Determinant of Medication Errors among Nurses in Health Care Sector

SHAHIDA PERVEEN
BSN, The University of Lahore
MUHAMMAD HUSSAIN
MS in Medical Imaging Technology (MSMIT) UOL, LHR
Bachelor of Science in Nursing (BSN) DUHS, KARACHI
Assistant Professor
Lahore School of Nursing, The University of Lahore
MUHAMMAD AFZAL
Master of Science in Nursing, AKU, Karachi
MSC Haematology, BMU, Karachi
MBA in Health Management, Preston University
Associate Professor
Lahore School of Nursing, The University of Lahore
SYED AMIR GILANI
PhD Public Health
PhD Medical Diagnostic Ultrasound
Dean, Faculty of Allied Health Science, The University of Lahore

Abstract:

Background: *Any errors which occur when drug is prescribe dispense or administered to the patient is called medication errors. Medication administration is a Systematic process which start step by step. These steps are prescription, documenting, giving, administrating and monitoring so the errors can occur while medicine is prescribed or given to the patient.*

Methodology *A cross sectional descriptive study design was used to determine the factor of medication errors. The research was conducted in Punjab institute of Cardiology Lahore. 187 nurses selected who were working in PIC Lahore by using simple random sampling technique. Data was collected by means of research*

instrument questionnaire consist of two demographic data and factors contributing medication errors.

Findings According to the study findings that the environmental factors cause medication errors among nurses. The 78.42% participants were positively response and consider that environmental factors are a major cause of medication errors. According to the study errors occurs when nurses were overburdone113.71% participant consider that chances of error increased when there was shortage of nurses and have a work pressure on nurse who performing duty.

Conclusion In this study the factors which contribute to medication errors among nurses were environmental factors and when nurses over burden due to high patient ratio, shortage of staff nurses put work pressure on them and this leads to medication errors.

Key words: Medication, Error, Factor, Nurses

1. INTRODUCTION

Any error which occur when drug is prescribe, dispense or administered called medication errors (Feleke et al., 2015).Medication administration errors occur when wrong medication give to the patient instead of which prescribed by the physician (Zed et al., 2018).

The National Coordinating Council for Medication Errors describe that Medication errors is preventable incident that lead to improper medicine use that harm to the patient. This happen due to unsafe practices, products, procedures done by the health care professionals. The chance of medication errors increases during recommending, product labelling, packing, compounding, dispensing, sharing, administration and monitor (Nccmer, 2015).

Health care professionals have major role in providing care to the patients. These professionals are physician, pharmacist and nurses. Physician suggests the medicine,

pharmacist issue the medicine and nurses administer the medicine (Brown et al., 2011).

The medication administration is a part of nursing practice and safe administration of medication is a responsibility of nurses because nurses spent most of their time in patient related activities in the work place (Maharajan, 2011). Similarly medication administration is considered one of main function of nurses while providing care, and it's their responsibility to follow guidelines of medication administration for the patients' safety because patient safety is nursing priority (Mrayyan, 2012).The aim of nursing care is to provide safe and quality care services to their patient (Westat et al., 2010).

Medication administration is a Systematic process which start step by step. These steps are prescription, documenting, giving, administrating and monitoring so the errors can occur while medicine is prescribed or given to the patient (Jaykare et al., 2013)

Multiple factors contribute to medication errors by the nurses. These errors are mathematical skills , awareness of medications when nurses experience, shift rotations, overwork and, interruption, staff shortages, cognitive overload, distraction, poor communication, fatigue and stress (Mahajan, 2011).

The study of Olds et al(2010) showed that nursing is considered as a stressful job as they encounter with heavy workload, sleeping disorders which lead to medication error because their professional stress affect their mental and emotional conditions and also their professional performance (Olds et al., 2010).

Nurses have many responsibilities during their duty and it is expected from them to fulfill all responsibilities in same time. This increases their work and also chances of errors because they only concentrate to finish their assigned work and ignore the patients (Kim et al., 2011)

Poor environmental working conditions can lead to medication errors like insufficient lighting, overcrowded work environments, increased patient acuity, and distractions during drug preparation and administration. Distractions and interruptions can divert the attention of nurses and this leading to serious mistake or errors (Petrova et al., 2010).

2. LITERATURE REVIEW

Nurses play an important and crucial role in health care facility to given the treatment to the patients of all group ages and all genders. Nurses needed the environment that gives satisfaction during working hours (Dar and Ahsan-ul-Haq 2015).

