

THE PREVALENCE AND MOST FREQUENTLY MEDICAL ERRORS IN EMERGENCY ROOM IN KSA

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Abstract

Background: Emergency department (ED) medical errors present high risk to patient safety and treatment quality. Despite the continuing efforts to reduce these errors they persist and are associated with increased rates of error among emergency physicians, largely due to fatigue. This study examines the occurrence of and types of medical errors in emergency rooms in (KSA), and medication errors in particular. **Objective:** The goals of this research were to ascertain the Prevalence of medical errors in emergency rooms of KSA and most common types of errors, which had affected patient care.

Methods: The study used a structured questionnaire distributed online to healthcare professionals with experience in emergency medicine and distributed through KSA. Individuals familiar with medical errors in emergency were included in the inclusion criteria. Data were collected and analyzed using Microsoft Excel and SPSS software, demographics, awareness of medical errors, perceived frequency and causes of errors. **Results:** A total of 524 participants completed the survey comprising a mean age of 28.9 years. Interestingly, not only did over 87.8% of respondents know what an error can be within emergency medicine, but also 44.9% asserted errors are happening on an extremely frequent or frequent basis. The main causes of these errors were miscommunication (64.3%) and inadequate training (42.7%). But 90 per cent of participants were in favour of mandatory training programs for improved patient safety, particularly in medication teaching and communication skills education. **Conclusion:** The study found that emergency medicine practitioners in KSA are highly aware of medical errors, but there is high frequency of medical errors, through gaps in communication and lack of training. The findings emphasize the dire need for systemic change — especially in terms of increased staffing and better training — to reduce errors and build patient safety in emergency settings.

Keywords: Saudi Arabia, healthcare providers, prevalence

Introduction:

Medical errors can be characterized as the use of an incorrect management strategy or the inability to carry out a plan as intended [1]. Medical errors have the potential to compromise patient safety, lower the standard of treatment, and, in some cases, permanently harm the patient. Despite efforts to reduce them, errors still occur in emergency departments [2]. An estimated 30–50% of emergency medicine physicians experience significant fatigue during their work shifts. Emergency physicians working night shifts have up to a 300% higher likelihood of making medical errors than those working day shifts [3]. The study highlights the high prevalence of medication errors in the emergency ward setting, with associated factors such as longer hospital stays, polypharmacy, and higher comorbidities [4]. Inappropriate antibiotic prescriptions are a threat to patients, leading to adverse drug reactions, bacterial resistance, and elevated hospital costs. There is recent evidence of inappropriate antibiotic usage in up to 50% of patients admitted to a typical emergency department setting with community-acquired pneumonia [5]. In previous studies, an estimated 108,000 individuals die annually due to potential medical errors, which affects one in every fifty hospitalized patients. Approximately 3% of these errors occur in emergency settings [6]. The most common type of these errors is diagnostic errors, which are common in the emergency room [7]. A survey and a prospective observational clinical study conducted in a tertiary care hospital in 2019 found that in 12.3% of cases, the diagnosis upon discharge significantly differed from the diagnosis at admission through the emergency room [8]. In addition, a recent study conducted in Saudi Arabia in 2021 demonstrates that drug-related problems (DRP) resulting in hospitalization are frequent among the general population in the emergency department (ED) [9]. Furthermore, two Middle Eastern studies conducted in a Tehran teaching hospital in 2020 showed that the emergency department (ED) accounted for 50.5% of all medication errors (MEs) and that the most common errors were prescription errors. Roughly 13.5% (n = 68) of the 504 prescriptions (for 504 patients) reviewed had at least one error. The errors include incorrect strength (14.6%), incorrect frequency (20.7%), and incorrect dosage (23.2%) [10]. In 2020, 547 patients visited the Emergency Department (ED) of Hospital University Sains Malaysia (HUSM) in Kelantan, Malaysia. We randomly selected 311 patient records for data analysis out of these. The results indicated that 30.5% of medication errors (ME) happened in the ED [11]. The high prevalence of medical errors and the limited number of studies conducted in this research field led to the goal of this study to assess the prevalence and most frequent medical errors in emergency rooms in KSA. This study aims to determine the prevalence and most frequently medical errors in Emergency room in KSA.

