

# A Systematic Review of Knowledge, Attitude, Practice and the Associated Factors of Medication Error among Registered Nurses

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## Research Article

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## ABSTRACT

Medication errors happen all over the world and can cause people real harm. To solve this problem, it is important to know what healthcare workers know, how they feel about medication errors, and what they do about them. The goal of this systematic review of the literature is to find and summarize the current data about the KAP of healthcare workers toward medication errors and related factors. Electronic sources like PubMed, Scopus, and Web of Science were thoroughly searched for applicable studies released between January 2013 and December 2023. There were a total of 31 studies looked at in this study. The results showed that healthcare workers have a middling amount of knowledge about medication errors, but this varies from country to country and specialty to specialty. Most people did not like the idea of medication errors, and the biggest reason they didn't tell them was fear of being sued. Doctors and nurses not following safety rules and not communicating to each other well enough often cause medication errors. Too much work, stress, and not enough training also is affected by medication safety habits. The results of this study show that to reduce the number of medication errors there needs to be more education, better communication and teamwork among healthcare workers, and the creation of processes that put medication safety first.

**Keywords:** Systematic review; Nurses; Safety; Medication; Healthcare

## INTRODUCTION

Patients' safety and the quality of treatment are both compromised by the prevalence of medication error. Medication errors are "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer," [1]. Prescription, distribution, administration, and tracking are all potential entry points for medication errors. A bad drug response, incarceration, or even mortality can result from medication errors [2]. Medication errors are relatively common, with some studies estimating that 10% of prescriptions in the industrialized world contain errors [3].

Medication errors can and should be avoided with the help of healthcare experts. Drug safety and patient results may be affected by healthcare providers' familiarity with and response to, the problem of medication errors. In order to better understand medication errors and the variables that contribute to them, numerous studies have analyzed the knowledge, beliefs, and behaviors of healthcare workers [4]. However, these investigations have yielded contradictory and unreliable

results. The purpose of this systematic review was to assess healthcare providers' understanding, perspective, and response to medication errors and their contributing variables.

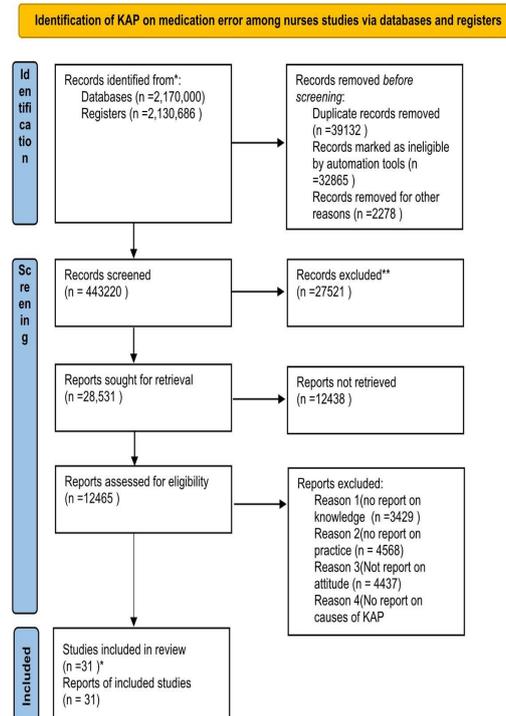
## MATERIALS AND METHODS

A comprehensive search was conducted using MEDLINE, Embase, and Cochrane databases from 2013 to 2023 as indicated by Table 1. The search terms included medication error, healthcare professionals, KAP, knowledge, attitude, and practice. The inclusion criteria were studies that investigated the KAP of healthcare professionals regarding medication errors and the associated factors. The exclusion criteria were studies that did not focus on medication errors or did not report KAP. Figure 1 shows the Prisma chart of the searches made.

**Table 1.** Table of searches using keyword.

Number	Searches	Results
1	Medication	5,360,000
2	Medication error	2,170,000
3	Medication knowledge	4,030,000
4	Medication attitude	16,200
5	Medication practice	4,230,000
6	3,4 and 5	656,000
7	Nurses	7,390,000
8	Medical nurses	4,880,000
9	Medical nurses knowledge	4,040,000
10	Medical nurses attitude	24,600
11	Medical nurses practices	3,710,000
12	Associated factors in medication errors	2,020,000
13	9,10 and 11	383,000
14	Nursing training	4,500,000
15	Nursing working environment	4,120,000
16	Nursing hospital resources	3,840,000

Figure 1. Plasma chart: Knowledge, attitude and practice.