Simonsen et al (2011) found that nurses have less pharmaceutical knowledge and inadequate knowledge regarding drug calculation , so this is a major risk for errors (Simonsen et al., 2011)

The study conducted in Malta show that nurses physical exhaustion due to overwork is the major cause of medication errors (Petrova et al., 2010). The study of Mueller et al (2010) stated that patient needs care while suffering to improve their health and when nurses are over work it is difficult for the nurses to meet patient need (Mueller et al., 2010)

According to the study of Mahmood et.al(2011) stress and fatigue are factors which may lead to medication errors (Mahmood et al., 2011)

According to the study of Marayyan (2007) Distraction and disruption of nurses during work diverts their attention and cause medication errors because interruption is major factor that contribute to medication administration errors (Mrayyan et al., 2007)

The study finding of Ozkan et.al(2011) showed that interruptions cause medication administration errors, because nurses are disrupted and their attention is diverted due to work

load when they prepare and given medicine to the patients (Ozkan et al., 2011).

According to the Kim et.al (2011) nurses engage in many activities at the same time mostly when they are expected to fulfill many responsibilities there is shortage of staff nurses and they have to work in the absence of colleague this increased their tasks and also chances of errors (Kim et al., 2011).

The study of Jones (2010) show that high nurse-to-patient ratio and increased workload″ have a similar relationship like that of cause and effect. When number of patients high per nurse it has a work pressure on nurses and their workload is increased. The factor workload is the top contributing factors to medication errors (Jones et al., 2010)

The study of Olds et al(2010) showed that nursing is considered as a stressful job as they encounter with heavy workload, sleeping disorders which lead to medication error because their professional stress affect their mental and emotional conditions and also their professional performance (Olds et al., 2010).

Nurses have many responsibilities during their duty and it is expected from them to fulfill all responsibilities in same time. This increases their work and also chances of errors because they only concentrate to finish their assigned work and ignore the patients (Kim et al., 2011)

Poor environmental working conditions can lead to medication errors like insufficient lighting, overcrowded work environments, increased patient acuity, and distractions during drug preparation and administration. Distractions and interruptions can divert the attention of nurses and this leading to serious mistake or errors (Petrova et al., 2010).

3. PROBLEM STATEMENT

The medication administration is a part of nursing practice and safe administration of medication is a responsibility of nurses

because nurses spent most of their time in patient related activities in the work place (Maharajan, 2011). Similarly medication administration is considered one of main function of nurses while providing care, and it's their responsibility to follow guidelines of medication administration for the patients' safety because patient safety is nursing priority (Mrayyan, 2012).The aim of nursing care is to provide safe and quality care services to their patient (Westat et al., 2010).

There are many factors that cause medication but, this study will find the effect of workload and Poor environmental condition on the chance of medication errors among nurses. Due to errors nurses cannot perform their duties effectively. The result of this study will bring awareness regarding factors responsible for medication error among nurses. So, if hospital management overcomes these associated factors then the nurses will be able to work in a fast paced and error free environment and quality of work automatically enhanced.

4. OBJECTIVE

The objective of the study is:
1. To assess the determinant of medication errors among nurses in health care sector.

5. RESEARCH QUESTIONS

- What are the determinants of medication errors among nurses in health care sector?

6. MATERIAL AND METHOD

The cross-sectional descriptive study design was used in this research to describe the determinant of medication administration errors. The research was conducted in Punjab institute of Cardiology Lahore. The target Population for this study was 350 staff nurses working in Punjab institute of cardiology Lahore. Simple random sampling technique was

used to select the participants. The sample size was187 that calculated according to the formula of Solvin.

$$n=N\backslash N+1(E)^2$$
$$n=350/1+350(0.05)2$$
$$n=350/351(0.0025)$$
$$n=350/1+o.8775$$
$$n=350/1.875$$
$$n=186.6$$

All registered nurses of Punjab institute of Cardiology was included in this study and exclusion criteria was all head nurses and those who are not willing to participate in this study. Before obtaining informed consent from participant I had explain the nature and purpose of this study. The participants were making sure that their information should be kept confidential. Data was analyzed on SPSS version 22.

7. ETHICAL CONSIDERATION

The rules and regulations set by the ethical committee of Lahore School of Nursing were followed while conducting the research and the rights of the research participants were respected.

