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A REVIEW: STUDY OF EFFECT OF EDUCATING THE PARENTS OF CHILDREN AGED 1 TO 5 YEARS ADMITTED TO SELECTED CLINICS IN SHIRAZ CITY ON THE OCCURRENCE OF MEDICATION ERRORS IN 2016

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ABSTRACT

Introduction: educating parents by health care team is an important step in the provision of children's health and reduction of medication errors occurrence. The present study aimed to determine the effect of educating the parents of children aged 1 to 5 years admitted to selected clinics in Shiraz City on the occurrence of medication errors.
Method: the presented research is a clinical trial study conducted in three selected clinics in Shiraz City and the samples were selected by 2-stage cluster sampling method. 120 persons were selected from the parents of children aged 1 to 5 years by simple sampling method. The data was collected before and 4 days after intervention. SPSS V.16 software, descriptive statistics, pair t-test, independent t-test and Pearson's correlation coefficient were used to analyze the data.
Results: in the experimental group, significant difference was observed between the medication errors scores obtained before (70.65±12.07) and 4 days after (90.43±6.86) intervention ($p<0.001$) and also, there is significant difference between the experimental and control groups (79.63±9.15) 4 days after intervention ($p<0.001$).
Discussion and conclusion: the results showed that educating parents reduces the occurrence of medication errors so that after educational intervention, desired level of medication errors occurrence was reached. So, it is recommended to use parental education program in order to reduce the occurrence of medication errors.

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Introduction

The role of human factors in occurrence of medication errors is undeniable. Medication errors refers to preventable events, doing and not doing an action which has a potential to harm the patient through prescription. This type of error takes place in all phases of prescription of drugs by a doctor, drug delivery, preparation of drug, implementation of drug formulary and

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inappropriate use of drugs and also it can be prevented in most cases [1]. So, inappropriate use of drug or damage to the patient due to the use of drug are called medication error [2]. Medication errors are one of the five categories of medical errors and considered as a global problem that can lead to the serious injuries and even death of patient. Medication errors are of the major challenges threatening the health system in all countries and also one of the factors threatening the patient safety [3]. 10 to 18 percent of all injuries reported in the hospital are attributed to the medication errors [4]. According to Philips, lack of knowledge of Pharmacology is the main cause and root of medication errors in drug prescription and use of drugs and causes 15-22 percent of medication errors [5]. Medication errors include prescription of wrong medicines, taking medication incorrectly or at wrong time interval and taking medication with the amount less or more than the amount ordered [2]. Errors can occur from the time of medication until the final preparation of drug. Common causes of medication errors include wrong diagnosis, wrong prescription, wrong drug dosage calculation, wrong drug distribution, the issues related to measuring tools of medications, wrong procedures of taking medication. Patients and their caregivers are often are not aware of errors that can occur and often cannot play an important role in understanding what happened in relation to the error occurred. Most errors occur when the patient doesn't know on the drug's name, its appearance, the reason for using it, duration of using it, the best time of using it, its interaction with food and medicine, its side effects, convenient doing when forgetting to give medications at the right time and sometimes, medication errors occur due to illegible labels on the medicines [6].

Although children are generally healthier than adults, the potential errors in pediatric patients is 3 times higher than the adult population [7]. Since the children are not able to recognize and use the drugs alone, they are physiologically more vulnerable than the adults and also more prone to errors than the adults [9, 8]. Given that the parents play a significant role in the child's recovery and his safety when using drugs, their knowledge is essential to prevent medication errors.

Any predetermined and planned activity aimed to facilitate the learning for learners, is called education [10]. In other words, education is meant is meant to teach a subject in order to learn it to make changes [11]. Education is a process performed in a planned way systematically and continuously and includes two main interdependent parts of teaching and learning. In other words, education is a mutual process that promotes learning and includes a conscious and deliberate activity that helps people to gain new knowledge or skills [12]. Education is a very simple and cheap tool required for the health of society and ultimately it leads to the change in behavior, creates a healthier life and plays a significant role in the area of healthcare [13]. In general, the lack of knowledge of parents can negatively affect the parents' performance and parent-child interactions [14]. One of the trainings which is required in the proper use of drugs and considered as a part of program for the prevention of medication errors is parental education because teaching such trainings strengthens the patients and their caregivers in doing health cares and reduces medication errors. These training are including to identify the drug, to recommend to read information about the drug and its brochure, to check expiry date of medicines and to dispose the expired drugs, to recommend to keep medications at the right place, to keep medicines away from children, to warn about the potential side effects of drugs to the patients or their caregivers [6].