**Selection criteria**

Studies reporting the prevalence of medication errors, associated factors, and healthcare professionals' knowledge, attitude, and practice toward medication errors were included. The exclusion criteria were studies reporting medication errors in non-healthcare settings, and studies not reporting healthcare professionals' knowledge, attitude, or practice toward medication errors.

**RESULTS**

218 studies were used for the study and 31 studies met the standards for inclusion, so they were all part of the systematic review. These studies were done in hospitals, clinics, and long-term care centers in many different countries and settings. The number of healthcare workers in the studies that were included went from 68 to 3,154. Most of the studies looked at what nurses and doctors knew, how they felt, and how they did their jobs. However, a few studies also looked at pharmacists and medical students. Table 2 shows summaries of the findings of the 31 studies.

Table 2. Summaries of the 31 studies included.

No	Author/year/title	Study design	Key findings
1	Zahary et al., (2021) Medication errors understanding among the healthcare providers at the health clinics in Labuan Federal Territory [5]	Cross-sectional, survey	<b>Knowledge:</b> The knowledge among healthcare providers were still low. (Overall, the medical officers had the best understanding towards medication error, with 62.9% them obtaining all correct answers. <b>Attitude:</b> They have positive attitude towards medication error reporting but afraid of the consequences. <b>Practice:</b> The healthcare workers were compliance to all the practice made by the organization. <b>Factors:</b> Due to lack of knowledge, heavy workload, poor training, tiredness fatigue and stress leads to failure to comply to the SOP.

2	Cheraghi et al., (2013) Medication errors of nurses in the emergency department [6]	Descriptive study	<p><b>Knowledge:</b> This study shows that nurses poor pharmacological knowledge, unfamiliarity with the abbreviated names tend to make more errors.</p> <p><b>Attitude:</b> Medication error is being underreported by nurses. They tend to be careless due to extreme fatigue.</p> <p><b>Practice:</b> Nurses tend to administer twice then the required dose of medication to patients.</p> <p><b>Factors:</b> Absence of proper recording and reporting system, unpleasant working environment, increase workload, poor staffing.</p>
3	Feleke et al., (2015) Medication administration error: Magnitude and associated factors among nurses in Ethiopia [7]	A cross sectional study	<p><b>Knowledge:</b> This study shows that nurses who have lower education background, tend to make more medication error compare those who is in the undergraduate level.</p> <p><b>Attitude:</b> Nurses who failed to document encountered the highest rate of error 56.4%.</p> <p><b>Practice:</b> Nurses who failed to administer medication in correct technique, were the second most predisposing factor to this medication error.</p> <p><b>Factors:</b> Documentation error was the most dominant factor, followed by technique and time error respectively. As well as organizational factor such as error in reporting systems, lack of experience, as well as educational background and poor staffing.</p>
4	Tsegaye et al., (2020) Medication administration errors and associated factors among nurses [8]	Cross sectional study	<p><b>Knowledge:</b> 45% of nurses were confused with the medication which "Look alike and sound alike" (LASA).</p> <p><b>Attitude:</b> Poor communication within staffs 43.7% nurses failed to communicate when in doubt, meanwhile 53.08% of nurses didn't report during an error.</p> <p><b>Practice:</b> Hence 71.5% nurse failed to comply with the SOP's administering medication prepared by another nurse, meanwhile 42% of nurses fail to follow the right of medication administration 42%, while 50.7% of nurses failed to clarify verbal orders by doctors.</p> <p><b>Factors:</b> Poor communication, interruptions, lack of training, poor staffing, and lack of training.</p>
5	Bravo et al., (2016) Nursing strategies to Increase medication safety in inpatient settings [9]	Retrospective study	<p><b>Knowledge:</b> The most common error in this study were wrong dose.</p> <p><b>Attitude:</b> Poor communication were the second most identified cause in this study. Nurses failed to reconfirm with doctor order.</p> <p><b>Practice:</b> Nurses must focus to ensure smooth flow on the match between medication and what they are obtaining. A 'non-interruption zone should be maintained in the preparation area.</p> <p><b>Factors:</b> Poor communication, interruptions, underreporting of medication error, lack of team work, and lack of training.</p>
6	Cheraghi et al., (2013) Types and causes of medication error from nurses viewpoint [10]	Cross sectional study	<p><b>Knowledge:</b> Wrong dosage, infusion rate were the common error, and use of abbreviation names.</p> <p><b>Attitudes:</b> Nurses in this study, prone to error due to fatigue, increase nurse to patient ratio.</p> <p><b>Practice:</b> Nurses in this study, were lack of trainings, poor practice in drug administration by nurses.</p> <p><b>Factors:</b> Lack of training, poor pharmacological knowledge, lack of staffs.</p>
7	Exploring facilitators and barriers to medication error reporting among healthcare professionals in Qatar using the theoretical domains framework: A mixed method approach [11]	Mixed methods design with a quantitative cross-sectional survey	<p><b>Knowledge:</b> Overall, respondents have positive responses regarding awareness of medication error reporting.</p> <p><b>Attitude:</b> Respondents attitude towards medication error reporting were low.</p> <p><b>Practice:</b> Respondents, in this study were not involve, in reporting medication error in consistent, they were facing some barriers and negative perceptions towards reporting medication</p>

