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ORIGINAL ARTICLE

Knowledge, Attitude and Practice of Medication Administration Errors among Internal Medicine Nurses

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ABSTRACT

Background: Medication administration errors (MAEs) are more likely to occur because millions of patients receive treatment in hospitals and many health services rely on drugs. This study aimed to identify nature and type of MAEs among internal medicine nurses, assessing levels of knowledge, attitude and practice of internal medicine nurses regarding MAEs, and identifying predictors of knowledge, attitude and practice of internal medicine nurses regarding MAEs.
Methods: A cross-sectional study was conducted on 167 nurses at internal medicine department at Zagazig University Hospitals (ZUH) (ICU and Inpatient departments) during 2023-2024. A semi structured questionnaire was used to identify sociodemographic, occupational characteristics, knowledge and attitude of nurses regarding MAEs. We used an observational checklist to assess practice of nurses before, during and after drug administration.
Results: The study revealed that 34.7% of participants experienced high knowledge, 24.6% had high attitude and 22.2% had satisfactory practice regards MAEs. Statistically significant associations were found between age, educational level, nature of work and duration of work with knowledge, attitude and practice of participants(p<005). Knowledge, attitude and practice scores showed significant positive correlation (r=0.43,0.45) (p=0.002,0.001). Also, a significant positive correlation (r=0.4; p=0.004) was found between attitude with practice score. By logistic regression, ICU nurses (O.R=1.98, 6.12, 7.4) and duration of work(>10 years)(O.R=3.84, 3.3, 3.8)were significant predictors for knowledge, attitude and practice. Technical institute education was a significant predictor for knowledge (O.R=1.36). Profession (head nurse) was a significant predictor for attitude and practice of participants (O.R=11.1,18.7)
Conclusion: A low percent of nurses had high levels of knowledge, attitude and practice towards MAEs, so it is recommended to encourage them to report any medication error. Also, training courses in medication administration may have good impact.
Keywords: Knowledge, Attitude, Practice, Medication, Administration.

INTRODUCTION

A medication error (ME) refers to any preventable mistake that could result in improper use of medication or harm to a patient while the medication is being handled by a healthcare professional, patient, or caregiver. Any step of the drug process, from prescribing and dispensing to administering and monitoring, is susceptible to these mistakes [1].

There are several potential points of error in the process of administering medication. Serious injury, impairment, or even death can result from pharmaceutical errors caused by insufficient medication systems or human variables impacting the processes of medicine administration, transcription, dispensing, or monitoring. These factors can include things like weariness, an undesirable work environment, or a shortage of staff [2].

Healthcare professionals may find it difficult to identify and report pharmaceutical errors due to a variety of variables, including their workload, education, training, institutional policies and procedures, and their fear of legal action or disciplinary action [3].

Health care personnel underreport medication errors due to a number of reasons, including the guilt culture, fear of punishment, ignorance of the value of reporting medication errors, and a lack of knowledge on how to do so [4].

However, failing to report medication errors might hinder efforts to enhance patient safety since it leaves gaps in healthcare providers' understanding of the factors that contribute to medication errors, thereby shielding the hospital from the potentially dangerous practice [5]. So, this study aimed to identify nature and type of MAEs among internal medicine nurses, assessing levels of knowledge, attitude and practice of internal medicine nurses regarding MAEs, and identifying predictors of knowledge, attitude and practice of internal medicine nurses regarding MAEs.

METHODS

A cross sectional study was carried out at internal medicine department at ZUH (ICU and Inpatient departments) during the year 2023-2024.The study was carried out among 167 registered nurses (RN) of internal medicine department at ZUH. Nurses who were working at internal medicine department at ZUH, had at least 1 year of working experience and ready to take part in the research were included in the study. Nurses who were in annual leave or sick leave during the study, internship nurses and student nurses were excluded from the study.

Using Open Epi-Info (Epidemiological Information Package) software version 6.1, the sample size was determined based on the information gathered; The total number of working nurses in internal medicine department of ZUH was 718, (Zagazig University Quality /statistical Center 2023) and the prevalence of medication errors in previous study was 17% [6]. At a confidence interval of 95.0%, and effect size =1, 167 nurses estimated to be the sample size and simple random sampling method was used.

All participants in this study were interviewed and asked to complete a semi-structured questionnaire that was adopted from previous studies [7,8,9]. An observational checklist was obtained from previous studies [2,7]. A group of occupational medicine specialists reviewed the questionnaire to ensure that it was clear, relevant, and easy to read. They also looked at the order of the questions and the time it took to complete.