- Written informed consent attached was taken from all the participants.
- All information and data collection was kept confidential.
- Participants remained anonymous throughout the study.
- The subjects were informed that there are no disadvantages or risk on the procedure of the study.
- They were also informed that they will be free to withdraw at any time during the process of the study.
- Data was kept in under key and lock while keeping keys in hand. In laptop it will be kept under password.

8. DATA COLLECTION PLAN

Research instrument was questionnaire which was adopted from () Questionnaire consists of two sections. Section A demographic data, Section B factor that lead to medication error like workload and environmental conditions on five point likert scale Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5. Questionnaire was distributed in PIC Lahore.

9. DATA ANALYSIS:

Data was analyzed by using SPSS version 22.0 statistical software for data analysis.

➢ Demographic variables like age, gender, marital status, education etc. were analyzed by using descriptive statistics like frequency, percentage, mean and standard deviation. Percentages were calculated for categorical data while continuous data will be analyzed through mean and standard deviation.

➢ Descriptive statistics was used to assess the determinant of medication errors among nurses in health care sector.

10. RESULTS
Data Analysis

This chapter of analysis consists of three sections A, B,C Section A consist of Demographic analysis and section B is Environmental factors that lead to medication errors and section C medication errors occur when nurses over burden. Descriptive analysis was used to determine the factors cause medication errors among nurses of Punjab Institute of Cardiology Lahore.

Demographic Data

Gender
Table 1

Gender

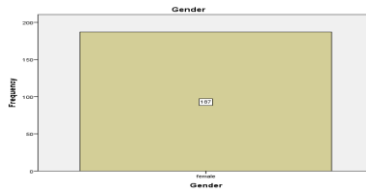|	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Female	187	100.0	100.0	100.0

Figure1

Interpret: Above table1, figure 1 show that all participants (n=187) were female.

Age
Table 2

Age

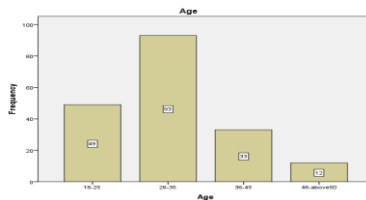|		Frequency	Percent	Valid Percent	Cumulative Percent
	18-25	49	26.2	26.2	26.2
	26-35	93	49.7	49.7	75.9
Valid	36-45	33	17.6	17.6	93.6
	46-above50	12	6.4	6.4	100.0
	Total	187	100.0	100.0	

Figure 2

Interpret: As show above table2, figure 2 the age of the respondents were 18-25(n=49) was 26.1percent, 26-35(n=93) 49.5 percent, 36-45(n=33)17.6 percent and 46-above 50years was (n=12) 6.4percent.The most representative age group was 26-35.

Experience
Table 3
Experience

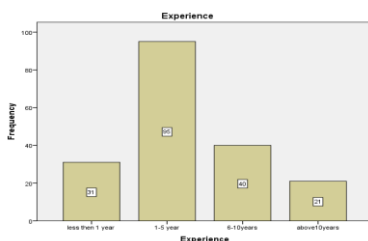|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less then 1 year	31	16.6	16.6	16.6
	1-5 year	95	50.8	50.8	67.4
	6-10years	40	21.4	21.4	88.8
	above10years	21	11.2	11.2	100.0
	Total	187	100.0	100.0	

Figure 3

Interpret: As show in above table3, figure 3that the clinical experience of the nurses. The participants which have less then 1 year experience were (n=31) 16.5percent, those which have 1-5 years (n=95) 50.5 percent, others have 6-10 years clinical experience (n=40) 21.3percent and above 10years (n=21) 11.2percent.Most of the nurses in this study have 1-5 year experience.

Marital status
Table 4
Marital status

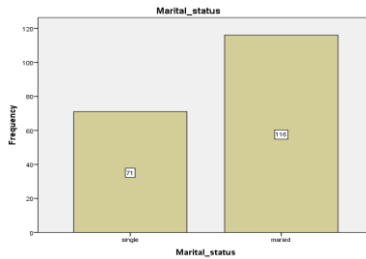|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	71	38.0	38.0	38.0
	Maried	116	62.0	62.0	100.0
	Total	187	100.0	100.0	

Figure 4

Interpret: As show in table 4, figure 4 the participants (n=71) 37.8 percent were single and (n=116) 61.7 percent were married.