Methodology:**Study design and Setting**

The authors developed a structured questionnaire as the basis for this cross-sectional questionnaire survey. The study included emergency department (ED) healthcare providers, including physicians, nurses, and other relevant staff. Participants must be 18 years of age or older and currently employed in an ED. After obtaining permission, we distributed a questionnaire based on a sample recruitment strategy to participants from various emergency departments around Saudi Arabia. The questionnaire included a brief overview of the study's purpose and procedures, as well as the contact details of the research team. We used a purposive sampling approach to ensure the sample is representative of the ED healthcare provider population. The researchers aimed to recruit participants with a range of roles, experience levels, and demographic characteristics. The target sample size for the study is 300 ED healthcare providers. We asked participants who have completed the study to refer other eligible ED

staff who might be interested in participating.

Sample size

The Data collection involved a target sample of 384 healthcare providers (confidence level: 95%; margin of error: 5%) The sample size was estimated using the formula $n = \frac{P(1-P) * Z^2}{d^2}$ with a confidence level of 95%. n: Calculated sample size Z: The z-value for the selected level of confidence $(1 - \alpha) = 1.96$. P: An estimated knowledge Q: $(1 - 0.50) = 50\%$, i.e., 0.50 D: The maximum acceptable error = 0.05. Therefore, the calculated minimum sample size required for this study is $n = (1.96)^2 \times 0.50 \times 0.50 / (0.05)^2 = 384$ participants.

Inclusion and Exclusion criteria

The study's inclusion criteria included the following items: This study focused on examining the prevalence or incidence of medical errors in the emergency room setting. Research aims to pinpoint the prevalent medical error types in the emergency room, affecting patients across all age groups (pediatric, adult, and geriatric). We excluded studies that don't concentrate on the emergency room environment or don't disclose medical errors, those that present methods and results in an incomplete or ambiguous manner, and those where patients or their representatives declined to take part in the study.

Method for data collection, instrument and score system

The data collection process used an online survey tool to efficiently and securely gather responses. We designed the questionnaire on platforms such as Google Forms, SurveyMonkey, or Qualtrics to ensure clarity, relevance, and ease of response. A pilot study tested the questionnaire's validity and reliability, with feedback used for refinement. We recruited participants with experience or knowledge in emergency medicine in KSA through social media, email lists, and professional networks. They received the survey link along with study information, confidentiality details, and consent requirements. We recorded responses online to maintain anonymity and confidentiality, while also automatically reducing data entry errors. We securely stored the collected data and export it for analysis. The primary instrument is a structured questionnaire with sections on consent, demographics, emergency medicine errors, their impact, causes, prevention strategies, and personal attitudes. Previous studies on medical errors, their impact on patient safety, and healthcare professionals' attitudes towards these errors inform the questionnaire design. A pilot study preceded full distribution to ensure clarity and reliability. This method aimed to collect valuable data on the prevalence, causes, and prevention strategies for emergency medicine errors in KSA.

Pilot test

We administered the survey to a group of 20 participants and requested them to complete it. We conducted this step to assess the survey's clarity and the research's viability. The final analysis of the research did not include the data gathered from the preliminary study.

Analyzes and entry method

We used "Microsoft Office Excel Software" (2016) for Windows to input data into the computer. Next, we transferred a component of the data to the SPSS Statistics statistical evaluation tool for Windows OS, Version 20.0 (Armonk, NY: IBM Corp.), a component of the Statistics Package of Social Science Software (SPSS) program.

Results:

Table (1) displays various demographic parameters of the participants with a total number of (524). Mean age of participants was 28.9 ± 5.6 years (range 12 to 53 years), a relatively young cohort of which 23.3 (79.3%) were 27 to 28 years old. Along with that, the data suggests a major concentration of respondents – 36.3% – coming from Madinah, then 19.5% from Riyadh, indicating a unevenness that may lead to response skew caused by geographic cultural factors. Another big factor was education level; a large majority (68.9%) had a bachelor's degree which suggests that the demographic engaged in this study was very much educated. It also reported encouraging 40.5 percent as excellent as far as their health status is concerned, although a small percentage were said to have poor health conditions.