Reliability coefficients (Cronbach's alpha) were calculated after the questionnaire was evaluated multiple times. They were generally high (0.78) for every section of the questionnaire and appropriate for scientific use.

Questionnaire included the following:

Socio-demographic and occupational characteristics as age, educational level, profession, nature of work and duration of work.

Questions covering knowledge of nurses about MAEs including (meaning of medication administration error, causes of medication administration error). One point was awarded for each right response, and zero points were awarded for each incorrect response. The scores were then computed and totaled. The overall scores were between 0 and 34. High knowledge level has been introduced when the score is 21-34(≥60%), and low knowledge level was considered when the score is 0-20(<60%).

Questions covering nurses' attitudes and beliefs about reporting medication administration errors asking about: Importance to report medication administration errors and reasons for not reporting medication administration errors. Likert scale was used to rate attitude& beliefs questions (disagree (0), neutral (1), agree (2)), negative warded questions, a reversed score was used (disagree (2), neutral (1), agree (0)). Total attitude score ranged from 0- 18. According to the total score, high attitude was considered when the score is 11–18 (≥60%) and low attitude was considered when the score is 0-10 (<60%).

An observational checklist completed by 90 nurses assess their medication administration practice including 4 main categories: nursing practice during medication preparation, administration and after administration. Last item assessing types of MAE (wrong dose, wrong drug ,wrong time, wrong patient and wrong route). Each complete and correct done step obtained one score, and" not done" or incorrect action step obtained take zero score. Total practice score ranged from 0- 40. According to the total score, satisfactory practice was considered when the score is 24–40 (≥60%) and unsatisfactory practice was considered when the score is 0-23(<60%).

A pilot study was conducted in september 2023 to evaluate the study's viability, spot any possible

issues with the design, and assist in the creation or improvement of the data collection instruments. Additionally, it aided in evaluating the suggested questionnaires' reliability and face validity. It was carried out on 10% of the study sample (16 nurses) who were selected randomly. Informed consent was obtained from all participants prior to their involvement in the study. The research protocol was thoroughly reviewed and approved by the Institutional Review Board (IRB) of Zagazig Faculty of Medicine, Zagazig University, under approval number 10364 on 18/1/2023. Throughout the study, strict adherence to the ethical principles outlined in the Declaration of Helsinki, established by the World Medical Association, was maintained to ensure the protection, safety, and rights of all participants.

After the collected data was updated, coded, tabulated, and transferred to a personal computer, it was examined using the Statistical Package for Social Sciences (SPSS) software for Windows Version 27. The mean and standard deviation (SD) were used to represent quantitative variables, whereas frequencies and percentages were used to represent qualitative data. At a significance level of $p < 0.05$, the chi square test and Fisher's exact test have been employed. Results were classified as non-significant (NS) if the P value was greater than 0.05, highly significant if it was less than 0.001, and significant if it was equal to or less than 0.05. The association between the study group's knowledge score and the study participants' attitude and practice scores was evaluated using Pearson's correlation coefficient.

RESULTS

This study was conducted on 167 nurses at internal medicine department. The mean age of the study participants was 34.6 years, 62.3% had technical institute degree. Most of the study participants were staff nurses (92.2%), and 61.1% of participants worked in inpatient. More than half of them worked for > 10 years **(Table 1).**

Results showed that 34.7% of the study participants had high knowledge regarding MAEs **(Figure 1),** 24.6% of participants had high attitude regards MAEs **(Figure 1),** and 22.2 % of participants had satisfactory practice regards MAEs **(Figure 1).**

Knowledge , attitude and practice scores showed a statistically significant positive correlation (r=0.43,0.45) (p=0.002,0.001). Also, a statistically significant positive association (r=0.4; p=0.004) was found between attitude with practice score.

Age (41-50), level of education (technical institute and baccalaureate degree), nature of work (ICU), duration of work (> 10 years), were significantly associated with study participants' level of knowledge regarding MAEs **(Table 2).**

Age (41-50 years), educational level (technical institute), profession (head nurse), nature of current work (ICU), duration of work (>10 years), were significantly associated with study participants' level of attitude regarding MAEs **(Table 3)** and also with study participants' level of practice regarding MAEs **(Table 4).**

By logistic regression, nature of work (ICU nurses) (O.R=1.98, 6.12, 7.4) and duration of work (>10 years)(O.R=3.84, 3.3, 3.8)were the significant predictors for knowledge, attitude and practice respectively. Educational level (technical institute) was a significant predictor for knowledge(O.R=1.36). Profession (head nurse) was a significant predictor for attitude and practice of study participants (O.R=11.1,18.7) **(Table 5).**