Qualification
Table 5

Qualification

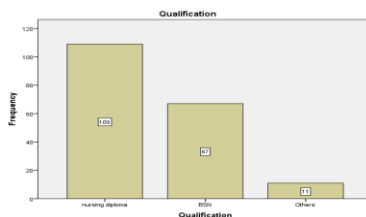|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	nursing diploma	109	58.3	58.3	58.3
	BSN	67	35.8	35.8	94.1
	Others	11	5.9	5.9	100.0
	Total	187	100.0	100.0	

Figure 5

Interpret: As show above table5, figure 5 qualification of the nurses was (n=109)58percent having nursing diploma, (n=67)35.6percent have BSN and others who have specialization and post-graduation were (n=11) 5.9percent.The average had nursing Diploma.

Section B: In Section B factors like Environmental factors that contribute medication error among nursing in clinical site. This section consists of three questions.

Question1
Table 6
The hostile environment contribute to medication error

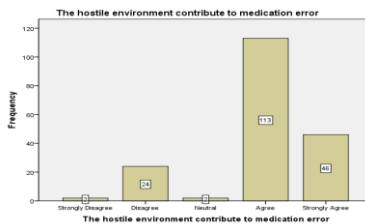|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	1.1	1.1	1.1
	Disagree	24	12.8	12.8	13.9
	Neutral	2	1.1	1.1	15.0
	Agree	113	60.4	60.4	75.4
	Strongly Agree	46	24.6	24.6	100.0
	Total	187	100.0	100.0	

Figure 6

Interpret: As presented above table 6, figure 6 that in response of the hostile environment contribute to medication errors (n=2)1.1 percent strongly disagree, (n=24)14.9percent disagree, Those who remain neutral were (n=2) 1.1 percent (n=113)60.4percent agree that hostile environment is a reason of medication errors committed by the nurses and (n=46) 24.6 percent strongly agreed and consider it a big factor of medication errors.

Question 2
Table 7

The interruption during medicine administration lead to medication error

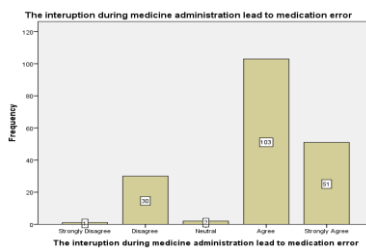|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.5	.5	.5
	Disagree	30	16.0	16.0	16.6
	Neutral	2	1.1	1.1	17.6
	Agree	103	55.1	55.1	72.7
	Strongly Agree	51	27.3	27.3	100.0
	Total	187	100.0	100.0	

Figure 7

Interpret: As show above table 7, figure 7response of question 2 that interruption during medicine administration lead to medication errors. The strongly disagree only (n=1).5 percent, those were disagree (n=30)17.6, those who not answer and stay neutral were (n=2)1.6 percent, those who Agreed that medication errors happened due to interruption were (n= 103)55.1 percent and those who were strongly agree (n=51) 27.3percent.

Question 3
Table 8

Distraction from patient due to overcrowding of attendant and coworker can cause medication error

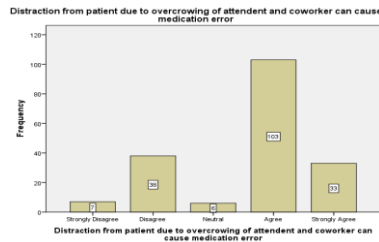|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	7	3.7	3.7	3.7
	Disagree	38	20.3	20.3	24.1
	Neutral	6	3.2	3.2	27.3
	Agree	103	55.1	55.1	82.4
	Strongly Agree	33	17.6	17.6	100.0
	Total	187	100.0	100.0	

Figure 8

Interpret: As show above table8, figure 8 in response of Distraction from patients, overcrowding of patient attendants and on duty coworkers can cause medication error among nurses. The respondent which are strongly disagree were (n=7) 3.7percent, those which are disagree (n=38)20.3 percent, Neutral (n=6) 3.2percent, those who consider distraction a factor of medication error were (n=103) 55.1percent and those who were strongly agree (n=33) 17.6percent.

Over burden

Overburdened is another determinant of medication errors among nurses of Punjab Institute of Cardiology. This section consists of four questions.