			error. <b>Factors:</b> Lack of support in reporting, unavailability of guidelines of reporting, lack of training regarding reporting an error.
8	Zeeratchi et al., (2013) Frequency and types of the medication errors in an academic emergency department in Iran: The emergent need for clinical pharmacy services in emergency departments [12]	Cross sectional study	<b>Knowledge:</b> Most error occur in the administration stage, due to poor knowledge on the certain drugs. <b>Attitude:</b> Nurses tend to ignore, the documentation stage during hectic hour in the ED, and tend to administer the drug twice. <b>Practice:</b> Nurses fails to practice the SOPs set by the hospital during drug administration. Nurses in this study have poor communication with their colleagues during passing over, and tend to make mistakes during administering the medication.
9	Johari et al., (2013) Medication errors among nurses in government hospital [13]	Cross sectional study	<b>Knowledge:</b> Nurses in this study has good knowledge in medication administration, but unfamiliarity with medication were another cause. <b>Attitude:</b> Heavy workload and personal neglect were one of the factor, in this study that causes medication error. <b>Practice:</b> New staffs tend to make error in this study. <b>Factors:</b> Increase workload, poor knowledge on drug names, complicated orders and new staffs.
10	Parthasarathi et al., (2021) Evaluation of medication errors in a tertiary care hospital of a low to middle income country [14]	A prospective observational study	<b>Knowledge:</b> Participants in this study had poor knowledge on prescribing medications such as antibiotics and proton pump inhibitor, nurses had poor knowledge medicinal dosages, wrong frequency and wrong medication were served such as (LASA) drugs. <b>Attitude:</b> Poor reporting of errors, unsure about dosages. <b>Practice:</b> Lack of knowledge on administration and prescribing medications, lack of standardized guidelines. <b>Factors:</b> Lack of time, increase workload, lack of knowledge on administration were common.
11	Yee Wei et al., (2015) Qualitative Research on Medication Safety among Nurses and Pharmacists in Hospital Miri [15]	Qualitative study	<b>Knowledge:</b> Nurses and the pharmacists, has good knowledge regarding medication administration in this study. <b>Attitude:</b> They have good communication, among their colleagues. <b>Practice:</b> They obey to the safety guidelines of the medication administration. <b>Factors:</b> work interruptions, poor guidelines, human attitude, stress factor.
12	Mulac et al., (2021) Severe and fatal medication errors in hospitals: Finding from the Norwegian incident reporting system [16]	Retrospective study	<b>Knowledge:</b> Most medication errors occurs during administration phase (68%), wrong dose (38%) were the leading type of error and wrong drug (15%). The most common drug that frequently reported due to an error is analgesics, antibacterials, for systemic use and antithrombotic agents and also error tend to occur at the prescribing stage. <b>Attitude:</b> Poor interrelationships between colleagues, unsure about calculations. <b>Practice:</b> Nurses might failed to practice a proper SOP's during medication administration. <b>Factors:</b> Lack of standardized protocols, poor support from colleagues, lack of in-house training .
13	Elasrag and Abu-Snieneh et al., (2020) Nurses perception of factors contributing to medication administration errors [17]	Cross sectional study	<b>Knowledge:</b> Nurses had insufficient knowledge regarding medication administration (42.46%). <b>Attitude:</b> Medication is transcribed wrongly in the treatment chart and interruptions during medication administration. <b>Practice:</b> Nurses should practice proper regulations, of medication administration that is being taught. <b>Factors:</b> Lack of staff, fatigue, lack of communications, transcriptions failure, lack of in-house training, poor nurse-physician relationship and fear of reporting any discrepancies.