Table (1): Sociodemographic characteristics of participants (n=524)

Parameter		No.	Percent (%)
Age (Mean:28.9, STD:5.6)	24 or less	109	20.8
	25 to 26	90	17.2
	27 to 28	122	23.3
	29 to 32	94	17.9
	33 or more	109	20.8
City of residence	Abha	2	.4
	Al-Taif	81	15.5
	Alhassa	8	1.5
	Dammam	19	3.6
	Dhahran	2	.4
	Jeddah	46	8.8
	Khobar	7	1.3
	Madhina	2	.4
	Madinah	190	36.3
	Makkah	28	5.3
	Najran	28	5.3
	Qassim	6	1.1
	Qatif	2	.4
	Riyadh	102	19.5
	Tabuk	1	.2
Education level	High School	1	.2
	Diploma	49	9.4
	Bachelor's degree	361	68.9
	Master's Degree	73	13.9
	Doctorate	39	7.4
	Other	1	.2
General health status	Excellent	212	40.5
	Very good	173	33.0
	Good	120	22.9
	Fair	11	2.1
	Poor	8	1.5

As shown in figure 1, The data shows a strong confidence in the Kingdom of Saudi Arabian (KSA) emergency medicine staff ability to manhandle the medical emergencies. A total of 524 respondents was surveyed and a significant 42.7% (224 individuals) felt 'Very Confident' in the staff's abilities and an additional 35.8% (188 individuals) stated that they were 'Confident'. What this means is that together, 78.5% of respondents (or 77.6% above and 79.4% below) have a positive view of the performance of emergency medical personnel. On the flipside, the data shows very little skepticism, out of 513 surveyed people, only 9 (1.7%) claimed to exhibit 'Not Confident' nature and another one (0.2%) stated they are 'Very Not Confident', which indicates that confidence in emergency medical staffs is predominant among surveyed people.

Figure (1): Illustrates ability of emergency medicine staff in KSA to handle medical emergencies effectively among participants.