Question 1
Table 9

Shortage of staff nurses contribute to medication error

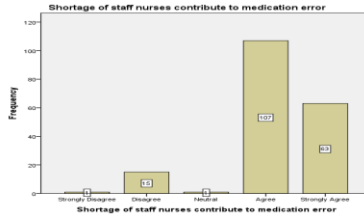|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.5	.5	.5
	Disagree	15	8.0	8.0	8.6
	Neutral	1	.5	.5	9.1
	Agree	107	57.2	57.2	66.3
	Strongly Agree	63	33.7	33.7	100.0
	Total	187	100.0	100.0	

Figure 9

Interpret: As show above table9, figure 9 in response of question that shortage of nurse contribute to medication error (n=1).5 percent strongly disagree, (n=15) 8 percent were disagree, neutral (n=1).5percent, the agreed respondents were (n=107) 57.2 percent and those who were strongly agree (n=63) 33.7 percent.

Question 2
Table 10
Nurse work more than 12 hours in one shift increase the chance of medication error

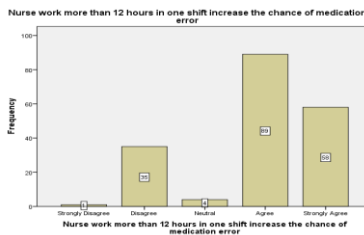|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.5	.5	.5
	Disagree	35	18.7	18.7	19.3
	Neutral	4	2.1	2.1	21.4
	Agree	89	47.6	47.6	69.0
	Strongly Agree	58	31.0	31.0	100.0
	Total	187	100.0	100.0	

Figure10

Interpret: As show in above table 10, figure 10 response of question that when nurse work about 12 hour in one shift this long duration increase the chance of medication error. The

participant were strongly disagreed (n=1) .5percent, Disagree were (n=35)18.7 those who were neutral (n=4)2.1 percent, those who were agree (n=89) 47.3percent and strongly agree were (n=58)31percent.

Question 3
Table 11

Tiredness and exertion lead to medication error

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.5	.5	.5
	Disagree	20	10.7	10.7	11.2
	Neutral	2	1.1	1.1	12.3
	Agree	109	58.3	58.3	70.6
	Strongly Agree	55	29.4	29.4	100.0
	Total	187	100.0	100.0	

Figure11

Interpret: In response tiredness and exertion lead to medication error. The participants which were strongly disagree (n=1).5 percent, Disagree were (n=20)10.1 percent, neutral were (n=2)1.1 percent, those who were agree (n=109) 58.3percent and strongly agree were (n= 55) 29.4percent.

Question 4
Table 12
High patient ratio lead to medication error

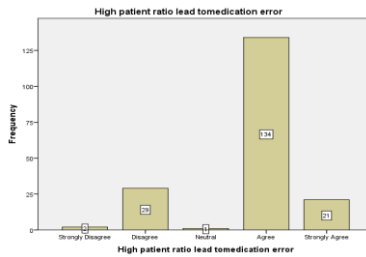|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	1.1	1.1	1.1
	Disagree	29	15.5	15.5	16.6
	Neutral	1	.5	.5	17.1
	Agree	134	71.7	71.7	88.8
	Strongly Agree	21	11.2	11.2	100.0
	Total	187	100.0	100.0	

Figure12

Interpret: As show in table12, graph 12 presents that high patient ratio lead to medication error. Those who were strongly disagree (n=2)1.1 percent, disagree were (n=29) 12.2percent neutral (n=1) .5%, the agree participant were (n=134)71.7 percent and strongly agree were(n= 21) 11.2percent.

Whole Description

S No	Questions Environmental Factors	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
1	The hostile environment contribute to medication error	(2)1.1%	(28) 14.9%	(2)1.1%	(110)58.5%	(45)23.9	
2	The interruption during medicine administration lead to medication error	(1).5%	(33) 17.6%	(3)1.6%	(103)54.8%	(47)25%	
3	Distraction from patient due to overcrowding of attendant and coworker can cause	(6)3.2%	(40) 21.3%	(6)3.2%	(102)54.3%	(33) 17.6%	
		(9) 561÷9=	(101) 561÷101=18%	(11) 561÷11=1.96	(315) ÷561=56.14%	(125) 187x3=561÷125=22.28%	56.14+22.28= 78.42%

