

Medication Errors and its Contributing Factors among Midwives

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ABSTRACT

Background & aim: Medication errors are among the most serious health errors threatening patient safety in all countries, with major impacts on public health. Midwives as members of healthcare systems are prone to such errors. Therefore, in this study, we aimed to determine medication errors and the contributing factors among midwives working in maternity units of Mashhad University of Medical Sciences, Mashhad, Iran in 2015.

Methods: This descriptive, cross-sectional study was performed on 104 employed midwives at four hospitals (Imam Reza, Ghaem, Omolbanin, and Hashemi Nezhad hospitals), affiliated to Mashhad University of Medical Sciences. The validity and reliability of the data collection tools were confirmed through content validity and internal consistency (Cronbach's alpha), respectively. For data analysis, descriptive and analytical tests, multiple linear regression, and negative binomial regression analysis were performed, using SPSS version 20 and STATA version 11.

Results: The average incidence of medication errors for each midwife was 21.24±2.89 in the past six months. Among reasons against reporting medication errors, fear of confrontation with authorities (3.79±1.5) and attributing the medication error to individual factors by officials (3.88±1.34) had the highest average scores. The most common causes of medication errors were overcrowding of the ward (4.32±1.01), excessive workload and overexertion (4.19±1.08), and presence of critically ill patients in the ward (4.03±1.18).

Conclusion: Overcrowding of the ward, fear of authorities, and attributing the medication error to individual factors were the main reasons against reporting medication errors, respectively. Therefore, more attention should be paid to error reporting systems, and workshops in this area are highly recommended.

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Introduction

Patient safety, as one of the key components of healthcare quality, is defined as "the prevention of harm to patients during medical care" (1). Medication errors are among the most serious errors threatening patient safety in all

countries and are known as one of the most common medical errors (2). These errors are defined as the inappropriate use of drugs, which can cause acute damage (3).

Drug safety is recognized as an important

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component of patient safety. Medication errors frequently occur, thereby increasing the risk of damage to the patients and raising healthcare system costs (4). Following motor vehicle accidents, diabetes, renal diseases, breast cancer, and flu, adverse drug events are the fifth leading cause of death in the United States (5). Based on recent reports, approximately 200,000 Americans die from preventable medical errors, including facility-acquired conditions, and millions may be affected by these errors. According to statistics, medical errors cost the United States 19.5 billion dollars in 2008 (6).

Common medication errors include wrong drug prescription, wrong route and time of drug administration, medication administration more than the prescribed dosage, dosage calculation errors, and drug administration to the wrong patient (7). Overall, forming an overall image of medication errors is challenging in developing countries, which may be attributed to lack of error reporting systems, inaccurate reporting, and scarcity of studies in this area in these countries. Although the exact incidence of medical and nursing malpractice has not been determined in Iran, it seems unlikely that Iran would have a better status than Western countries. The rise in complaints against physicians and midwives to medical councils and courts could prove this issue (8).

The perinatal safety movement was started in 1999 by publishing an article about the prevention of patient injury and medical malpractice claims. In this research, the authors described the characteristics of highly reliable perinatal units (9). Overall, management of medication errors is of particular importance, considering the adverse outcomes on patient health and safety as the most important healthcare priorities and indicators in Iran (10, 11). Medication errors may lead to maternal mortality, prolonged hospitalization, and increased treatment costs. As a result, such errors may eventually cause conflict and stress for health providers and increase client dissatisfaction with the health system (11-15).

In a qualitative study by Lynden, nurses defined patient safety as the protection of physical, psychological, and emotional wellbeing of the patient and his/her family. Nurses could maintain patient safety through preparing the environment, anticipating the potential pro-

blems, and preventing errors before they affected the patient (16). With regard to the reporting of medication errors, previous studies have shown that only serious adverse events caused by medication errors are reported (10), while less important errors may be neglected (17). In a study conducted in Iran, the results showed that 72% of nurses did not report medication errors (18).