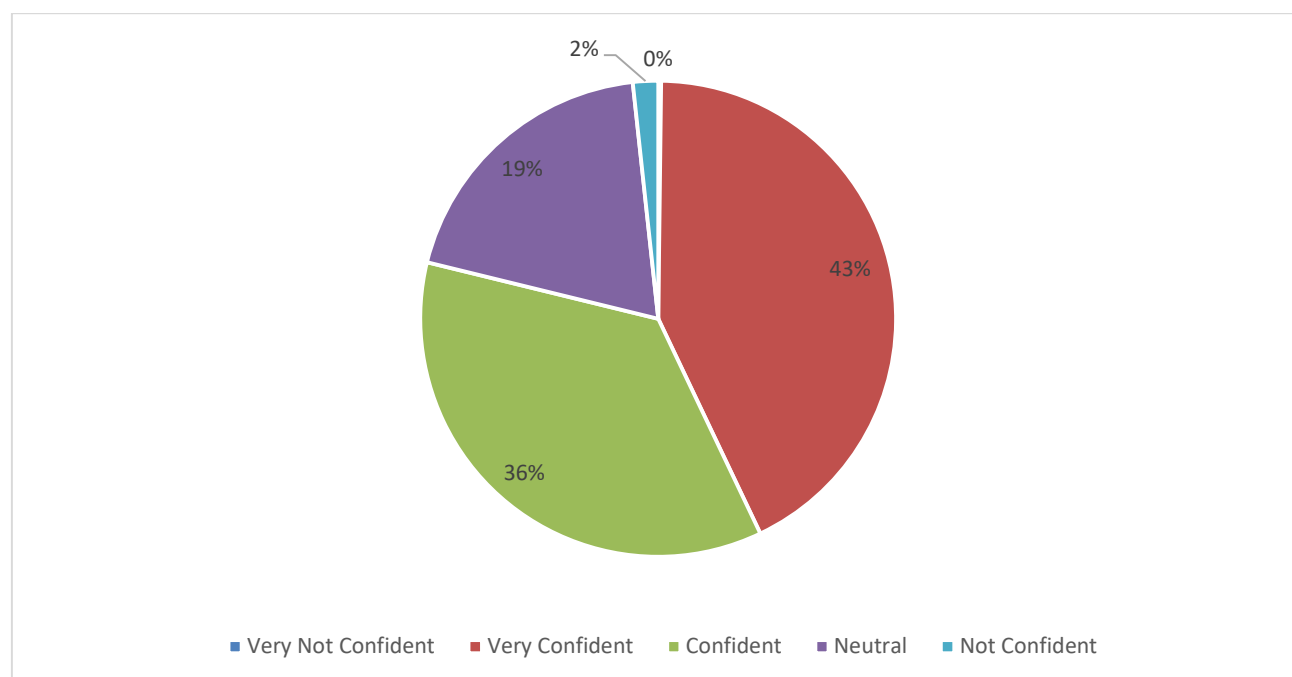


Table 2 presents the data in summary of knowledge and experience related to emergency medicine errors among a sample of 524 participants in Saudi Arabia (KSA). Interestingly, of note, a key majority, or 87.8% recognize what constitutes an emergency medicine (EM) error, demonstrating a beneficial baseline understanding of the problem. But the perceived frequency of these errors rings a warning bell, as 17.4% say errors are very frequent, and another 27.5% say they are frequently. This finding implies that emergency medicine practices have a widespread concern for safety. Additionally, 37.8% of respondents had personal or firsthand experience with an adverse event from these errors. Miscommunication by staff (64.3%) and the lack of training (42.7%) were commonly accepted reasons for systemic improvements. Respondents reported that improvements to training and education (71.2%) and more staff (66.9%) held the potential to greatly improve patient safety in emergency settings and help mitigate these errors.

Table (2): Parameters related to knowledge and experience with emergency medicine errors (n=524).

Parameter		No.	Percent (%)
<i>Are you aware of what constitutes an emergency medicine error?</i>	No	64	12.2
	Yes	460	87.8
<i>How often do you think emergency medicine errors occur in KSA?</i>	Very Frequently (monthly or more often)	91	17.4
	Frequently (more than 6 times a year)	144	27.5
	Occasionally (3-6 times a year)	164	31.3
	Rarely (1-2 times a year)	125	23.9
<i>Have you or someone you know suffered any adverse events due to emergency medicine errors?</i>	No	326	62.2
	Yes	198	37.8
<i>Do you know someone who has been affected by emergency medicine errors?</i>	No	390	74.4
	Yes	134	25.6
<i>In your opinion, what are the most common causes of emergency medicine errors in KSA? (Select all that apply) *</i>	Miscommunication among staff	337	64.3
	Inadequate training	224	42.7
	High patient volume	321	61.3
	Fatigue or burnout	274	52.3
	Poor system design	237	45.2
	Lack of resources	200	38.2
<i>Which specific system failures do you believe contribute most to emergency medicine errors? (Select all that apply) *</i>	Electronic Health Record (EHR) issues	275	52.5
	Medication dispensing errors	375	71.6
	Laboratory test handling errors	223	42.6
	Radiology errors	174	33.2
<i>What measures do you believe could prevent emergency medicine errors? (Select all that apply) *</i>	Improved training and education	373	71.2
	Better communication protocols	311	59.4
	Increased staffing levels	351	66.9
	Enhanced technology and equipment	272	51.9
	Regular audits and feedback sessions	227	43.3

As shown in figure (2), Using survey data from 524 respondents regarding their comfort level in reporting emergency medicine errors highlights an interesting trend in perceived levels of error reporting comfort in this high-stake field. 38.3 percent (201 individuals) said they would be ‘Very

Comfortable' reporting such errors; and 26.5 percent (139 respondents) that they would be 'Comfortable'. Compared to this, a large percentage of people reported a range of discomfort, with 11% (57 people) agreeing that they would feel 'Uncomfortable' and 1.3% (7 people) saying they would be 'Very Uncomfortable.' Moreover, 22.9 percent of respondents (120 people) took a neutral stance, an ambivalence caused by several factors including possible repercussions of the reporting.

Figure (2): Illustrates reporting an emergency medicine error if you witnessed one among participants.