Table 1: Frequency distribution of the study participants regarding socio-demographic and occupational characteristics (N=167)

Variable	NO.	%
Age		
20-30	60	36
31-40	59	35.3
41-50	44	26.3
51-55	4	2.4
Mean ± SD	34.6± 8.9	
Range	(21-53)	
level of education		
Diploma	58	34.7
Technical institute	104	62.3
Baccalaureate	5	3.0

Variable	NO.	%
Profession		
Head nurse	13	7.8
Staff nurse	154	92.2
Nature of current work		
ICU	65	38.9
Inpatient	102	61.1
Duration of work (years)		
≤10	78	46.7
>10	89	53.3

Table 2: Frequency distribution of the study participants' level of knowledge regarding MAEs according to socio-demographic and occupational characteristics (N=167)

Variable	Low knowledge (N=109)		High knowledge (N=58)		Test of significance	P
	NO.	%	NO.	%		
Age						
20-30 (n=60)	40	66.7	20	33.3		Ref
31-40 (n=59)	46	77.9	13	22.1	1.9	0.17
41-50 (n=44)	20	45.5	24	54.5	4.7	0.03*
51-55(n=4)	3	75	1	25	0.1	0.7
level of education						
Diploma (n=58)	48	82.8	10	17.2		Ref
Technical (n=104)	59	56.7	45	43.3	11.2	<0.001**
Baccalaureate (n=5)	2	40.0	3	60.0	5.1	0.02*
profession						
Head nurse(n=13)	10	76.9	3	23.1	f	0.54
Staff nurse(n=154)	99	64.3	55	35.7		
Nature of current work						
ICU (n=65)	30	46.2	35	53.8	17.15	<0.001**
Inpatient (n=102)	79	77.5	23	22.5		
Duration of work (years)						
≤10 (n=78)	65	83.3	13	16.7	21.06	<0.001**
>10(n=89)	44	49.4	45	50.6		

Chi square test was done f : Fisher *: Significant (P≤0.05) **: highly significant (P<0.001)

Table 3: Frequency distribution of the study participants' level of attitude according to socio-demographic and occupational characteristics (N=167)

Variable	Unsatisfactory (n=70)		Satisfactory (n=20)		Test of significance	P
	NO.	%	NO.	%		
Age						
20-30 (n=35)	29	88.6	6	11.4		Ref
31-40 (n=31)	28	90.3	3	9.7	0.78	0.37
41-50 (n=20)	10	50.0	10	50.0	6.7	0.009*
51-55 (n=4)	3	75.0	1	0.25	0.15	0.69
level of education						
Diploma (n=30)	27	90.0	3	10.0		Ref
Technical (n=55)	39	70.9	16	29.1	4.07	0.04*
Baccalaureate (n=5)	4	80.0	1	20.0	0.4	0.5
Profession						
Head nurse (n=9)	3	33.3	6	66.7	f	0.003*
Staff (n=81)	67	82.7	14	17.3		
Nature of current work						
ICU (n=31)	14	45.2	17	54.8	f	<0.001**
Inpatient (n=59)	56	94.9	3	5.1		
Duration of work (years)						
≤10 (n=35)	33	94.0	6.0	20.0	0.16	0.003*
>10 (n=55)	37	67.3	18	32.7		

Chi square test was done f : Fisher *: Significant (P≤0.05) **: highly significant (P<0.001)

Table 4: Frequency distribution of the study participants' level of practice according to socio-demographic and occupational characteristics (N=90)

Variable	Low attitude (N=126)		High attitude (N=41)		Test of significance	P
	NO.	%	NO,	%		
Age						
20-30 (n=60)	50	83.3	10	16.7		Ref
31-40 (n=59)	51	86.4	8	13.6	0.2	0.6
41-50 (n=44)	22	50.0	22	50.0	13.2	<0.001**
51-55(n=4)	3	75.0	1	25.0	0.18	0.7
level of education						
Diploma (n=58)	51	88	7	12		Ref
Technical institute (n=104)	72	69.2	32	30.8	7.1	0.007*
Baccalaureate (n=5)	3	60.0	2	40.0	2.9	0.08
profession						
Head nurse (n=13)	5	38.5	8	61.5	f	0.001**
Staff nurse (n=154)	121	78.6	33	21.4		
Nature of current work						
ICU (n=65)	35	53.8	30	46.2	26.8	<0.001**
Inpatient (n=102)	91	89.2	11	10.8		
Duration of work (years)						
≤10 (n=78)	70	89.7	8	10.3	16.1	<0.001**
>10(n=89)	56	62.9	33	37.1		