Mahon [1997] has performed a study to determine the effects of training on the reduction in medication errors in taking liquid medicines to the children by their parents. The study was conducted on 90 parents of the children admitted to the public clinic in America. The parents were selected by simple sampling method and then randomly divided into three groups. The first group was taught according to the verbal instructions by explaining how to measure the correct amount of medicine. The 2nd group was taught how to measure the correct amount of medicine with a syringe and the third group was taught how to measure the correct amount of medicine with a syringe marked. The results showed that in the first and second groups, %37 and %83 parents gave the correct amount of medicine to their children, respectively and in the third group, all the parents gave the correct amount of medicine to their children. The results showed that the error in the amount of medicine given to the child by the parents has been reduced by training [15].

Valizadeh et al. [2004] have conducted a cross-sectional, descriptive study to examine medication errors in pediatric ward. The samples included 897 records of the children hospitalized in Shahid Madani Hospital in Khorramabad City. They were randomly selected. The data was collected using a questionnaire of personal information of patient, doctor and nurse, checklist for writing medication orders and checklist for implementing medication orders. The results showed that %77.5 of medication errors were related to the implementation of medication orders and %14.9 of them were related to drug interactions and %14.8 of them were related to mismatch between the intervals of taking medicine and the doctor's prescription. The most common errors were related to non-observance of precautions related to the implementation of medication orders and medication errors occur in pediatric ward many times [16].

Smith [2014] has conducted a study to examine the medication errors and their trends among the children out of the hospital in America. The participants were 696937 children younger than 6 years who had experienced medication errors between 2002 and 2012. The data was collected using the database of America Poison Center. The results showed that averagely, a child per 8 minutes experiences medication error and the number and speed of all kinds of medication errors have increased during the eleven-year period. %25.2 of errors were caused after taking painkillers, %96.2 of errors were caused by preparation and consumption of cough and cold medicines and %27 of them were inadvertent medication errors and occurred due to giving medications to children two times [17].

You [2015], in Korea, has conducted a study to examine the drug administration to the children by their parents at home and understanding its side effects. The samples were 179 parents of the children admitted to the pediatric ward of a hospital in Korea and three daycares. The data was collected by a self-reporting form. According to the results, %12.3 of parents observed the side effects of the drugs. %15.1 of parents were skeptical of using drugs in a right way and %11.2 of them were skeptical of given dosage. The results showed that in order to reduce the medication errors at home, the parents should be taught [18].

Method

This study is a clinical trial research. In order to calculate the sample size of two control and experimental groups, by taking into account the prevalence of medication errors among trained and untrained parents according to the study of Kaushal et al. [9] (0.7 for untrained parents and 0.41 for parents trained) and considering the error type I (α) equal to 0.05 and power (1-β) 80%, the sample size was calculated 60 for each group with dropout of %15 and using Medcalc14 software.

$$N = \frac{\left(Z\alpha_{/2} + Z_{[1-\beta]}\right)^2 [P_1(1-P_1) + P_2(1-P_2)]}{(P_1 - P_2)^2}$$

