# Knowledge, Attitude and Practice of Nurses in Administering Medications at Mansoura University Hospitals

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## Abstract

***Background:*** *Patient safety is a priority for health care organizations worldwide. Nurses need to recognize the challenges they face when administering medications to their patients.* ***Aim:*** *the current study was carried out to assess knowledge, attitude and practice of nurses in administering medications, identify the relationship between knowledge attitude and practice of nurses in administering medications. Finally, examine the association between nurses' knowledge, attitude, practice and socio-demographic characteristics.* ***Design:*** *A descriptive correlational cross sectional study design was used.* ***Setting:*** *This study was conducted on nurses in specialized medical hospital.* ***Subjects:*** *140 nurses.* ***Tools:*** *Two tools were used; the first tool was structured interviewing questionnaire. It was used to measure socio-demographic data, nurses' knowledge and nurses' attitude regarding medication administration. Tool two was medication administration checklist to assess nurses' practice regarding medications administration.* ***Findings:*** *Slightly less than two thirds of nurses have poor total knowledge score regarding medication administration. Slightly more than half of the nurses have positive attitude regarding medication administration, while more than two fifths have negative attitude. Around half of the nurses have poor total practice score regarding medication administration. Generally, there is a statistically significant relation between nurses' knowledge and their practice and attitude regarding medication administration. Moreover, there is a statistically significant association between nurses' years of experience and their knowledge regarding medication administration. There is a statistically significant association between nurses' sex and qualification and their practice regarding medication administration. Finally, there is a statistically significant association between nurses' working unit and age and their attitude regarding medication administration.*
***Conclusion****: Nurses have poor knowledge, practice, and negative attitude toward medication administration, which needs to be corrected.*
***Key words:*** *Drug, Medication Administration, Medication Errors, Pharmacology.*

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## I.    Introduction

World Health Organization (WHO) has successfully led two global patient safety challenges in the past. According to  [1]. The Third Global Patient Safety Challenge is Medication without Harm. That was formally announced at the 2nd Global Ministerial Patient Safety Summit at Bonn, Germany. The overall goal of the Challenge is to reduce severe, avoidable medication-related harm by 50% over the next 5 years. Many participating countries confirmed that they will be participating in the challenge [1].

According to [2,3], Unsafe medication practices and medication errors are a leading cause of injury and avoidable harm in health care systems across the world. Globally, the cost associated with medication errors has been estimated at $42 billion USD annually. Errors can occur at different stages of the medication use process. Medication errors occur when weak medication systems and/or human factors such as fatigue, poor environmental conditions or staff shortages affect prescribing, transcribing, dispensing, administration and monitoring practices, which can then result in severe harm, disability and even death. Multiple interventions to address the frequency and impact of medication errors have already been developed, yet their implementation is varied. A wide mobilization of stakeholders supporting sustained actions is required. In response to this, WHO has identified Medication without Harm as the theme for the third Global Patient Safety Challenge.

Health services work hard to provide safe and high quality care, but sometimes people are inadvertently harmed. Unsafe health care including unsafe medication administration practice has been recognized as a global challenge facing nursing staff and much has been done to understand the causes, consequences and potential solutions to this problem [4].

In this regard, The Multi-professional Patient Safety Curriculum Guide was developed to assist in the teaching of patient safety in universities and schools in the fields of dentistry, medicine, midwifery, nursing and

pharmacy. It also supports the on-going training of all health care professionals, including proper and safe medication administration guidance [5].

That was confirmed by [6] whom found that the participants encountered a variety of teaching strategies in relation to drug calculation in their pre-registration nursing programs.

Drugs may be given to the whole ward by the same nurses or to a smaller group of patients by those directly involved in their care. The nurse is responsible for interpreting the prescription accurately, recording that the drug has been given and observing the patient's response. Prior to administration the nurse must know the reason for, action and usual dosage of the drug; this should enable him or her to recognize mistakes in prescribing medication. In the community, most patients, or some member of the family, are responsible for drug administration, although the nurse may have a role to play [7].