14	You et al., (2015) Perceptions regarding medication administration errors among hospital staff nurses of South Korea [18]	Cross sectional	<p><b>Knowledge:</b> Lack of pharmacological knowledge regarding infusion rates, wrong dosage of medications, lack of knowledge regarding medications.</p> <p><b>Attitude:</b> Fear of reporting medication error, failed to follow 6R's, lack of time.</p> <p><b>Practice:</b> Lack of communication.</p> <p><b>Factors:</b> Lack of in-house training, lack of staffs, lack of standardized rules in medication administrations.</p>
15	Pournamdar and Zare et al., (2016) Survey of medication error factors from nurses perspective [19]	Descriptive research	<p><b>Knowledge:</b> Wrong medication calculations due to poor computational skills, unfamiliarity with the drugs and, Kardex illegibility.</p> <p><b>Attitude:</b> Physician illegible handwriting in patients file, unconducive working environment with poor lightings.</p> <p><b>Practice:</b> High volume of work, and lack of time.</p> <p><b>Factors:</b> Poor nurse to patient ratio, poor supervision, noisy and crowded environment, medication error tend to occur during night shift due to lack of supervision, due to fatigue, followed by evening shifts, drug prescription method, Kardex illegibility, and lack of concentration</p>
16	Joolae S et al., (2016) The relationship between medication errors and nurses work environment [20]	Cross sectional, correlational study	<p><b>Knowledge:</b> Wrong time nurses not taking responsibility before administration.</p> <p><b>Attitude:</b> Lack of communication between nurse-physicians.</p> <p><b>Practice:</b> Nurses failed to practice 6R's during their medication round, such as wrong time.</p> <p><b>Factors:</b> Poor working environment, lack of resources, poor communication, inadequate information, technical failures, inappropriate planning, poor facilities.</p>
17	Getnet and Biftu et al., (2017) Work interruption experienced by nurses during medication administration process and associated factors, Northwest Ethiopia [21]	Cross Sectional Study	<p><b>Knowledge:</b> Knowledge were not accessed in this study.</p> <p><b>Attitude:</b> Nurses, were being interrupted during medication administration phase. (50.3%) participants experiences severe/major interruptions.</p> <p><b>Practice:</b> There were no standard guidelines, for nurses to follow during medication administration. Nurses should have signage board or wearing a vest indicating 'Do Not Disturb' or 'Medication Nurse'.</p> <p><b>Factors:</b> Work interruptions, lack of guidelines on medication administration, lack of work experiences.</p>
18	O'Hara et al., (2018) What can patients tell us about the quality and safety of hospital care? Findings from a UK multicentre survey study [22]	Randomized control trial	<p><b>Knowledge:</b> Not accessed in this study.</p> <p><b>Attitude:</b> Not accessed in this study.</p> <p><b>Practice:</b> Not accessed in this study.</p> <p><b>Factors:</b> Lack of communication can threaten patient safety, lack of training, lack of staffs, unconducive working environment, lack of equipment and resources.</p>
19	Ehsani et al., (2013) Medication errors of nurses in the emergency department [23]	Descriptive study	<p><b>Knowledge:</b> Lack of pharmacological knowledge, the use of abbreviated names, similarities of drug names that causes medication error in this study.</p> <p><b>Attitude:</b> It is seen, that (72.7%) in this study failed to report medication error.</p> <p><b>Practice:</b> Lack of guidelines and support from superior for medication error reporting, lack of education programmes.</p> <p><b>Factors:</b> Lack of staffs, lack of knowledge, lack of in-house training, many defects in the prescription list, encourage staff to report if an error has occur in a non-punitive method.</p>
20	Samad et al., (2019) Knowledge, Attitude and Practice (KAP) on importance of medication checking among staff nurses at in-patient setting in Hospital Slim River (HSR), Perak [24]	Cross sectional study	<p><b>Knowledge:</b> Nurses in this study, has good knowledge on medication checking (88.9%).</p> <p><b>Attitude:</b> (99.1%) of nurses has good attitude, and they have awareness on the importance of medication checking.</p> <p><b>Practice:</b> In this study (100%) of staff nurse possessed a good practice, towards importance of medication checking, through their ability to perform the right procedures.</p>