Previous studies have shown that working conditions are responsible for the majority of nursing medication errors, while health provider's level of education and work experience have little relevance to nursing malpractice. Moreover, healthcare providers, who work in hospitals with insufficient human resources and are forced to work overtime or consecutive shifts, are more likely to have medical errors (19-21).

Midwives are known as the first providers of maternal and fetal care. Generally, midwifery, as a component of medical care systems and women's health care, is of great importance. Today, with the increasing complexity of the process of reproductive health care, midwifery activities have become more intricate, leading to midwives' irreparable mistakes in the workplace.

In addition, night work, long shifts, and unpredictable activities of midwives increase the likelihood of fatigue, which can in turn reduce physical function and capacity and increase the possibility of errors (22-24). In fact, according to the announcement by the chief executive of Health and Population Office of the Iranian Ministry of Health, approximately 60% of maternal mortality was due to medical, midwifery, and nursing errors between 1999 and 2005 (13).

In order to offer high-quality care services and achieve the goal of patient safety, i.e., prevention and mitigation of problems and adverse outcomes through healthcare services, it is essential to increase the level of knowledge about the causes of medication errors and determine the reasons against error reporting by employed midwives. Therefore, by eliminating these barriers, optimal services can be offered to mothers. Moreover, identifying the causes of errors can be helpful in eliminating medication errors and the contributing factors, improving the quality of care, and increasing patient safety.

Research on medication errors has been conducted among nurses in nursing wards (19-

21). Considering the importance of midwifery in the health of mothers and infants and the scarcity of studies in the field of midwifery (22, 25-28), in this study, we aimed to determine medication errors and the contributing factors among midwives working in maternity units of Mashhad University of Medical Sciences, Mashhad, Iran in 2015.

Materials and Methods

In this descriptive, cross-sectional research, the study population consisted of 104 employed midwives working in hospitals, affiliated to Mashhad University of Medical Sciences (Imam Reza, Ghaem, Omolbanin, and Hashemi Nezhad hospitals). The inclusion criteria were as follows: 1) employed midwives at maternity wards; 2) six months of work experience (minimum); and 3) bachelor's degree or higher.

If the questionnaires were answered incompletely, they were excluded from the study. The data collection tool was a questionnaire, consisting of four sections, designed according to the study objectives. The first section included nine questions on personal and organizational information, and the second section consisted of 19 items on the incidence of medication errors over the past six months. Each item was scored on a 4-point Likert scale, ranging from "never" to "more than twice"; a score of 0 to 3 was assigned to each item.

The third section contained 14 items about the reasons against reporting medication errors, and the fourth section consisted of 25 items on the causes of medication errors. Items in the third and fourth sections were set on a 5-point Likert scale, ranging from "low importance" to "high importance"; a score of 1-5 was assigned to each item. The content and face validity of the questionnaire were confirmed by a panel of experts.

The reliability and validity of the second and third parts of the questionnaire have been confirmed in a study by Mirzaei et al. (29), while the reliability and validity of the fourth part of the questionnaire have been approved in studies by Yousefi (20) and Nickpayma (30). In this study, the reliability of the second, third, and fourth parts of the questionnaire were re-evaluated, using Cronbach's alpha (0.61, 0.87, and 0.93, respectively).

Informed consent forms were obtained from all the participants. Anonymity of the participants and confidentiality of the data were respected by the researcher. This article was extracted from a postgraduate thesis by the main author, which was approved by Mashhad University of Medical Sciences (code: 930682). Data collection was performed by midwifery and reproductive health students.

Women were asked to complete the self-report questionnaires in a proper setting at an appropriate time. In order to analyze the data related to the causes of medication errors, reasons against medication error reporting, and the contributing factors, linear regression and negative binomial regression analyses were carried out independently, using SPSS version 20 and STATA version 11, respectively. In all statistical tests, confidence interval and significance level were considered to be 95% and 0.05, respectively.