		1.60%					
	Overburdened						
1	Shortage of staff nurses contribute to medication error	(1).5%	(17)9%	(2)1.1%	(106)56.4%	(61) 32.4%	
2	Nurse work more than 12 hours in one shift increase the chance of medication error	(2)1.1%	(36) 19.1%	(4)2.1%	(89)47.3%	(56) 29.8%	
3	Tiredness and exertion lead to medication error	(1).5%	(19) 10.1%	(2)1.1	(108)57.4%	(57) 30.3%	
4	High patient ratio lead to medication error	(2)1.1%	(23) 12.2%	(1).5%	(138)73.4%	(23) 12.2%S	
		1.06%	69.2%	1.24%	78.60%	35.11%	78.60+35.11= 113.71%

Reliability and Validity
Environmental factors:

According to Burns & Grove (2007) reliability is concerned with the consistency of the measurement technique. The questionnaire was also tested for reliability.

Reliability Statistics

Cronbach's Alpha	N of Items
.661	3

Overburden

Reliability Statistics

Cronbach's Alpha	N of Items
.764	4

Validity

According to Burns & Grove (2007) Validity is the degree to which an instrument measures that is supposed to measure or the level to which the instrument accurately reflects the concept being examined.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	2.541
	df	1
	Sig.	.111

Component Matrix[a]

	Component
	1
EN_F	.847
OV_B	.747

DISCUSSION

According to the study findings factors that contribute to medication errors occurred by nurses at clinical site were environmental factors in which they working and when nurse were over burden due to heavy work. According to the study findings that the environmental factors cause medication errors among nurses. The 78.42% participants were positively response and consider that environmental factors are a major cause of medication errors. Similarly as compare to the study results show that clinical work environment 44.0% is less effective factor of medication errors among nurses (Shahrokhi et al., 2013).

The findings of this study that interruption can cause medication errors 58% nurse response that when they were interrupted most of the errors occurred at that time. However the according the study of Mahmood et al, (2011) interruption is a primary cause of medication errors among nurses. The finding of this study in response of that distraction from patients, overcrowd wards with patient and their relatives, distraction from coworkers lead to medication errors 53.2 % response that it was a big factor of medication error because nurses attention divert and they committed to errors. Similarly according to the study show that nurses were distracted by other patients, workers and unit unfamiliarity cause medication error by the nurses and consider both interruption and distraction the top reason of medication errors (Mayo et al., 2004).

According to this study most of the errors occurs when nurses were overburdone113.71% participant consider that chances of error increased when there was shortage of nurses and have a work pressure on nurse who performing duty. So the study of that nurses involve in many work at the same time and enough staff not present on duty the chances of error much increased when there was shortage of nurses(Seki et al.,

2006). This study shows that 47.3 % study participant agreed that when they perform more than 12 hours of duty they more prone to committed medication errors.

Similarly the study findings that medication errors occur 43.3 % in morning,29.7 % in evening and 27% in the night duty because in the morning shift nurses engage in multi task responsibilities and overburdened is related medication errors(Tang et al., 2007). In this study nurses believe that tiredness and exertion increased the chance of medication error the 57.4% participant agreed that another big reason of medication errors by nurses was tiredness and exertion. According to the study finding show that nurses consider tiredness is a second top factor which contributes to medication errors among nurses(Hassan et al., 2008).The participant of this study 73.4 % agreed that there is very high patient ratio in the Punjab Institute of Cardiology patient ratio not maintained and this leading to medication errors. According to the study high patient ratio and over work is a major factor of medication errors (Eslamian et al., 2011).

CONCLUSION

This study was conducted in Punjab Institute of Cardiology to determine the factor that lead to medication errors among nurses of PIC Lahore. The purpose of this study to assess factors that cause medication errors among nurses. In this study nurses (n=187) were participate to determine the reasons of occurrence medication errors by nurses. After results it was concluded that there were many factors that contribute to medication error but according to the nurses of PIC point of view that most of errors occur when they were exhaust, tired due to over-work and environmental factors like interruption, distraction and hostile environment is a considerable reason of making medication errors by nurses. These errors put the patient on harm and that was risk for patient's health.

RECOMMENDATIONS

There are many other factors that need to be determining in Punjab Institute of Cardiology, This study finding recommend to further deep study on other factors. Like pharmaceutical knowledge of nurses and fear to reporting medication errors.

- The management should maintain staff patient ratio to reduce medication error among nurses of Punjab Institute of Cardiology.
- The management should maintain nurses working hours, reduce the irrelevant activities of nurses, improving working environment and the most important improve nurses professional knowledge by training, workshops and seminars it will increased working environmental standards.

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