Since nurses are committed to tackling the challenges of patient safety and minimizing the hazards of unsafe medication administration. The current study has focused on assess knowledge, attitude and practice of nurses in administering medication; identify the relationship between knowledge, attitude and practice of nurses in administering medications. Finally, examine the association between nurses' knowledge, attitude, practice and socio-demographic characteristics.

## II. Aim of study

The current study was carried out to:
1. Assess knowledge, attitude and practice of nurses in administering medications.
2. Identify the relationship between knowledge, attitude and practice of nurses in administering medications.
3. Examine the association between nurses' knowledge, attitude, practice and socio-demographic characteristics.

## III. Materials & Method

**3.1-Study Design:-**
A descriptive correlational cross sectional research design was used in this study.

**3.2- Setting:**
This study was conducted on nurses in specialized medical hospital.

**3.3- Subjects:**
According to Epi Info 7 sample size estimation program using the following parameter:
1) Population size (700 nurse, all nurses working at Mansoura University Hospitals)
2) Expected frequency (12%)
3) Margin of error (5%)
4) Confidence co. efficient (95%)
5) Minimum sample size (132nurse)

The total sample size was 140 nurses (all of the available nurse at the selected hospital). By using simple random technique140 nurses were recruited in the study.
A sample of 140 nurses working at specialized medical hospital who accept to participate as a voluntarily in this study during a period of four months.

**3.4-Tools:**
Two tools were used in this study for collecting of necessary data and achieving the aim of the study as follows:
**Tool I**: consists of 3 parts:
**The first part:** was socio demographic questionnaire (6 items):
It was used for collection of personal data as:
(Nurse name- age-sex-unit-training courses regarding medication administration-qualification-years of experience).
**The second part:** was medication administration knowledge questionnaire. This part was used to assess the knowledge of nurses regarding medication administration and includes 15 items:
1) Nurses knowledge regarding the policy of medication administration.
2) Nurses knowledge regarding medication preparation.
3) Nurses knowledge regarding medication administration.
4) Nurses knowledge regarding charting of medications.
5) Nurses knowledge regarding missed dose due to diagnostic procedures.
6) Nurses knowledge regarding withholding medications.
7) Nurses knowledge regarding discontinued medications.

**8)** Nurses knowledge regarding PRN medications.
**9)** Nurses knowledge regarding standard medication administration times.
**10)** Nurses knowledge regarding intravenous push medications.
**11)** Nurses knowledge regarding floor-stock medication and supplies.
**12)** Nurses knowledge regarding single dose vial/ ampoules.
**13)** Nurses knowledge regarding multiple dose vials/containers.
**14)** Nurses knowledge regarding medication refrigerators.
**15)** Nurses knowledge regarding verification of physician orders.

**The third part:** was medication attitude questionnaire this part contains 20 questions on positive attitude and negative attitude.
**Scoring system:**
The total score was calculated according to the following; each complete and correct answer was given 2 points, the incomplete answer was given 1 point and finally zero was given for incorrect or missed answer.
**Tool II:** Performance checklist in medication administration
**This tool includes questions about medication administration process:**
- General preparation principles
- Administration of medication dose
- Post administration of medications