Results

In this study, the response rate was estimated at 76%; in other words, 79 out of 104 midwives completed the questionnaire. The average age and work experience of the participants were 34.5 ± 9.1 years and 130.4 ± 113.1 months, respectively. In total, 93.7% of the samples had a bachelor's degree, 78.5% were married, 41.8% were full-time employees, and 85.9% worked rotating shifts.

The mean incidence of medication errors for each midwife over the past six months was 2.24 ± 2.89 , and the most common medication error was medication administration later or earlier than the stipulated time (0.85 ± 1.13). Among 14 reasons against reporting medication errors, attributing the medication error to individual factors by officials (3.88 ± 1.34) and fear of confrontation with authorities (3.79 ± 1.5) had the highest average scores (Table 1). Also, among 25 causes of medication error, the highest average scores were related to the overcrowding of the ward (4.32 ± 1.01), excessive workload and overexertion (4.19 ± 1.08), and presence of critically ill patients in the ward (4.03 ± 1.18) (Table 2).

The negative binomial regression model

Table 1. The distribution of reasons against reporting medication errors among midwives working in maternity units of Mashhad University of Medical Sciences

Reasons against reporting medication errors	The degree of importance					Mean±SD ¹
	Low importance					
	1 N(%)	2 N(%)	3 N(%)	4 N(%)	5 N(%)	
Insignificance of the medication error	20(28.2)	8(11.3)	11(15.5)	8(11.3)	24(33.8)	3.11±1.65
Lack of a system for recording and reporting medication errors in the hospital	20(29)	16(23.2)	10(14.5)	5(7.2)	18(26.1)	2.78±1.58
Low importance of reporting medication errors for officials and lack of appropriate feedback	12(18.5)	15(23.1)	8(12.3)	6(9.2)	24(36.9)	3.23±1.59
Fear of being criticized by physicians	18(25)	8(11.1)	8(11.1)	15(20.8)	23(31.9)	3.23±1.61
Fear of being criticized by officials	16(22.9)	6(8.6)	4(5.7)	18(25.7)	26(37.1)	3.46±1.60
Fear of confrontation with the authorities	10(13.9)	8(11.1)	5(6.9)	13(18.1)	36(50)	3.79±1.50
Fear of job loss	19(26.4)	7(9.7)	13(18.1)	11(15.3)	22(30.6)	3.13±1.59
Fear of being criticized by colleagues	18(25)	12(16.7)	17(23.6)	9(12.5)	16(22.2)	2.90±1.48
Fear of revealing the issue for the patient and his/her family and their subsequent reactions	12(16.7)	16(22.2)	8(11.1)	14(19.4)	22(30.6)	3.25±1.51
Fear of the consequences and side-effects of medication errors	10(14.1)	6(8.5)	12(16.9)	13(18.3)	30(42.3)	3.66±1.45
Midwife's disagreement on the incidence of medication error	21(30)	16(22.9)	15(21.4)	6(8.6)	12(17.1)	2.60±1.44
Lack of a clear-cut definition for medication errors	13(19.1)	15(22.1)	14(20.6)	8(11.8)	18(26.5)	3.04±1.48
Midwife's unawareness about the occurrence of medication errors	12(16.9)	10(14.1)	12(16.9)	9(12.7)	28(39.4)	3.44±1.54
Attributing medication errors to individual factors rather than organizational factors by the officials	5(6.9)	9(12.5)	12(16.7)	10(13.9)	36(50)	3.88±1.34

¹ Standard deviation

Table 2. The distribution of causes against reporting medication errors among midwives working in maternity units of Mashhad University of Medical Sciences

