angelis, S. Colaceci, A. Giusti, E. Vellone, and R. Alvaro, "Factors that condition the spontaneous reporting of adverse drug reactions among nurses: an integrative review," *Journal of nursing management.*, vol. 24, no. 2, pp. 151–163, 2016.
66. A. R. Abubakar, N. B. Simbak, and M. Haque, "A systematic review of knowledge, attitude and practice on adverse drug reactions and pharmacovigilance among doctors," *Journal of Applied Pharmaceutical Science.*, vol. 4, no. 10, pp. 117–127, 2014.
67. M. Vaismoradi, S. Jordan, and M. Kangasniemi, "Patient participation in patient safety and nursing input–a systematic review," *Journal of clinical nursing.*, vol. 24, no. 5-6, pp. 627– 639, 2015.
68. F. R. Varallo, S. O. P. Guimarães, S. A. R. Abjaude, and P. C. Mastroianni, "Causes for the underreporting of adverse drug events by health professionals: a systematic review," *Revista da Escola de Enfermagem da USP*, vol. 48, no. 4, pp. 739–747, 2014.
69. T. Dilles, R. V. Stichele, B. Van Rompaey, L. Van Bortel, and M. Elseviers, "Nurses' and Doctor's practices in pharmacotherapy and their association with educational level," *Journal of advanced nursing.*, vol. 66, no. 5, pp. 1072–1079, 2010.
70. G. Cereza, A. Agustí, C. Pedrós et al., "Effect of an intervention on the features of adverse drug reactions spontaneously reported in a hospital," *European journal of clinical pharmacology.*, vol. 66, no. 9, pp. 937–945, 2010.
71. D. Stewart, K. Mac Lure, V. Paudyal, C. Hughes, M. Courtenay, and J. McLay, "Non-medical prescribers and pharmacovigilance: participation, competence and future needs," *International Journal of Clinical Pharmacy*, vol. 35, no. 2, pp. 268–274, 2013.
72. M. Bäckström, E. Ekman, and T. Mjörndal, "Adverse drug reaction reporting by nurses in Sweden," *European journal of clinical pharmacology.*, vol. 63, no. 6, pp. 613–618, 2007.
73. M. E. Ndosi and R. Newell, "Nurses' and Doctor's knowledge of pharmacology behind drugs they commonly administer," *Journal of clinical nursing.*, vol. 18, no. 4, pp. 570–580, 2009.
74. M. Vaismoradi, S. Jordan, F. Vizcaya-Moreno, I. Friedl, and M. Glarcher, "PRN medicines optimization and nurse education," *Pharmacy.*, vol. 8, no. 4, p. 201, 2020.
75. A. Mardani, P. Griffiths, and M. Vaismoradi, "The role of the nurse in the management of medicines during transitional care: a systematic review," *Journal of multidisciplinary healthcare*, vol. Volume 13, pp. 1347–1361, 2020.
76. Lavina Prashar, "Inadequate Knowledge and Practice of Pharmacovigilance affecting Adverse Drug Reaction Reporting by Health Professionals in Private Healthcare Facilities in Lusaka, Zambia," *ResearchGate*, March 2020
77. C. K. Desai, G. Iyer, J. Panchal, S. Shah, and R. Dikshit, "An evaluation of knowledge, attitude, and practice of adverse drug reaction reporting among prescribers at a tertiary care hospital," *Perspectives in Clinical research*, vol. 2, no. 4, pp. 129–136, 2011.
78. M. Bisht, S. Singh, and D. Dhasmana, "Effect of educational intervention on adverse drug reporting by physicians: a cross-sectional study," *International Scholarly Research Notices.*, vol. 2014, article 259476, pp. 1–8, 2014.
79. L. Hazell and S. A. Shakir, "Under-reporting of adverse drug reactions," *Drug safety*, vol. 29, no. 5, pp. 385–396, 2006.
80. E. Lopez-Gonzalez, M. T. Herdeiro, and A. Figueiras, "Determinants of under-reporting of adverse drug reactions," *Drug safety.*, vol. 32, no. 1, pp. 19–31, 2009.
81. C. Palleria, C. Leporini, S. Chimirri et al., "Limitations and obstacles of the spontaneous adverse drugs reactions reporting: two "challenging" case reports," *Journal of pharmacology & pharmacotherapeutics.*, vol. 4, Suppl 1, pp. S66–S72, 2013.
82. Dorkasi L. Mwakawanga, "Pharmacovigilance and Adverse Drug Reactions Reporting: Healthcare Providers' Experiences from Southern Highland Tanzania," *Adv Pharmacol Pharm Sci. 2023*.