**Scoring system of nurse's performance:**
A score one was given for each correct performance and zero for each incorrect performance.
**Validity and reliability:**
The tools were developed by the researcher and tested for content related validity by 7 experts, five experts from faculty of nursing and two from the faculty of medicine, who reviewed the tools for clarity, relevance, understanding, and applicability for implementation. According to their critiques, the modifications were done.
Reliability was measured for knowledge, attitude and practice tool using the cronbach's alpha test with R=0.89.
**Pilot study:**
Pilot study was conducted on 10 nurses in order to examine the clarity and applicability of the tools. These nurses were excluded from the study sample .Tools were modified to be clear and under stood .
**Human right and ethical consideration:**
In arrange to undertake this study, the proposal was submitted for acceptance from research ethical committee, faculty of nursing, Mansoura university. Official written permission to implement the study was taken from responsible authorites of specialized medical hospital in Mansoura university hospital, oral consent was be obtained from each participant enrolment into the study, after clarification of the nature and the purpose of the study.
The investigator emphasized participation is voluntary and confidential.
Anonymity, privacy, safety and confidentiality will absolutely assured throughout the whole study.
Each participant has the right to withdraw from the study at any time without any explanation.
**Data collection procedure:**
Once permission was granted to proceed with the proposed study from the hospital director, heads and nursing supervisors, nurses were interviewed individually to explain purpose and nature of the study
**Statistical analysis:**
The collected data were coded and analyzed using PC with the Statistical Package for Social Sciences (SPSS version 20) and tabulated frequency and percentages were calculated. Descriptive statistics as frequency, distribution, mean, and standard deviation were used to describe different characteristics. The Chi-square test was used for testing relationship between categorical variables. Median percent score was used in order to categorize the total score of attitude scale. Pearson's r test was used to measure the degree to which two variable's movements are associated. The level of significance selected for this study was p value equal to or less than 0.05.

## IV. Results
The collected data were analyzed    statistically and the results were categorized into the following parts:
**Part I:** Socio-demographic characteristics of the studied nurses.
**Part II:** Nurses' knowledge regarding medication administration
**Part III:** Nurses' attitude regarding medication administration.
**Part IV:** Nurses' practice for medication administration.
**Part V:** Relationship between nurses' knowledge, attitude and practice regarding medication administration.

**Part VI:** The association between nurses' knowledge, attitude, practice and their socio-demographic characteristics.

**Part I: Socio-demographic characteristics of the studied nurses.**

**Table (1) Distribution of the nurses according to their socio-demographic characteristics**

| Nurses' Socio-demographic characteristics | Frequency n(140) | |
|---|---|---|
| | **No** | **%** |
| **Unit** | | |
| ▪ ICU | 35 | 25 |
| ▪ Ward | 101 | 72.1 |
| ▪ ER | 4 | 2.9 |
| **Age (Years)** | | |
| ▪ 18-25 years | 64 | 45.7 |
| ▪ 26-45 years | 76 | 54.3 |
| **Sex** | | |
| ▪ Female | 137 | 97.9 |
| ▪ Male | 3 | 2.1 |
| **Training course** | | |
| ▪ Yes | 2 | 1.4 |
| ▪ No | 138 | 98.6 |
| **Qualifications** | | |
| ▪ Diploma | 57 | 40.7 |
| ▪ Institute / technical | 51 | 36.4 |
| ▪ Bachelor | 32 | 22.9 |
| **Experience (Years)** | | |
| ▪ Less 5 years | 54 | 38.6 |
| ▪ 5-10 years | 57 | 40.7 |
| ▪ More than 10 years | 29 | 20.7 |

**Table (1)** Portrays the distribution of the nurses according to their socio-demographic characteristics. The table shows that around three quarters (72.1%) of nurses working at wards, slightly more than half (54.3%) of the nurses at the age group 26-45 years old, the majority (97.9%) of nurses were females. Furthermore, the majority (98.6%) of the nurses reported that they didn't received any training regarding medication administration, slightly more than two fifths (40.7%) of the nurses were have diploma in nursing, while only around one fifth (22.9%) have bachelor degree in nursing. Finally, around two fifths of the nurses have less than five years of experience and other have 5 to 10 years of experience (38.6%, 40.7% respectively).