			<p><b>Factors:</b> Lack of communication when is unsure about the medication, high workload, inadequate drug knowledge, lack of training and lack of experience.</p>
21	<p>Khalil et al., (2022) Nurses Practices errors regarding medication administration in different critical care units at a Teaching Hospital in Upper Egypt. An observational study [25]</p>	<p>A descriptive exploratory design</p>	<p><b>Knowledge:</b> Lack of knowledge on high alert medications. Almost two third (63.30%) had unsatisfactory practices in preparation of education.</p> <p><b>Attitude:</b> Nurses, in this study had poor communication with patients in this study, nurses didn't not stay with the patient until the drug has been swallowed.</p> <p><b>Practice:</b> Most of the nurses, didn't communicate with their patients if needed, and with a greater number of nurses didn't record their data related to administered medication.</p> <p><b>Factors:</b> Lack of communication, interruptions during medication round, lack of support among colleagues lack of in-house training, standardized policy of work flow in the department, lack of adherence to guidelines among nurses.</p>
22	<p>Abdel-Latif (2016) Knowledge of healthcare professionals about medication errors in hospitals [26]</p>	<p>Cross sectional questionnaire</p>	<p><b>Knowledge:</b> Majority of healthcare worker has good knowledge regarding medication error. Thus, prescribing errors (46.5%), and administration phase (26%) errors occurred most frequently. Most frequent type of medication which was involved in the error were anti-hypertensives, anti-diabetics, antibiotics, digoxin and insulin.</p> <p><b>Attitude:</b> It is seen, that majority of healthcare workers does not report medication error.</p> <p><b>Practice:</b> Poor practice of medication error reporting, lack of guidelines regarding reporting system and insufficient training among healthcare workers.</p> <p><b>Factors:</b> Lack of communication, lack of collaborations, lack of in house training, poor documentation of medication errors.</p>
23	<p>Di Simone et al., (2018) medication errors in the emergency department: Knowledge, attitude, behaviour and training needs of nurses [27]</p>	<p>Descriptive study</p>	<p><b>Knowledge:</b> Only (15.6%) of nurses has good knowledge about the preparation and administration of IV medications, (89.3%) considered it is vital to improve their knowledge, and (85.6%) mentioned that educating about the use of IV medications should be increased, during their undergraduate level and (30.3%) agreed in postgraduate courses IV drugs should be designed, thus (77%) considered calculations and drug dosage is important to reduce medication error.</p> <p><b>Attitude:</b> Overall (95%) to reduce errors a systematic approach is vital, hence nurses showed right attitude in preparation and administration of IV medications.</p> <p><b>Practice:</b> Almost (66%) agreed on proper guidelines on IV administrations.</p> <p><b>Factors:</b> Lack of training, poor pharmacological knowledge, poor reporting attitude, poor computational skills, drug packaging, increase workloads and proper guidelines and standardized regulations on IV administration.</p>
24	<p>El. Sayed Ragheb et al., (2016) effect of training program on reduction of nurse's medication errors [28]</p>	<p>Quasi experimental design</p>	<p><b>Knowledge:</b> In this study 18% of nurses had satisfactory knowledge about medication administration and medication errors. The errors were high in medication documentation (70.5%).</p> <p><b>Attitude:</b> Proper reporting system for nurses to report in case of an error, lack of communications.</p> <p><b>Practice:</b> Lack of supply for proper administration and preparation such as insulin syringe, crushing machines, medication storage container, syringe pumps and infusion pump.</p> <p><b>Factors:</b> Lack of guidelines, poor communication among staffs, poor knowledge, lack of standardised reporting system.</p>