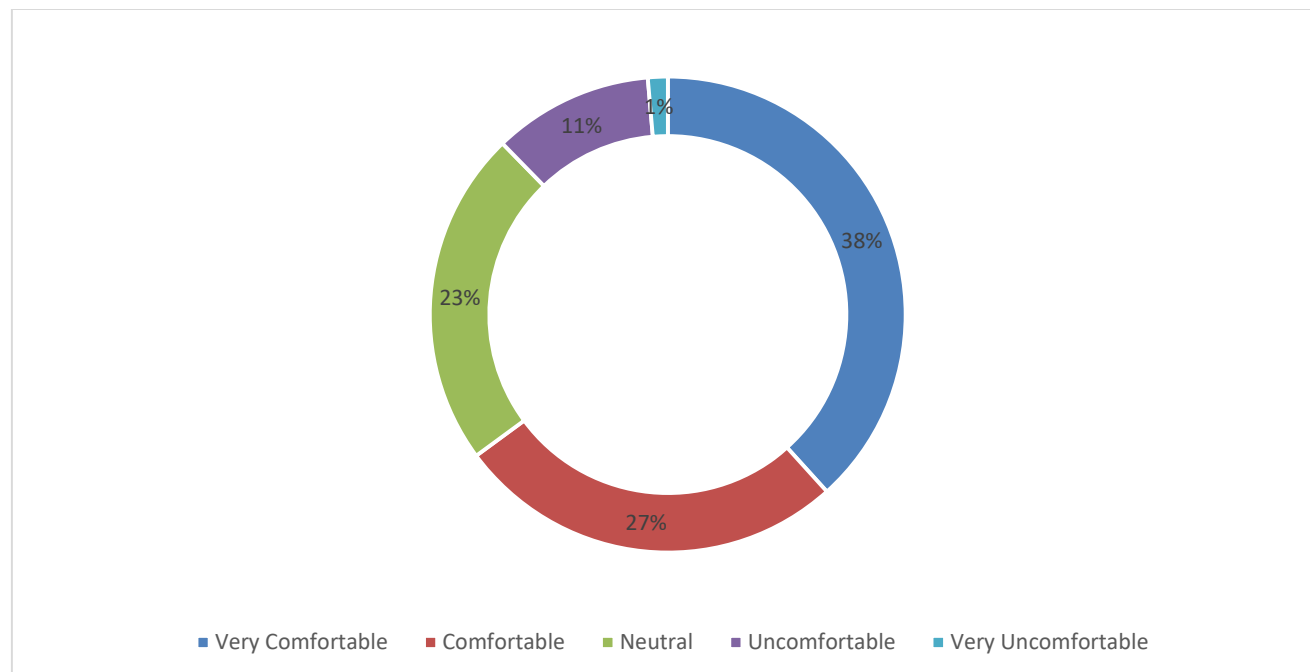


Table 3 presents some very compelling data on the perceptions and experience of 524 participants regarding the prevention and mitigation of error in emergency departments. Ninety percent of respondents strongly pressed for mandatory training programs in error prevention to improve patient safety. These types of training focus predominantly on topics of basic patient and medication safety (72.9%) as well as effective communication skills (62.8%) but, taken together, it shows that there are strategies for preventing errors in high pressure environments such as emergency departments. Significantly, many participants (42.7%) expressed confidence in the skill and ability of emergency medicine staff of Saudi Arabia to cope with medical emergency. Additionally, not surprisingly, over 38.4 percent of participants were comfortable reporting witnessed errors and may suggest an encouraging culture of accountability. Significantly, 84.8 percent of respondents agree that systemic protocol changes can cut down on medical errors markedly.

Table (3): participants' prevention and mitigation of errors (n=524).

Parameter		No.	Percent (%)
Do you think mandatory training programs on	No	48	9.2

<i>error prevention should be implemented for all emergency department staff?</i>	Yes	476	90.8
<i>What topics should be covered in these training programs? *</i>	Basic patient safety training	382	72.9
	Effective communication skills	329	62.8
	Teamwork and collaboration practice	327	62.4
	Medication safety training	377	71.9
	None	5	0.9
<i>How confident are you in the ability of emergency medicine staff in KSA to handle medical emergencies effectively?</i>	Very Not Confident	1	.2
	Very Confident	224	42.7
	Confident	188	35.9
	Neutral	102	19.5
	Not Confident	9	1.7
<i>How comfortable would you feel reporting an emergency medicine error if you you witnessed one?</i>	Very Comfortable	201	38.4
	Comfortable	139	26.5
	Neutral	120	22.9
	Uncomfortable	57	10.9
	Very Uncomfortable	7	1.3
<i>What do you think is the most important factor in improving patient safety in emergency departments?</i>	Accountability and incentives	1	.2
	Better staff training	163	31.1
	Enhanced patient monitoring	53	10.1
	Improved communication	125	23.9
	Increasing the nursing staff	6	1.1
	More resources and equipment	88	16.8
	Stronger policies and procedures	84	16.0
	System enhancement in ordering the medication	4	.8
<i>Do you believe that systemic changes in emergency department protocols can significantly reduce the occurrence of medical errors?</i>	Strongly Agree	253	48.3
	Agree	191	36.5
	Neutral	62	11.8
	Disagree	15	2.9
	Strongly Disagree	3	.6

Table (4) shows that emergency medicine errors rate has statistically significant relation to general health status (P value=0.0001) and being aware of emergency medicine errors (P value=0.002). It also shows statistically insignificant relation to age, educational level.