**Part II: Nurses' knowledge regarding medication administration**

**Table (2) Distribution of nurses according to their mean knowledge domain score regarding medication administration**

| Nurses' knowledge domains | Mean ± SD |
|---|---|
| **(24 question / 48 point)** <br> • Basic knowledge regarding medication administration | 44.92±1.92 |
| **(21 question / 42 point)** <br> • Nurses' knowledge regarding medication preparation | 36.58± 2.37 |
| **(4 questions /8 point)** <br> • Nurses' knowledge regarding medication administration | 7.82 ±1.026 |
| **(10 questions / 20 point)** <br> • Nurses' knowledge regarding charting of medications | 6.50 ± 0.605 |
| **(12 question / 24 point)** <br> • Nurses' knowledge regarding PRN Medications | 5.45 ± 0.4999 |
| **(19 question / 38 point)** <br> • Nurses' knowledge regarding floor-stock ,medications and supplies | 16.335 1.083 |
| **(12 question / 24 point)** <br> • Nurses' knowledge regarding verification of physicians orders | 19.964 ± 2.07 |
| **(102 question / 204 point)** <br> • Total nurses' knowledge score | 102.72 ± 35.38 |

**Table (2)** Shows the distribution of nurses according to their mean knowledge domain score regarding medication administration. Nurses basic knowledge, knowledge regarding medication preparation, medication administration and verification of physician orders reflect higher mean score (44.92±1.92, 36.58± 2.37, 7.82 ±1.026, and 19.964 ± 2.07 respectively). Whereas, mean score of nurses knowledge regarding charting of medication, PRN medication, and floor- stock medication represent the lower mean score (6.50 ± 0.605, 5.45 ± 0.4999, and 16.335 ± 1.083 respectively). Finally, mean score of nurses total knowledge regarding medication administration is 102.72 ± 35.38.

**Table (3) Distribution of the nurses according to their total knowledge score regarding medication administration**

| Nurses' knowledge | Poor | | Fair | | Good | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| • Knowledge regarding drug Policy | 52 | 37.1 | 32 | 22.9 | 56 | 40 |
| • Knowledge about drug Preparation | 55 | 39.3 | 22 | 15.7 | 63 | 45 |
| • Knowledge about drug Administration | 109 | 77.9 | 23 | 16.4 | 8 | 5.7 |
| • Total knowledge score | 88 | 62.9 | 29 | 20.7 | 23 | 16.4 |

**Table (3)** Presents distribution of the nurses according to their total knowledge score regarding medication administration. The table shows that, around two fifth of the nurses have poor knowledge score regarding drug policy, and drug preparation (37.1%, and 39.3% respectively). Additionally, more than three quarters (77.9%) of the nurses reported poor knowledge score in relation to their knowledge regarding drug administration. Finally, slightly less than two thirds (62.9%) of nurses have poor total knowledge score regarding medication administration.

**Part III: Nurses' attitude regarding medication administration.**

**Table (4) Distribution of the nurses according to their attitude regarding medication administration**

| Nurses' attitude | Frequency | |
|---|---|---|
| | No | % |
| ▪ Positive attitude ( ≥ Median % score) | 72 | 51.4 |
| ▪ Negative attitude ( <Median % score) | 68 | 48.6 |

**Table (4)** Shows distribution of the nurses according to their attitudes regarding medication administration. The table presents that, slightly more than half (51.4%) of the nurses have positive attitude regarding medication administration, while more than two fifths (48.6%) have negative attitude regarding medication administration.

**Table (5) Distribution of the nurses according to mean and standard deviation of their attitude score regarding medication administration**

| Nurses' attitude | Mean ± SD |
|---|---|
| Positive attitude (12 question / 36 Point) | 27.53±1.92 |
| Negative attitude (8 question / 24 Point) | 12.5±1.68 |
| Total attitude score (20 question / 60 Point) | 40.04±2.21 |

**Table (5)** Presents distribution of the nurses according to mean and standard deviation of their attitude score regarding medication administration. This table shows that, the mean and standard deviation of the nurse's positive attitude regarding medication administration is 27.53±1.92, while the mean and standard deviation of the nurse's negative attitude regarding medication administration is 12.5±1.68. In relation to the nurse's total attitude score regarding medication administration is noticed from the table that the mean and standard deviation is 40.04±2.21.