Contributing factors for medication errors	The degree of importance					Mean±SD ¹
	Low importance					
	1 N(%)	2 N(%)	3 N(%)	4 N(%)	5 N(%)	
Low ratio of midwives to patients	12(15.4)	5(6.4)	9(11.5)	14(17.9)	38(48.7)	3.78±1.49
Excessive workload and overexertion	2(2.6)	5(6.4)	12(15.4)	16(20.5)	43(55.1)	4.19±1.08
Presence of critically ill patients in the ward	2(2.6)	10(12.8)	11(14.1)	16(20.5)	39(50)	4.03±1.18
Overcrowding of the ward	1(1.3)	6(7.7)	7(9)	17(21.8)	47(60.3)	4.32±1.01
Midwife's inaccuracies	9(11.8)	12(15.8)	19(25)	12(15.8)	24(31.6)	3.39±1.39
Lack of drug information resources in the ward	14(17.9)	25(32.1)	15(19.2)	12(15.4)	12(15.4)	2.78±1.34
Wide variety of drugs in the ward	16(20.8)	20(26)	20(26)	(14.3)	(13)10	2.73±1.30
Similarities between drug names	11(14.3)	20(26)	16(20.8)	14(18.2)	16(20.8)	3.05±1.37
Improper labeling and packaging of medicines	14(18.4)	14(18.4)	13(17.1)	18(23.7)	17(22.4)	3.13±1.44
Improper location of drug shelves	17(22.4)	19(25)	13(17.1)	10(13.2)	17(22.4)	2.88±1.48
Lack of a system for recording and reporting errors	18(23.7)	24(31.6)	15(19.7)	5(6.6)	14(18.4)	2.64±1.40
Lack of officials' emphasis on the importance of recording and reporting medication errors	16(21.3)	12(16)	15(20)	14(18.7)	18(24)	3.08±1.48
Lack of coordination with other colleagues	14(18.4)	18(23.7)	18(23.7)	10(13.2)	16(21.6)	2.95±1.40
Type of work shift schedule	16(20.5)	10(12.8)	12(15.4)	14(17.9)	26(33.3)	3.31±1.55
Mandatory overtime work shifts and the subsequent fatigue	8(10.4)	7(9.1)	12(15.6)	11(14.3)	39(50.6)	3.86±1.40
Inappropriate physical environment (e.g., light, temperature, and noise)	10(13)	9(11.7)	20(26)	10(13)	28(36.4)	3.48±1.42
Lack of training programs related to the importance of medication errors	9(11.8)	14(18.4)	20(26.3)	12(15.8)	21(27.6)	3.29±1.36
Illegible or corrupted physician orders	8(10.4)	7(9.1)	9(11.7)	16(20.8)	37(48.1)	3.87±1.38
Illegible handwriting of the midwife in drug kardex	8(10.7)	7(9.3)	11(14.7)	22(29.3)	27(36)	3.71±1.33
Emergency situation of the patient and the subsequent need for speeding up the treatment process	4(5.2)	7(9.1)	13(16.9)	22(28.6)	31(40.3)	3.89±1.19
Patient's disobedience	10(13.7)	13(17.8)	19(26)	12(16.4)	19(26)	3.23±1.38
Midwife's job dissatisfaction	12(15.8)	10(13.2)	18(23.7)	11(14.5)	25(32.9)	3.36±1.46
Midwife's dissatisfaction with the ward	14(18.2)	11(14.3)	18(23.4)	11(14.3)	23(29.9)	3.23±1.48
Midwife's dissatisfaction with the hospital	17(22.1)	10(13)	21(27.3)	8(10.4)	21(27.3)	3.08±1.49
Type of task-sharing among midwives	12(15.6)	11(14.3)	15(19.5)	17(22.1)	22(28.6)	3.34±1.43

¹ Standard deviation

indicated that the ratio of the incidence of medication errors among married subjects was

0.45. Based on the findings, the incidence of medication errors increased as job satisfaction improved in the participants (Table 3). Multiple linear regression analysis showed that lack of medication error reporting was more prevalent

among subjects working fixed shifts, compared to those on rotating shift schedules. Moreover, the average incidence of not reporting medication errors decreased as education and job satisfaction improved (Table 4).