25	Shitu et al., (2020) Prevalence and characteristics PF medication errors at an emergency department of teaching hospital in Malaysia [29]	Cross sectional study	<p><b>Knowledge:</b> The most common error were wrong time (46.9%), unauthorized drug error (25.4%), omission error (18.5%) and dose error (9.2%).</p> <p><b>Attitude:</b> Lack of concentration and communication due to the busy schedule of the emergency department.</p> <p><b>Practice:</b> Poor handover between staffs, no proper handover.</p> <p><b>Factors:</b> Poor documentation, poor pharmacological knowledge, and increase workload.</p>
26	Bahramiazar et al., (2021) A causal model to design more effective policies and practices in error management in the healthcare industry [30]	Descriptive analytical study	<p><b>Knowledge:</b> Were not accessed in this study.</p> <p><b>Attitude:</b> Were not accessed in this study.</p> <p><b>Practice:</b> Poor practice such as, lack of communication within colleagues leads to error. A proper standardized guidelines is vital for reducing this error.</p> <p><b>Factor:</b> Increase workload, poor communication, poor guidelines, lack of pharmacological knowledge, and lack of in-house trainings.</p>
27	Alshammari et al., (2021) Teamwork conflicts: Medical errors and patient safety as perceived by nurses: A cross sectional study of selected hospitals In Hail City Saudi Arabia [31]	Cross sectional	<p><b>Knowledge:</b> Were not accessed in this study.</p> <p><b>Attitude:</b> Miscommunication causes medical error in any settings.</p> <p><b>Practice:</b> Poor teamwork causes negligence, miscommunication, poor hand hygiene, weak commitment in following the safety protocols.</p> <p><b>Factors:</b> Lack of teamwork, poor communications .</p>
28	Mansah et al., (2014) Older folks in hospitals: The contributing factors and recommendations for incident prevention [32]	Retrospective audit	<p><b>Knowledge:</b> Was not accessed in this study.</p> <p><b>Attitude:</b> Prescribers illegible handwriting on medication chart (79%) prone to medication error.</p> <p><b>Practice:</b> Failure of communication between nurses and nurse to physician contributed to half of this error (49%), failure to follow up by nurses when patient is being transferred within ward (26%).</p> <p><b>Factors:</b> Pharmacy dispensing wrong medications (2.2%), Increase workload (14%), and (88%) poor adherence to policies and procedures which involved 6R's.</p>
29	Mahesh et al., (2016) Nursing perceptions of medication administration practices, reasons for errors in a tertiary care hospital, Bangalore [33]	Cross Sectional study	<p><b>Knowledge:</b> Poor knowledge on Look-Alike drugs mislabelled drugs, incorrect prescriptions and errors in computer entry and pharmacy error.</p> <p><b>Attitude:</b> Nurses generally reported medication errors in this study (66.3%).</p> <p><b>Practice:</b> It is noted that (97%) of nurses always checked patients file before administration.</p> <p><b>Factors:</b> Lack of experiences, mislabelled drugs, lack of cross checking between nurses especially on heparin and insulin medications</p>
30	Karttunen et al., (2020) Nurses' self-assessments of adherence to guidelines on safe medication preparation and administration in long-term elderly care [34]	Cross sectional study	<p><b>Knowledge:</b> Over half of the nurses, administered medication according to the guidelines (56%).</p> <p><b>Attitude:</b> Nurses, follow a safe proper practice in preparing medications for their patients (94.5%).</p> <p><b>Practice:</b> Nurses in this study were vigilant, and always practice the right steps in medication administration.</p> <p><b>Factors:</b> Increase workload and, lack of concentration.</p>

31	Bucknall et al., (2019) Nurses 'decision-making, practices and perceptions of patient involvement in medication administration in an acute hospital setting <sup>[35]</sup>	Descriptive exploratory study design	<p><b>Knowledge:</b> Lack of pharmacological knowledge regarding doses, and time.</p> <p><b>Attitude:</b> Nurses always counter check with doctors and pharmacy when faced in doubt, in this study.</p> <p><b>Practice:</b> A good rapport with patients and colleagues, nurses in this study always follow proper guidelines in serving medication, and good teamwork.</p> <p><b>Factors:</b> Poor knowledge, lack of guidelines, lack of teamwork, increase workload, lack of staffs.</p>
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A total of 31 studies were included in this systematic review. The studies included a range of healthcare professionals, including physicians, nurses, pharmacists, and other allied health professionals.