Table (4): Relation between emergency medicine errors rate and sociodemographic characteristics.

Parameters		Emergency medicine errors rate		Total (N=524)	P value*
		Frequent or occasional	Rare		
Age	24 or less	82	27	109	0.692
		20.6%	21.6%	20.8%	
	25 to 26	74	16	90	
		18.5%	12.8%	17.2%	
	27 to 28	91	31	122	
		22.8%	24.8%	23.3%	
	29 to 32	70	24	94	
		17.5%	19.2%	17.9%	
	33 or more	82	27	109	
		20.6%	21.6%	20.8%	
Educational level	High School	1	0	1	0.118
		0.3%	0.0%	0.2%	
	Diploma	31	18	49	
		7.8%	14.4%	9.4%	
	Bachelor's degree	282	79	361	
		70.7%	63.2%	68.9%	
	Master's Degree	55	18	73	
		13.8%	14.4%	13.9%	
	Doctorate	30	9	39	
		7.5%	7.2%	7.4%	
	Other	0	1	1	
		0.0%	0.8%	0.2%	
General health status	Excellent	156	56	212	0.0001
		39.1%	44.8%	40.5%	
	Very good	147	26	173	
		36.8%	20.8%	33.0%	
	Good	89	31	120	
		22.3%	24.8%	22.9%	
	Fair	3	8	11	
		0.8%	6.4%	2.1%	
	Poor	4	4	8	
		1.0%	3.2%	1.5%	
Are you aware of what constitutes an emergency medicine error?	No	39	25	64	0.002
		9.8%	20.0%	12.2%	
	Yes	360	100	460	
		90.2%	80.0%	87.8%	

*P value was considered significant if ≤ 0.05 .

Table (5) shows that experiencing any adverse events due to emergency medicine has statistically significant relation to general health status (P value=0.0001) and age (P value=0.008). It also shows statistically insignificant relation to being aware of emergency medicine errors, educational level.

Table (5): Experiencing any adverse events due to emergency medicine in association with sociodemographic characteristics.

Parameters		Have you or someone you know suffered any adverse events due to emergency medicine errors?		Total (N=524)	P value*
		No	Yes		
Age	24 or less	76	33	109	0.008
		23.3%	16.7%	20.8%	
	25 to 26	43	47	90	
		13.2%	23.7%	17.2%	
	27 to 28	76	46	122	
		23.3%	23.2%	23.3%	
	29 to 32	55	39	94	
		16.9%	19.7%	17.9%	
	33 or more	76	33	109	
		23.3%	16.7%	20.8%	
Educational level	High School	1	0	1	0.103
		0.3%	0.0%	0.2%	
	Diploma	35	14	49	
		10.7%	7.1%	9.4%	
	Bachelor's degree	210	151	361	
		64.4%	76.3%	68.9%	
	Master's Degree	50	23	73	
		15.3%	11.6%	13.9%	
	Doctorate	29	10	39	
		8.9%	5.1%	7.4%	
	Other	1	0	1	
		0.3%	0.0%	0.2%	
General health status	Excellent	111	101	212	0.0001
		34.0%	51.0%	40.5%	
	Very good	129	44	173	
		39.6%	22.2%	33.0%	
	Good	72	48	120	
		22.1%	24.2%	22.9%	
	Fair	6	5	11	
		1.8%	2.5%	2.1%	
	Poor	8	0	8	
		2.5%	0.0%	1.5%	

<i>Are you aware of what constitutes an emergency medicine error?</i>	No	42	22	64	0.548
		12.9%	11.1%	12.2%	
	Yes	284	176	460	
		87.1%	88.9%	87.8%	

**P value was considered significant if ≤ 0.05 .*

Discussion:

Any healthcare organization brings a large number of patients through its emergency department (ED). Emergency departments require the dominance of the urgent and high-pressure atmosphere, which often leads to communication failures, misdiagnosis and inappropriate treatment [12]. However, various studies and reports show that the speed of medical errors in emergency rooms of KSA varies incredibly, with estimates that between 20% and 30% of patients will encounter any type of error in their care. It is important to identify type of errors that occur in order to improve patients' safety and the quality of care. One of the most common medical errors found in the emergency room is misdiagnosis [13]. Emergency medicine poses a fast-paced environment and therefore healthcare providers are often asked to evaluate and choose rapidly in situations with little information. Often, patients come in with nonspecific symptoms that can imply a lot of other issues. Medication is another error and includes the dispensing of incorrect drugs and also the misplaced administration of dosage [14]. A high volume of patients requiring immediate medication are seen in the emergency department and for some, hurried assessments increase the risk of drug interactions. Finally, the reliance on verbal orders in chaotic circumstances contributes to misunderstanding and errors in administration. While this crucial step is sometimes skipped in chaos...Healthcare providers must verify patient allergies and current medications before proceeding. Another major problem of emergency department in KSA is inadequate communication amongst healthcare providers [15], other than misdiagnosis and medication errors. Thus, we aimed in this study to determine the prevalence and most frequently medical errors in Emergency room in KSA.

Our investigation into medical errors in the emergency room found that a striking 87.8% of participants did recognize the kinds of errors inherent in emergency medicine. Compared to this grim perception of how often such errors occur, 17.4 % of the respondents rated them as very frequent and 27.5 % as frequent. This highlighted a discrepancy where awareness should not necessarily imply mitigation — a large percentage (37.8%) of callers reported adverse events related to these errors for the most part stemming from miscommunication (64.3%) and inadequate training (42.7%). Our results fit in with other literature, such as those of Williams who observed rates of medications errors varying from 2% to 14% for patients admitted to the emergency center, where 1-2% was associated with harm [16]. Like Marcin et al., we observed a much higher error incidence of 39% in pediatric emergency departments [17], highlighting the vulnerability of patients in these high-pressure environments. Additionally, Marcin et al [18] also proposed the prevalence of approximately 40% among children visiting the emergency department and so, the attending physicians can know about these children when they are even at the emergency department. Additionally, 71.2% of our respondents voted in favor of greater training and education of staff members and 66.9% favor increased staffing for patient safety. Our findings are in line with others that medication errors occur most frequently during the administration phase and we echo this need for systemic change. For example, Copp and colleagues have found that 34% of medication errors occur during administration in intensive care units [19] and emergency

departments are not immune to this problem. On the other hand, our study found that there is strong consensus among healthcare providers for mandatory training programs: 90% support for training on patient safety, medication management, and communication skills. Additionally, a willingness to intervene is suggested by the high belief (84.8%) in the effectiveness of their protocol changes. Just as we are finding, Palabindala et al.[20] found that hospitals must ensure that all users participate in regular system upgrade training in order to limit the risk of errors and adverse events.

Our study data very strikingly agrees with previous literature on the contribution of nursing staff to reduce medication errors [21]. Consistent with previous literature, we found that problems occurred mostly among nursing personnel. Furthermore, according to Tissot and colleagues the relationship between high workload and rates of medication error lends support to claims that shortage of staff are the principal risk factors [22]. The prevalence of omission errors in our emergency department highlights a critical area requiring attention, consistent with findings from several other studies showing that omission errors are among the most common types of errors across various hospital departments [21,23, 24]. Given the crowded and often understaffed environment of emergency rooms, our study adds to the body of evidence indicating that high workloads significantly contribute to error rates in emergency services. With the absence of formulary interchanges noted at our center, we emphasize the need for such services to mitigate errors effectively while also reducing costs. Moreover, our analyses revealed significant relationships between the incidence of emergency medicine errors and participants' general health status and their awareness of errors, although age and educational level did not yield significant correlations.

Conclusion:

Finally, this study has drawn our attention to the alarming frequency of errors in emergency departments in Saudi Arabia of around 20 to 30% of experienced errors in patients. Common errors include misdiagnosis and medication mistake with miscommunication and lack of training being the main causes of healthcare staff. For example, participants were notably aware of these issues, with 87.8% recognizing their existence but only 37.8% of respondents reporting having personally had adverse events. This highlights the necessity for systemic improvements such as improved training programs and larger staffing levels—being agreed to by 71.2% of participants and 66.9% of participants, respectively. In addition, there is a strong consensus that mandatory training in patient safety and communication skills is warranted for this readiness for intervention. In summary, addressing these problems is vital to the improvement in patient safety and care quality in the emergency setting in Saudi Arabia.

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Ethical approval:

After fully explaining the study and emphasizing that participation is optional, each participant gave their informed consent. The information gathered was safely stored and utilized exclusively for study.

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Conflict of interests:

The authors declare no conflict of interest.

Informed consent:

Written informed consent was acquired from each individual study participant.

Data and materials availability:

All data associated with this study are present in the paper.

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