This study was performed in the period from July to December 2016 after receiving approval for the study from the Research Council of the university and also moral authority from the Ethics Committee (Code: IR.SUMS.REC.1395.56). THREE Igbal, Fatemeh Zahra (SA) and Meftahi clinics were randomly selected among the clinics of Shiraz City by two-stage cluster sampling method and then, 120 parents of children aged at 1 to 5 years admitted to one of mentioned clinics were selected according to inclusion criteria (1- Having conscious willingness to participate in research. 2- The child's father or mother or both of them participate in training sessions. 3- The parents have a child aged at 1 to 5 years. 4- The child has a history of disease in last three months. 5- Parents speak in Persian. 6- Parents have the ability to read and write) by simple sampling method and then informed consents were obtained from them and they were divided into two control and experimental groups. The participants, before calling the child by a doctor, filled out the demographic characteristic form (including demographic characteristics of father or mother and characteristics of children. Parents' characteristics were including relation with the child, age, number of children, occupation, average monthly income and child characteristics were including age and birth order), and a medication errors questionnaire. After filling out the questionnaires, the participant of experimental group were divided into 4-6 person groups and taught through lecture and question and answer method. The first training session was performed in a 40-minute session using a Powerpoint Software and presenting a file on different types of medication errors, different forms of medicines and how to use various forms of medicines. The second training session was performed after calling a child by a doctor and for 15 minutes through lecture and answering the parents' questions about the prescribed medication. After holding training sessions, training manual was given to them and they were asked to admit the clinic 4 days later to fill out the questionnaire again. About the control group, no intervention, except for normal course of drug administration, was performed, then, in order to comply with ethical principles, training manual containing drug information was provided to the control group. Exclusion criteria were including: 1- The child becomes worse and he/she is transferred to the hospital for admission. 2- They parents have no willing to participate in the research or opt out of the research. 3- Absence of participant in training sessions. 4- No medicine was prescribed for the child by a doctor.

Researcher-made questionnaire was developed based on scientific articles [9,10]. In order to examine its content validity, Lawshe's method was used and 12 faculty members and experts of the School of Midifery and Nursing, Shiraz Fatemeh Zahra (SA) University of Medical Sciences were asked to fill out the questionnaires and content validity was estimated 0.83 and also approved. In order to estimate its reliability, 30 parents were asked to fill out the questionnaires and then Cronbach's alpha was estimated 0.86 according to the results. A questionnaire had 27 items about the implementation of medication orders and educational intervention was performed in connection to them. Scoring was performed based on the answers. A questionnaire was designed based on 4-point Likert scale (in which the lowest score was 1: never and the highest score was 4: always).

SPSS Software and descriptive statistical methods such as frequency table, percent, average and standard deviation and plotting diagram were used to describe and analyze the data. After calculating the total score, Kolmogorov-Smirnov test was used to examine the normality of the data in separate areas, independent t-test was used to compare the medication errors scores in the control and experimental groups, pair t-test was used to compare the medication errors scores before and after intervention and Pearson's correlation coefficient was used to examine the relationships between the variables. $P<0.05$ was considered as significance level.

Results

The results of Kolmogorov-Smirnov test showed that the medication errors scores in both experimental and control groups follow a normal distribution ($P>0.05$). To compare the frequency distribution of the variables of relation with child and occupation in the two experimental and control group, the Chi-square test was used. Based on the results, there was

statistically no significant difference between the two control and experimental groups in the variables of relation with child and occupation (P>0.05) (Table 1).

Table 1. Comparison between the experimental and control groups in frequency distribution of quantitative demographic characteristics

Group		Experimental (N=60)	Control (N=60)	p-value
Frequency / Variable		Frequency (%)	Frequency (%)	
Relation with child	Mother	53 (88/3)	53 (88.3)	1.000
	father	7 (11.7)	7 (11.7)	
Occupation	Employee	12(20)	13(21.7)	0.867
	Housewife	46(76.7)	44(73.3)	
	Self-employed	2(3.3)	3(5.00)	

The results of t-test showed that there was statistically no significant difference between the two control and experimental groups in demographic characteristics (P>0.05) (Table 2).

Table 2. Comparison between the averages and standard deviations of demographic characteristics of experimental and control groups

variable	Group	mean±standard deviation	t-statistic	p-value
parent's age	Experimental	34.63±3.15	0.68	0.49
	Control	31.80±5.58		
Number of children	Experimental	1.6±0.64	-0.77	0.44
	Control	1.7±0.76		
Average monthly income	Experimental	1.63±0.48	-1.86	0.06
	Control	1.81±0.51		
Child's age	Experimental	26.15±16.19	-0.55	0.57
	Control	27.80±16.24		
Child's birth order	Experimental	1.50±0.59	-0.39	0.69
	Control	1.55±0.76		

The average medication errors scores of the two experimental and control groups before and 4 days after intervention were compared using pair t-test. The results showed that in the experimental group, the average medication errors score obtained 4 days after intervention was significantly greater compared to before intervention (p<0.001). Also, in the control group, the average medication errors score obtained 4 days after intervention was significantly greater compared to before intervention (p<0.001). The results of independent t-test showed that before intervention, the average medication errors scores of the experimental and control groups were 70.65±12.07 and 70.46±6.85, respectively and no significant difference was observed between them (p=0.91). 4 days after intervention, the average medication errors scores of the experimental and control groups were 90.43±6.86 and 79.63±6.86, respectively and significant difference was observed between them (p<0.001) (Table 3).