**Part IV: Nurses' practice for medication administration.**

**Table (6) Distribution of the nurses according to their total practice score regarding medication administration**

| Nurses' practice | Poor | | Fair | | Good | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Preparation | 106 | 75.7 | 34 | 24.3 | 0 | 0.00 |
| Administration | 85 | 60.7 | 37 | 26.4 | 18 | 12.9 |
| Post administration | 55 | 39.3 | 63 | 45 | 22 | 15.7 |
| Total practice score | 65 | 46.4 | 42 | 30 | 33 | 23.6 |

**Table (6)** Presents distribution of the nurses according to their total practice score regarding medication administration. This table shows that more than three quarters (75.7%) of the nurses have poor practice score regarding drug preparation, followed by slightly more than three fifths (60.7%) of them reported poor practice score regarding drug administration too. Furthermore, slightly less than two fifths (39.3%) of the nurses have poor practice post administering medication. Lastly, around half (46.4%) of the nurses have poor total practice score.

**Table (7) Distribution of the nurses according to mean and standard deviation of their practice score regarding medication administration**

| Nurses' practice | Mean ± SD |
|---|---|
| Preparation (66 question / 132 point) | 50.66±11.85 |
| Administration (95 question / 190 point) | 122.19±14.65 |
| Post administration (36 question / 72 point) | 44.17±14.76 |
| Total practice score (197 question / 394 point) | 267.05±29.62 |

**Table (7)** Presents distribution of the nurses according to mean and standard deviation of their practice score regarding medication administration. This table shows that, the mean and standard deviation of the nurse's preparation for medication is 50.66±11.85, while the mean and standard deviation of the nurse's medication administration is 122.19±14.65. Regarding nurses' practices post medication administration mean and standard deviation is 44.17±14.76. In relation to the nurse's total practice score regarding medication administration it noticed from the table that the mean and standard deviation is 267.05±29.62.

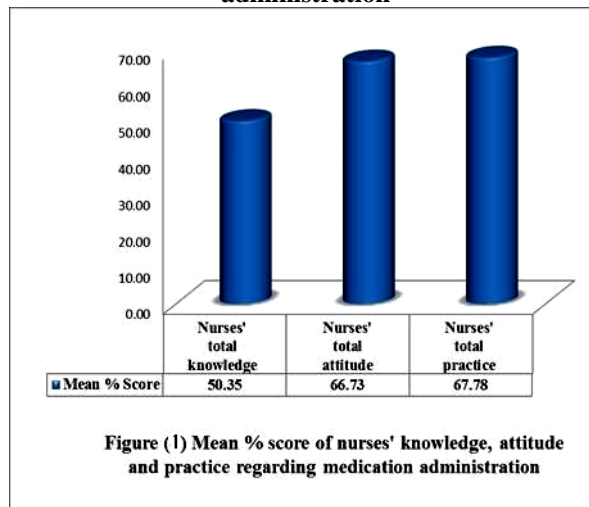**Figure (1) Mean % score of nurses' knowledge, attitude and practice regarding medication administration**



Figure (1) Mean % score of nurses' knowledge, attitude and practice regarding medication administration

**Figure (1)** Portrays that, the mean % score of nurses' knowledge is 50.35, while the mean % score of the nurses' attitude is 66.73 and mean % score of nurses' practice regarding medication administration is 67.78.