## DISCUSSION

The current systematic literature review aimed to explore the knowledge, attitude, and practice of healthcare professionals towards medication errors and the associated factors. A total of 31 studies were included in the review, which analyzed data from healthcare professionals, including nurses, physicians, and pharmacists.

### Knowledge

Out of 31 papers presented 22 researcher's findings showed that nurses have a poor amount of knowledge about medication errors <sup>[17]</sup>, but this varies from country to country and specialty to specialty and process of medication delivering <sup>[24,27,28]</sup>. For instance, a study done by Zahary et al. found that nurses knew more about medication errors than doctors did <sup>[5]</sup>. In the same way, a study done by Yee Wei et al. showed that pharmacists and nurses had sound knowledge regarding medication administration compare to other health care workers <sup>[15]</sup>. Meanwhile, Bravo et al., Cheraghi et al., Bucknall et al., and Parthasarathi et al., identified the most common form of medication error among nurses were wrong dose) <sup>[6,9,14,35]</sup>. Thus, Mahesh et al., Tsegaye et al., and Ehsani et al., identified that the nurses were confused with medications names such as (LASA) drugs because they look alike and sound alike <sup>[8,23,33]</sup>. In Abdel-Latif, Mulac et al., Zeeratchi et al., and Johari et al., had a contradicting idea that most error occur in the administration stage <sup>[12,13,16,26]</sup>. However on the other hand, Mulac et al and Parthasarathi et al., commented on the finding that medication error occurs during antibiotics transcription) <sup>[14,16]</sup>. Meanwhile, Pournamdar and Zare et al., argues that medication error among the nurses occurs due to poor computational skills <sup>[19]</sup>.

### Attitude

Out of 31 papers reviewed n=24 papers shows the nurses had poor attitude towards medication error reporting <sup>[11,26,36]</sup>. Main reason for this condition is due to lack of communication skills <sup>[8,29,31]</sup>. This include failure to reconfirm with doctor's order <sup>[9]</sup>. According to Zeeratchi et al., one major negative attitude seen among the nurses is they tend to administer the drug twice <sup>[12]</sup>. However, Johari et al., claim that workload is contributing factor towards the negative attitude <sup>[13]</sup> Some other reasons for the attitude include physician illegible handwriting in patients file, unconducive working environment and interruptions during medication administration <sup>[19,21]</sup>.

The most prevalent reason given for not disclosing medication errors was concern and fear over potential legal repercussions <sup>[18]</sup>. Those working in the healthcare industry also voiced concerns about legal liability, censure action, and harm to professional standing <sup>[36-38]</sup>. Some people may not disclose medication errors because they do not believe the reporting system or because they do not think it is essential if the patient is not hurt. Healthcare workers have an unfavorable outlook on drug mishaps, but they also want a culture of safety that promotes sharing and learning from mistakes. Alsulami et al., found that medical workers recognized medication errors as a reality of healthcare but viewed them as teachable moments rather than causes for reprimand. Hence, more open and clear contact between various healthcare practitioners was also mentioned, as was the need for improved instruction for healthcare workers on drug safety and medication error reporting. There was also a distinction on how community felt about medication errors based on the severity of the damage that could have resulted from each category of error <sup>[37]</sup> according to research by Seys et al. <sup>[39]</sup>.

## Practice

The practice of medication errors are commonly the result of healthcare providers failing to follow established protocols and failing to effectively communicate with one another. Out of 31 paper reviewed, 24 paper suggest that the nurses lack of practices [12,13,16]. Thus, non-compliance to medication safety practices was due to improper medication technique [27] and communication [18,25,31], together with no proper guidelines [21,26,29]. The study by Tsegaye et al. [8]. In a study conducted by Cheraghi et al., quotes that lack of training lead to poor practice [6].