Table 3. Comparison between the average medication errors scores of the two experimental and control groups before and 4 days after intervention

Time	Group	N	mean±standard deviation	t-statistic	p-value
Before intervention	Experimental	60	70.65±12.07	0.1	0.91
	Control	60	70.46±6.85		
After intervention	Experimental	60	90.43±6.86	7.31	p<0.001

	Control	60	79.63±9.15		

According to the results of Pearson's correlation coefficient shown in (Table 4), there was no significant relationship between the average medication errors score and quantitative-descriptive demographic characteristics of the parents (p>0.05)

Table 4. Pearson's correlation coefficients-The relationship between the average medication errors score and quantitative-descriptive demographic characteristics of the parents after intervention

Time	After intervention	p-value
Variable	Pearson's correlation coefficient	
Parent's age	-0.03	0.74
Number of children	-0.06	0.51
Average monthly income	0.02	0.82
Child's age	-0.05	0.53
Child's birth order	0.01	0.90

The results of t-test showed that there were no significant relationships between average medication errors score and the variables of relation with children and occupation (p>0.05). (Table 5 And 6)

Table 5. The relationship between the average medication errors score and the variables of relation with children and occupation after intervention

Variable	Occupation	Employee	Housewife	Self-employed	p-value
	mean±standard deviation	mean±standard deviation	mean±standard deviation	mean±standard deviation	
Group	Experimental	89.00±5.57	91.21±6.92	81.00±7.07	0.08
	control	81.46±10.51	79.02±8.88	80.66±9.07	0.69

Table 6. The relationship between the average medication errors score and the participant's relation with the child after intervention

Variable	Relation with child	Mother	Father	p-value
		mean±standard deviation	mean±standard deviation	
Group	Experimental	90.88±6.83	87.00±6.53	0.16
	Control	79.45±9.34	81.00±8.12	0.67

According to (Diagram 1), the changes in average medication errors scores in the experimental group was greater compared to the control group.

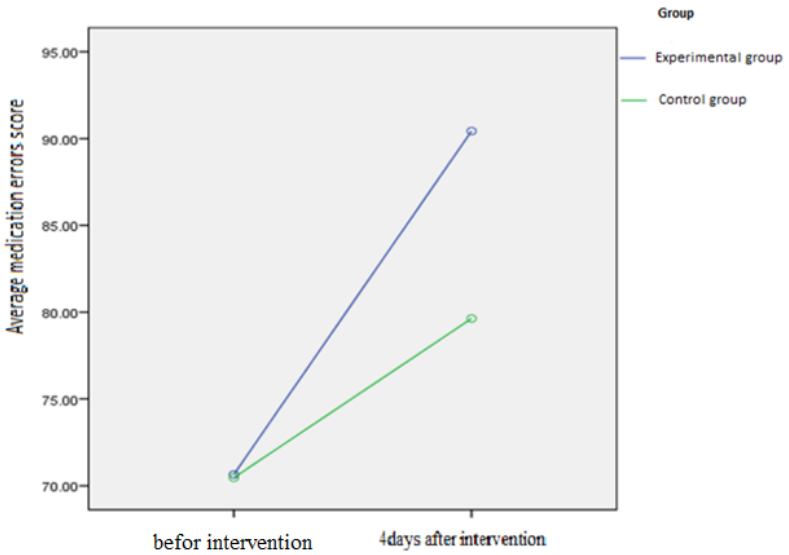

Diagram 1. Comparison between the average medication errors scores of the two experimental and control groups before and 4 days after intervention