**Part V: Relationship between nurses' knowledge, attitude and practice regarding medication administration.**

**Table (8) Relationship between nurses' knowledge, practice, and attitude regarding medication administration**

| Variables | Test of significance | |
|---|---|---|
| | R | P |
| Nurses' knowledge & practice | 0.195 | 0.021* |
| Nurses' knowledge & attitude | 0.149 | 0.022* |
| Nurses' practice & attitude | 0.050 | 0.002* |

**\* Significant at p ≤0.05**

**Table (8)** According to regression analysis this table shows that there is a statistically significant relation between nurses' knowledge and their practice and attitude regarding medication administration where P=0.021, 0.022 respectively. Moreover, this table also shows a statistically significant relation between nurses' practices for medication administration and their attitude regarding medication administration where P=0.002.
**Part VI: The association between nurses' knowledge, attitude, practice and their socio-demographic characteristics.**

## V.  Discussion:

Patient safety is increasingly recognized as essential in the practice of nursing and medical profession as one of the main important concern worldwide[8]. According to WHO (2017), the simplest definition of patient safety is the prevention of errors and adverse effects to patients associated with health care. Medication administration forms a major part of the clinical nurse's role[9]. Thirty three percent of all reported hospital injuries have been attributed to medication errors, among them thirty percent of all medication errors reported to the US Food and Drug Administration (FDA) in 2013 was fatal FDA [10]. In administering any medication, nurses must make a professional decision and apply their safety skills in the existing situation and acting in the best interests of the patient. Nurses are the professionals closest to the patient that is the final link in the medication administration chain Sulosaari et al. [11].

A narrative literature review estimates medication errors' percentage is included among 12% and 20% of total errors such errors are expensive from a human, economic, as well as social point of view Dimuzio et al. [12].

**Part I: Socio-demographic characteristics of the studied nurses:**

The finding of the present study indicated that most nurses were female within 26 to 45 years old; this is supported by Feleke et al [13]. whom reported that, the majority of the studied subjects were female. This could be attributed to the higher exposure of female especially nurses from middle age to the concept of medication errors since medication administration is one of their responsibilities

Concerning to educational level, the present study clarified that slightly more than two fifths of the nurses were have diploma in nursing, while only around one fifth have bachelor degree in nursing. This result is agreed with Ahmed[14]& Kimeu [15], whom found that the highest percentage among nurses were have diploma in nursing. This could be attributed to decrease knowledge level and affecting medication administration practices.

The highest percentage of nurses were reported that they didn't received training regarding medication administration , this result was consistent with Lavin et al. [16], Gordon [17] and Ahmed et al. [14] whom found that the patient safety in medication administration enhanced by in service training. This might due to lack of nurses' understand to the value of such training in controlling medication errors.

Regarding years of experience, the present study indicated that around two fifths of the nurses have less than five years of experience and other have 5 to 10 years of experience. This is supported by Lavin et al. [16]; Gordon, [17]. This factor can interfere with job performance for medication administration. As well as the exposure to different technique of administering medication which affect on quality of care provided to patients, since newly hired or junior staff member may have lack of experience in clinical practice regarding medication administration than senior staff.

**Part II: Nurses' knowledge regarding medication administration.**

Knowledge of pharmacology, or right drug, is an important component of safe medication administration. Medication errors are the most common error that occurs in hospital, settings Gonzales [18]. The importance of effective pharmacological knowledge for nurses is important for various reasons. Nurses are the biggest health care professional group who mainly administer medicines McMullan et al. [19]. Therefore a consistent update of knowledge in this area is clearly of importance.

So, the current study aims to assess nurses' knowledge regarding medication administration. Where, nurses' basic knowledge, knowledge regarding medication preparation, medication administration and verification of physician orders reflect higher mean score. Whereas, mean score of nurses knowledge regarding charting of medication, PRN medication, and floor- stock medication represent the lower mean score.

The results of the current study, also reveals that around two fifths of the nurses have poor knowledge score regarding drug policy, and drug preparation. Finally, slightly less than two thirds of nurses have poor total knowledge score regarding medication administration. This finding was contradicted with Nair [8] who found that nurses' knowledge on pediatric medicine administration is above average. This finding could be due to lack of training, poor level of education since only around one fifth of nurses in the current study have bachelor degree in nursing.