Chi square test was done f: Fisher *: Significant (P≤0.05) **: highly significant (P<0.001)

Table 5: Logistic regression for significant predictors of knowledge, attitude and practice of study participants regarding MAEs

Predictors	B	S.E	Wald	O.R (95%C.I)	P
Knowledge					
Age (41-50)	1.64	0.49	3.99	2.69 (0.06-2.75)	0.91
Baccalaureate	0.17	0.14	2.11	1.21 (0.84-2.93)	0.22
Technical institute	0.31	0.04	4.66	1.36 (1.25-1.51)	<0.001**
Nature of work (ICU)	0.53	0.79	12.18	1.98 (1.05-4.15)	<0.001**
Duration of work (>10y)	1.35	0.34	15.89	3.84 (1.98-7.38)	<0.001**
Attitude					
Age (41-50)	0.97	0.22	2.17	2.04 (0.89-4.56)	0.41
Technical institute	0.34	0.18	1.97	1.87 (0.97-2.33)	0.22
Profession (Head nurse)	2.43	1.99	3.71	11.1 (1.04-17.5)	0.04*
Nature of work (ICU)	1.81	1.11	2.19	6.12 (1.3-22.8)	<0.001**
Duration of work (>10y)	1.97	0.97	10.1	3.3 (1.6-6.7)	0.001**
Practice					
Age (41-50)	0.76	0.8	0.42	1.7 (0.33-8.9)	0.51
Technical institute	0.66	0.76	0.91	2.2 (0.46-10.7)	0.3
Profession (Head nurse)	1.12	1.22	6.1	18.7 (1.81-90.6)	0.01*
Nature of work (ICU)	1.09	0.80	5.6	7.4 (1.42-39.1)	0.01*
Duration of work (>10y)	0.89	2.34	12.8	3.8 (1.6-33.9)	0.003*

*: Significant (P≤0.05) **: highly significant (P<0.001)

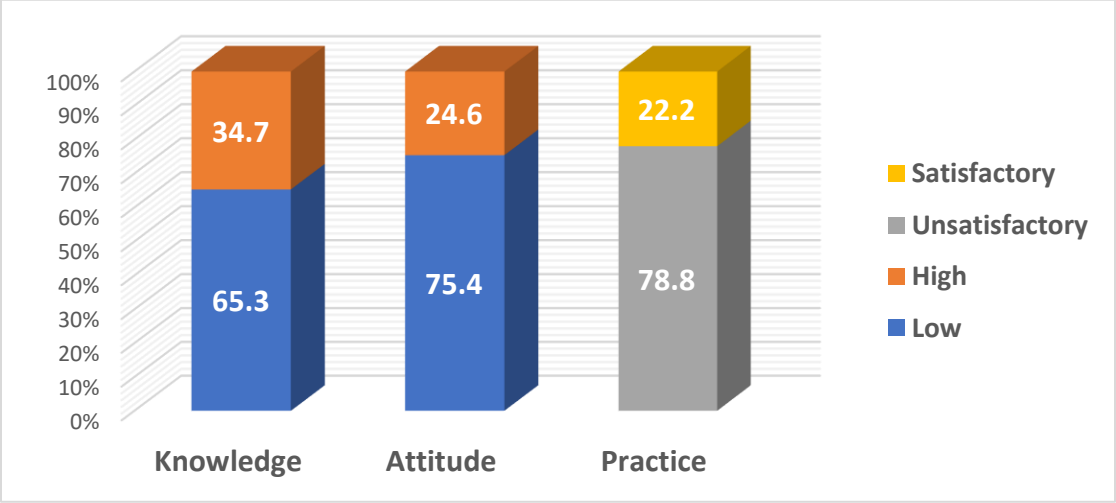

Figure 1: Level of knowledge, attitude and practice regarding MAEs among the study participants.

DISCUSSION

Reducing the prevalence of drug-related iatrogenic disease is a public health problem, and safe, effective, and ethical pharmaceutical practice is a vital component of client care [10]. Clarifying nurses' knowledge about medication errors will have a major impact on patient safety, even though their abilities in patient management and medicine delivery are impressive. In Egypt, however, nurses'

awareness of medication errors is still underreported [11].