## Factors associated with KAP of medication error among nurses

There are several factors that were associated with KAP on medication error among the nurses. The study identified staff factors such as lack of pharmacological knowledge, unfamiliarity with the abbreviated names tend to be the factor associated with medication [5,13,15,23]. Medication errors were found to be more common among healthcare workers working in high-stress settings like critical care units due to factors like unpleasant working environment, increase workload, poor staffing [6,8,16,22,25]. As a result of under staffing, healthcare providers may be asked to perform duties outside their area of specialization or may not have enough time to dedicate to medication safety practices, both of which can increase the likelihood of prescription mistakes occurring. Finally, a major contributor to medication errors was found to be insufficient instruction on medication safety. It was discovered that healthcare workers who said they had received little to no instruction on drug safety were more likely to make mistakes [40]. This emphasizes the need for healthcare groups to focus and engage in training programs, as well as the significance of continuous training and instruction on drug safety practices. Several studies have examined how administrative and environmental factors affects nurses' ability to follow safe prescription procedures. The study carried out by Pournamdar and Zare et al., O'Hara et al., and Joolae et al., identified that factors of medication error is due to poor nurse to patient ratio, poor supervision, noisy and crowded environment, technical failures, inappropriate planning, poor facilities [19,20,22].

## CONCLUSION

The current review shows how healthcare workers have different levels of understanding, attitude, and practice when it comes to medication errors and related factors. To make patients safer, health care workers should learn how to define and categorize drug errors, as well as what happens to patients when these mistakes happen. In addition, health care workers should be directed appropriately to report medication errors without worrying about jeopardizing their career, and safety methods should be practice as often as possible. More study is needed to find out what healthcare workers know, how they feel, and what they do about Medication errors in different healthcare situations.

## Limitations

Firstly, most of the studies included in this analysis were cross-sectional in design, which limits the ability to establish causality between the factors and knowledge, attitude, and practice levels. Secondly, the studies included in this review were conducted in different countries, which may affect the generalizability of the findings. Thirdly, most of the studies included in this literature used self-report measures to assess knowledge, attitude, and practice levels, which may be subject to bias. Fourthly, the studies included in this analysis varied in the tools and criteria used to assess medication errors, which may affect the comparability of the findings. Lastly, the heterogeneity of the included studies was high, which may affect the validity of the results.

## Practical implications

The results of this comprehensive literature analysis have numerous practical consequences. Educating healthcare workers on the description and categorization of Medication errors, as well as the application of safety strategies to avoid errors, should be a top priority for the hospital concerned with patient safety. Medication errors should be reported and healthcare providers should have access to a secure reporting system that will safeguard their privacy and prevent them from facing repercussions for doing so.

Healthcare groups should implement prescription delivery procedures and standards, and healthcare workers should be encouraged to double-check medicines on a regular basis to decrease prescription mistakes. Safe drug delivery and the avoidance of errors depend on the effective dialogue and collaboration of healthcare workers.

Healthcare facilities should routinely evaluate and analyze medication error rates in order to spot problem areas and develop corrective measures. Healthcare organizations can enhance patient results and foster a culture of safety by making

safety a top priority and employing methods supported by evidence to reduce medication errors.

### Future research implications

The understanding, mindset, and practice of healthcare workers in various contexts, such as general care, long-term care, and community settings, regarding Medication errors should be investigated in future studies. To further facilitate the similarity of study results, studies should work to create and verify uniform criteria and classes of Medication errors. Furthermore, initiatives targeted at enhancing healthcare workers' understanding, perspective, and behavior with regard to Medication errors should be studied to determine their efficacy. Education and training, the introduction of safety strategies, and the application of technology are all examples of potential initiatives that could help cut down on medication errors. Finally, research should investigate how medication errors affect patients' results and quality of life from the patients' points of view. Healthcare groups can enhance patient-centered care and patient safety by engaging patients in the creation of strategies to avoid medication errors.

### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

### CONSENT FOR PUBLICATION

Not applicable.

### AVAILABILITY OF DATA AND MATERIALS

Data are derived from previous studies.

### COMPETING INTERESTS

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### AUTHORS' CONTRIBUTIONS

Author A: Priscila Anesha Visvalingam researched and prepared the manuscripts.

Author B: Shidqiyyah Binti Abdul Hamid has read the systematic review and suggested some corrections to be carried out.

Author C: Muzaitul Akma Binti Mustapha Kamal Basha has approved the systematic review upon reading.

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