Table 3. The results of the negative binomial regression model for determining the factors related to the number of medication errors

Variables	Regression coefficient	SE ³	P-value	IRR ¹ (95% CI ²)	
Age	-0.44	0.04	0.34	0.96 (0.87, 1.05)	
Work experience	-0.01	0.01	0.07	0.99 (0.98, 1)	
Marital status	Married	-0.80	0.14	0.01	0.45 (0.24, 0.84)
	Single (reference)	--	--	--	--
Work shift schedule	Rotating	-0.99	0.21	0.07	0.37 (0.12, 1.11)
	Fixed (reference)	--	--	--	--
Employment Status	Contract work (training contract)	-0.21	0.36	0.64	0.81 (0.33, 1.95)
	Fixed term	-1.21	0.17	0.053	0.54 (0.29, 1.01)
	Permanent contract (reference)	--	--	--	--
Job satisfaction	-0.17	0.58	0.05	0.84 (0.45, 1.54)	
Education level	-0.49	0.18	0.09	0.61 (0.34, 1.08)	

¹Incidence rate ratio; ²Confidence interval; ³Standard error

Table 4. The results of multiple linear regression analysis for determining the factors related to the causes of not reporting medication errors

Variables	Regression coefficient	SE	P-value	95% CI	
Age	-0.03	0.03	0.29	(-0.09, 0.03)	
Work experience	0	0.002	0.14	(-0.001, 0.009)	
Marital status	Married	0.10	0.29	0.73	(-0.49, 0.70)
	Single (reference)	--	---	---	---
Work shift schedule	Rotating	-0.95	0.39	0.02	(-1.74, -0.15)
	Fixed (reference)	--	---	---	---
Employment Status	Contract work (training contract)	0.21	0.21	0.41	(-0.29, 0.71)
	Fixed term	0.23	0.32	0.54	(-0.52, 0.97)
	Permanent contract (reference)	---	---	---	---
Job satisfaction	-0.61	0.24	0.02	(-1.08, -0.14)	
Education level	-0.43	0.19	0.04	(-0.83, -0.03)	

Discussion

This study was performed to determine the prevalence of medication errors and the contributing factors among midwives working in maternity wards of Mashhad University of Medical Sciences in 2013. The results showed that the average rate of error over the past six months was 21.24±2.89 for each midwife. This rate was reported to be 19.5 for each midwife in a study by Joolae (15). Additionally, in a study conducted by Penjoveini, the error rate reported by the nursing staff was 16.7% (31).

In addition, in a study by Nikpeima et al., 53% of the participants had at least one medication error throughout their career (30). Also, in a study by Stratton, the average error rate reported by midwives was low. The rate of medication error was 14.8 and 5.6 for every 1000 cases in hospital wards with pediatric and adult patients, respectively (32). This significant difference in the

incidence of medication errors in two different environments could be attributed to variations in working conditions, such as lack of facilities, human resources, and healthcare management. Moreover, the medication error rate might vary depending on the hospital ward; however, it should be noted that a limited number of drugs is used in maternity wards.

In the current study, the most common medication error was the administration of medication later or earlier than the stipulated time. According to studies by Hajibabae et al. and Mirzaei et al., multiple oral drug administration was the most common medication error (33, 29). In another study in the United States, wrong time of drug administration, negligence of drug administration, administration of wrong drug dosage, and use of an illicit drug were the most common medication errors (32).

The difference in the incidence of medication

errors could be attributed to the status of pregnancy and the subsequent concerns about maternal and fetal health in maternity wards, which may cause midwives to use medications conservatively. On the other hand, since oxytocin is the most commonly used drug in maternity wards, its early or late prescription can lead to irreparable consequences, such as uterine rupture or postpartum hemorrhage; therefore, this issue should be reminded to midwives working in maternity wards.