This study shows that the age of the study participants ranged from 21 to 53 years with mean age 34.6 years (table 1). This is consistent with Alhashemi et al. [12] who reported that the mean age of nurses was 32 years.

According to the findings of their qualifications, over half of them (62.3%) had earned a nursing degree from a technical institute (table 1). The fact that a small percentage of faculty graduates have worked in the university hospital as well as in schools or ministry of health hospitals may help to explain this.

In our study 34.7% of participants had high knowledge regarding MAEs (Figure 1) and 24.6% of participants had high attitude towards MAEs (Figure 1). In comparison to prior studies, compared to 97% of participating doctors and nurses who knew enough about medication mistakes, this result is lower documented by Alsulami et al. [13] and lower than a study by Alandajani et al. [11] which discovered that just 50% of the nurses showed a positive attitude toward medication errors, while slightly more than half (55%) had strong knowledge about medication errors. The discrepancy may have to do with the measures used to evaluate their attitude and knowledge, as well as the participation of nurses and doctors in the latter study. Furthermore, because of their training, doctors are better informed and knowledgeable about errors in medication than nurses.

A study by Alandajani et al. [11] reported that age groups under 25 and 25 to 35 years old were linked to higher rates of medication errors. This is consistent with age of participants of our study with low knowledge (Table 2).

Our study shows duration of work (> 10 years), were significantly associated with study participants' level of knowledge regarding MAEs (Table 2). This is consistent with a study by Shamsuddin and Shafie. [14], The study titled "Knowledge of Nurses in the Preparation and Administration of Intravenous Medication" revealed that nearly three-quarters of the participating nurses had over eight years of professional experience. Results shows that age, profession and level of education were significantly associated with attitude of participants as regard MAE (Table 3), these findings similar to results in a study done by Alandajani et al. [11] demonstrates how demographic variables, cultural consequences, and nurses' attitudes toward medication errors are related.

In this study it's observed that nurses with technical institute degree education were had high statistical significant association with attitude of nurses towards MAEs (Table 3). This is opposite a study performed by Mohammad et al. [15] in which nurses with bachelor degree exhibit higher perception levels of barriers in reporting MAE.

According to research by Di Muzio et al. [16], the nurses' knowledge and attitudes toward medication errors differed according to their degree of education.

The present study showed that duration of work, nature of current work were significantly associated with attitude of participants as regard MAEs (Table 3). These findings are found in an integrative review by Kerari & Innab [17] which was conducted on 1141 publications, and offered strong proof that the incidence of MAEs is directly correlated with the educational level and professional experience of nurses.

According to the current study, 78.8% of nurses had unsatisfactory practice, whereas only 22.2% of nurses had overall satisfactory practice regarding drug administration errors (Figure 1). This can be the result of a shortage of ongoing training courses and practice sessions for administering medications. This study is almost identical to one conducted by Abd Elmageed et al. [18], who discovered that over 75% of nurses exhibited unsatisfactory practice scores for administering and preparing drugs. This result contrasts with a research by Nasr et al. [19] that found that over half (51.7%) of nurses had an average total score of practice in drug preparation and administration errors. This conclusion is also supported by Ramya [20], who demonstrated that 31% of staff nurses had moderate practice in preventing medication errors in children, whereas 69% of staff nurses had good practice.

This study showed that educational level (technical institute) was significantly associated with study participants' level of practice regarding MAEs (Table 4). In contrast to earlier cross-sectional studies, this the bulk of research consistently demonstrated that RNs' MAEs were strongly predicted by their educational level, with Asad. [21] finding that Compared to nurses with associate degrees, those with bachelor's and master's degrees were significantly less likely to create MAEs ($p < 0.01$).

The study showed that duration of work (> 10 years), was significantly associated with study participants' level of practice regarding MAEs (Table 4). This is opposite a study by Nasr et al. [19] which concluded that the significant difference was found concerning total scores of nurses practices (0.04) in Less than 1 year duration of working experience.

Conclusion:

It was concluded that the levels of knowledge, attitude and practice of internal medicine nurses regarding MAEs were 34.7%, 24.6% and 22.2% respectively**.**

Recommendation:

For nurses it's recommended to encourage them to report any medication error. Pre-training and continuous courses must be implemented to up date information among nurses as regard MAEs. Also, it's recommended to conduct a preventive program that involves planning, monitoring, implementation, and evaluation of prevention-intervention measures which could deal with MAEs. Further studies to find causal association and risk factors for MAEs are recommended.

Conflict of Interest: None

Financial Disclosures: None

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