Whereas, this findings supported by a survey done in India **(2013)** to assess the knowledge, attitude and practices of the chief healthcare providers about medication errors among healthcare personnel revealed that, the score of knowledge of the doctors was significantly higher than that of the nurses and the pharmacists[20].

Each nurse should be aware of indication, action, contraindication, adverse reaction and interactions of drugs to prevent errors (Edwards and Axe**,** 2015) [21]**.** So it is important to clarify level of knowledge regarding medication administration in order to put a spot light on weakness and correct it to provide a high quality care.

**Part III: Nurses' attitude regarding medication administration.**

To ensure safe medication administration the nurses should have a positive attitude toward it, understanding nurses' attitude toward medication administration is highly important issue, poor attitude affecting nurses' response toward medication administration in all the medication administration process.

Positive attitudes play a vital role in reporting errors since fear of manager and peer reactions in case of medication errors makes reporting difficult, which reflects poor attitude Cheragiet al. [22]**.** This finding was in agreement with the current study findings, since the current study reported that more than two fifths of nurses have negative attitude regarding medication administration. This may be attributed to lack of information, and also may be due to work overload that force the nurse to put more concern on other roles assigned to them.

Moreover, some nurses considers medication errors must not be reported especially if they working in an environment where individuals are punished for making mistakes that will discourage error reporting and encourage hiding mistakes, ultimately making it difficult to identify errors and to prevent them from happening. Furthermore, Armstrong [23] as they claimed that the study subjects in their research have unfavorable attitude towards reporting.

In contrast, Dimuzio et al. [12] reported that,  the majority of the sample have positive attitude toward medication administration and they acts to reduce errors as they follow preventive measures, such as frequent trainings, use authoritative guidelines which drawn up from scientific evidence, continuous evaluation of clinical skills, as well as they reporting errors in order to improve care. All of these finding reflects a positive attitude.

This finding may be attributed to that they were focused only on IV injection and didn't cover all method of drug administration, while the current study shed the light on all types of medication administration. In addition to that the current study was carried out in more than one setting (Ward, ICU and ER) , while the Dimuzio et al. [12] study was carried at ICU only, where ICU is put extra care to IV line as IV line considered as one of  the main method of medication administration there.

**Part IV: Nurses' practice regarding medication administration.**

To ensure safe medication administration the nurses should practice medication administration correctly. Medication administration process starts by prescription of medication, which is not an easy task.

In this regards, the current study presents that more than three quarters of the nurses have poor practice score regarding drug preparation, followed by  slightly more than three fifths of them reported poor practice score regarding drug administration too. Furthermore, slightly less than two fifths of the nurses have poor practice post administering medication. Lastly, around half of the nurses have poor total practice score.

This finding is in agreed with Westbrook et al. [24] whom found that the studied nurses fail to follow medication protocol and record medication. Moreover, Wabe et al. [25] reported that post medication practice needs improvement.  This finding may be attributed to workload that makes the nurses practice characterized by poor performance.

In contrast, Al-Rukban et al. [26] study knowledge, perception and attitude of community pharmacists at Riyadh and found that, most of the pharmacists teach the patient and informed them about medication. This finding may be attributed to those pharmacies in Saudi Arabia sell drugs as well as prescribing it, so pharmacist there totally responsible in treating patient and gives them all needed information to reach to the treatment goals.

Generally, the current study revealed that the mean percent score of nurses' knowledge was around fifty percent only. Additionally, the mean percent score of nurses' attitude, and practice regarding medication administration was around sixty percent. These findings are frustrating; it denotes that medication administration process may threaten the patient's health. So, nurses must act to decrease medication administration errors.

In this regards, Hughes[27]**,** Vazin[28] **and** Hickner[29]  confirming that research on medication administration error reported an error rate of 60 percent, mainly in the form of wrong time, wrong rate, or wrong dose'. Additionally, approximately one out of every three adverse drug events was attributable to nurses administering medications to patients.