Discussion and conclusion

The present study aimed to determine the effects of educating the parents of children aged 1 to 5 years admitted to selected clinics in Shiraz City on the occurrence of medication errors in 2016. In the present study, 120 parents of children aged 1 to 5 years who were eligible according to the inclusion criteria, were examined. According to the available resources and existing data, it seems that the present study is of the first studies performed in Iran and also in the world to examine the effects of educating the parents of children aged 1 to 5 years on the occurrence of medication errors. Before intervention, in order to determine the consistency of demographic factors in both experimental and control groups, the Chi-square test and t-test were used based on the types of variables, being qualitative or quantitative. According to the p-values obtained from two Chi-square test and t-test, no significant differences were observed between the two control and experimental groups in parent's age, relation with child, number of children, occupation, occupation, average family income, child's age and child's birth order (Tables 1 And 2). In the present study, most of the participants were mothers and it is consistent with the results of Walsh et al.'s study, on medication errors in children at home, in which %87 of participants were mothers [20]. Ryu et al. [2012] have conducted a study to determine the extent and magnitude of the error in the amount of liquid medicine measured by measuring devices and given by the children's

result of the present study [21]. The results of these studies show that the role of parents in the occurrence of medication errors is undeniable and often, mothers are more involved in child care and the need for education in mothers is more.

According to the (Table 3), before intervention, the average medication errors scores in the two control and experimental groups were 70.46 and 70.65. Accordingly, independent t-test showed no significant difference between the two groups ($p>0.05$). So the two groups were similar in this regard before intervention and can be compared after intervention. The results show that after intervention, no significant differences were observed between the average medication errors score and demographic characteristics including parent's age, relation with child, number of children, occupation, occupation, average family income, child's age and child's birth order. Also, it can said that demographic characteristics had no effect on the medication errors score. The result of the present study is consistent with the results of a study by Kharod et al. (2006). They have conducted a study entitled "A study of the effects of written instructions on the accurate use of the drugs in patients with glaucoma". They have concluded that there is no significant relationship between the accurate use of the drugs by the patient and his/her age, gender and race [22]. Bailey et al., in their study entitled "prediction of parents' misunderstanding of the liquid drugs instructions in the children admitted to the clinics in Chicago, Michigan and Jackson", have concluded that parents' misunderstanding of the liquid drugs instructions in the children is common [23]. In the world, it is recommended that in the first priority, the drugs in syrup form are used for the children but calculation of its amount is a general problem that should be solved [24]. In recent years, occurrence of medication errors in children has been not reduced but also, it is increasing. So, educating the parent should be seriously considered. It seems that in addition to the high occurrence of medication errors in pediatric outpatients, it is not low in chronic diseases.

The results of the present study showed that after intervention, in the experimental group, average medication errors score significantly increased. The same result was observed in the control group after intervention. The reason for this is their sensitiveness in controlling the medication error and their motivation for knowing about medication errors. But, it should be noted that the difference between the averages in experimental group is greater compared to the control group. In the experimental group, after intervention, the average medication score increased as much as 19.76 while it increased as much as 9.17 in the control group. And this shows that the intervention was effective.

In general, the results showed that education can reduce the parents' medication errors. This result is consistent with the results of a study by Hu et al. (2013). They have conducted a study to investigate the effect of education program of caregivers on the use of oral antibiotics in children. The results of their study showed that face to face and group education of caregivers significantly increase the medications errors after intervention [25]. Yin et al. (2011) have conducted a study to investigate the effects of using image diagram on reduction of parents' medication errors in prescribing the dose of acetaminophen to babies. Education through giving the text on drug administration to the parents along with showing images was more effective than education through giving the text on drug administration alone [26].

According to the results of the present study, after intervention, significant difference was observed between the two control and experimental groups in average total score of medication errors. Also, in the experimental group, average medication errors score increased significantly after intervention compared to before intervention ($p<0.001$) and for the control group, average medication errors score after intervention was also significantly greater compared to before intervention ($p<0.001$). These results are consistent with the results of many studies on the effects of educating the parents of children with chronic diseases at different age groups on reduction on medication errors. For example, Walsh et al.'s (2013) have conducted a study entitled "evaluation of parent-oriented errors using different websites in order to reduce the medication errors of oral chemotherapy in children" in 3 oncological clinics in Northeast and Southwest of America. The results of their study showed that after education through the sites, medication errors in parents significantly reduced [27].

The present research is a step toward completing previous studies to reduce medication errors in parents. Also its results showed that the design and implementation of a good education have significantly reduced the medication errors in the experimental group. So, educational intervention can be used to reduce the medication errors.

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