In this study, among 13 main barriers against the report of medication errors, attributing the medication error to individual factors by officials and fear of confrontation with authorities had the highest average scores. Chiang et al. considered factors such as fear, difficulty in reporting the process, and administrative barriers as the major preventive factors (34). Fear of officials' reaction or being labeled for incompetency, patient's negative attitude towards healthcare providers, and legal issues have been reported as barriers against medication error reporting, as well (35-39).

In a study by Noohi et al., the main barriers against medical error reporting were concerns about the negative reactions of managers and colleagues (40). Fear of the consequences, punishment, job loss, or being labeled as incompetent, as well as changes in patient's attitude, has been reported in other studies (15, 41-42). Today, medication errors are one of the important issues in healthcare environments, and prevention of these errors depends on accurate reporting; therefore, factors against error reporting should be recognized and evaluated.

The present study also showed that among 25 causes of medication errors, overcrowding of the ward, excessive workload and overexertion, and presence of critically ill patients in the ward had the highest average scores, respectively. These findings were consistent with the results reported by Yousefi and Taheri (20, 37).

The present study showed no significant relationship between age, work experience, work shift schedule, and the incidence of medication errors, similar to a study by Hajibabae (33). Nevertheless, Chiang et al. reported that medication error reporting was less frequent in younger midwives (34). Furthermore, Sheu et al. suggested a significant relationship between

work experience and the incidence of medication errors (38).

In the study by Nikpeyma et al., the highest incidence of errors was reported in morning shifts (30). The discrepancy between the findings could be attributed to variations among hospital wards. In other words, the incidence of medication errors was higher in wards where a greater variety of drugs was used (e.g., antibiotics). Also, in the present study, the incidence of medication errors in unmarried subjects was twice as high as married staff.

The current study showed that medication error reporting was more prevalent among midwives working fixed shift schedules. It seems that in fixed shifts, especially morning shifts, the staff report errors directly to the midwife in charge. In a study by Unver, 45.25% of novice nurses and 37.63% of experienced midwives believed that medication errors should be reported to the head midwife (39).

The results of the present study were somehow in line with the findings of the abovementioned studies. In fact, in this study and similar research, fear of legal problems and negative effects of error disclosure were the most important barriers against error reporting. Therefore, adapting strategies, such as the use of more accurate surveillance systems and electronic error registration systems (without mentioning the identity) and reassuring midwives of the support they would receive in case of medication errors, could lead to an increase in the rate of reporting medical errors.

The present study also showed that the rate of medication error reporting was lower among those with higher job satisfaction and education level. This could be due to variations in individual characteristics and safety culture. In fact, patient safety culture indicates the priority of patient safety from the perspective of the staff and organization.

The main strength of the present study was the evaluation of midwives with regard to medication error reporting for the first time. A limitation of the present study was the application of self-report questionnaires for data collection. Although studies on medication errors are performed through observation, most international studies apply the self-report method (32, 41). Another limitation was the

participants' accuracy while answering the questions. To partially control this limitation, the participants completed the questionnaires in a relaxing environment at an appropriate time. The researcher's confidence in the accuracy of the answers was another limitation of our study. Therefore, in order to gather factual information, participants were asked to honestly complete the questionnaires.

Conclusion

Based on the findings, overcrowding of the ward, fear of legal authorities, and attributing the medication error to individual factors were the main factors contributing to the incidence of medication errors and negligence of medication error reporting, respectively. Therefore, more attention should be paid to error reporting systems to reduce the likelihood of these errors. In this regard, the following strategies are recommended: holding educational workshops on patient safety and drug prescription, presence of an adequate number of midwifery staff, and design of an error reporting system (to help increase the rate of error reporting by midwives in a safe environment without the fear of legal issues and to ensure impunity for those reporting the errors). Overall, further qualitative studies in this area can present a more comprehensive view about the risk factors and solutions for medication error reporting.

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Conflicts of interest

The authors declare no conflicts of interest.

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