**Part V: Relationship between nurses' knowledge, attitude and practice regarding medication administration.**

In the current study we use a KAP approach to test whether there is a positive link between nurse's knowledge, attitude, and practices in relation to medication administration. In this regard it is interesting to highlight that according to regression analysis the finding shows that there is a statistically significant relation between nurses' knowledge and their practice and attitude regarding medication administration.

In contrast, Dimuzio et al. [8] highlight that appropriate knowledge weighs negatively on correct behavior. This may be attributed to that they didn't conduct a comprehensive assessment since they focused only on IV injection which doesn't reflect all medication administration techniques. Additionally, Al-Sarawan [30] reported a gap between knowledge and perception.

Whereas, the current study finding go in line with Aghakouchakzadeh et al. [31] whom studied knowledge, attitude, and practice towards medication errors and adverse drug reaction reporting among medical students and found that, the students had a poor KAP towards medication errors.

In this regard, **V**aismoradi et al [32] added another issue that affects on KAP this issue regarding curriculum and medication administration safety as they stated that nursing curricula need to increase investment in medicines management). That's why the current study focusing on studying KAP related to medication administration; in fact if nursing students are to become competent, skillful and safe practitioners, their learning will require extensive support from their academic institutions and clinical mentors, which plays an important role in their work later.

**Part VI: The association between nurses' knowledge, attitude, practice and their socio-demographic characteristics.**

This part of the discussion put a spotlight on the association between nurses' knowledge, attitude, practice and their socio-demographic characteristics, which is considered one of the main factors that affect either positively or negatively on the medication administration outcomes.

Concerning years of experience, the current study indicates that, there is a statistically significant association between nurses' years of experience and their knowledge regarding medication administration. This finding go in line with Bifftu et al .[33], Feleke et al . [13], Johnson, and Thomas [34] whom reported that years of experience statistically associated with nurses' knowledge. This finding guides us to retaining experienced nurses from leaving to train and supervise inexperienced nurses with the focus on medication administration.

Regarding working unit, the current study revealed that there is no significant association between nurses' knowledge and working unit, which contradict Al-Youssif et al. [35] whom reported that nurses working at Emergency room were more likely to report medication administration errors than other units [35].

On the other hand, in the current study it unexpected to find that there is no significant association between nurses' knowledge and their qualification. This finding not the same as Dimuzio et al. [8] since they studied Knowledge, attitudes, behavior and training needs of ICU nurses on medication errors in the use of IV drugs and declared that the strongest associations for appropriate knowledge are related to having a university degree. This finding may attribute to that the minority of the studied nurses in the current study having bachelor degree.

In relation to the association between nurses' socio-demographic data and practice the current study clarify that there is a statistically significant association between nurses' sex and qualification and their practice regarding medication administration. This finding go in line with Kimeu[15] who reported that nurse qualifications and years of experience had moderate effects on medication administration. This finding indicates that practice are better among higher education; that is acceptable since those who have higher education have a better chance to be trained and they are aware by the consequences of poor medication administration practices.

Finally, the current study highlight that, there is a significant relation between nurse's knowledge, attitude, and practice, and also association was documented between nurse's knowledge, practice and attitude and socio-demographic characteristics.

## VI. Conclusion:
**This study concluded that:**
Nurses have poor knowledge, practice, and negative attitude toward medication administration, which needs to be corrected.

## VII. Recommendation
Based upon findings of the present study, the following suggestions are recommended:
* Simple handouts as booklets and brochures about medication administration essential instruction and medication errors should be developed and distributed at all nursing care settings.

- Evidence-based medication administration guidelines should be integrated in pharmacology courses curriculum for nursing students.
- Using a standardized assessment sheet to assess knowledge, attitude and practices regarding medication administration quality is recommended.
- Set a policy that enhances medication errors reporting without punishment.
- Training and educational session should be applied as a part of in-service training program.

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