ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR2016; 2(5): 1094-1098
www.allresearchjournal.com
Received: 21-03-2016
Accepted: 22-04-2016

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The effectiveness of simulation-based education on parental management of fever for young children: A quasi-experimental study

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Abstract
Background: Childhood fever is a common occurrence and often a grave concern to parents. Providing parents with more education about fevers could improve home management and reduce unnecessary medical treatment.
Objective: This study assesses the effectiveness of simulation-based education on information, motivation, behavioral skills, and behaviors related to parental fever management.
Methods: A pre-posttest with a control group was used among one hundred and fifty parents of young children enrolled in three kindergartens, whose children were aged six months to five years. Control group was selected randomly from those volunteered parents and both groups were equal (n=75). The intervention group was provided with a 20-minute fever care simulation session and the control group was just provided with the fever education brochure. Follow-up phone calls were conducted after three months.
Results: The results showed that the experimental group and control group had improved regarding fever management at the post-test assessment, with the experimental group, who received the simulation-based education, showed significantly higher information, motivation, behavioral skills, and management behaviors than the control group.
Conclusion: The simulation-based education in fever management is effective in promoting fever information (FI), motivation (M), behavioral skills (BS) and fever management behaviors (FMB). With application of situation scenarios, it is recommended to develop and apply simulation-based education.

Keywords: Fever management, Learning program, Simulation, Parent, Young children.

1. Introduction
Childhood fever is a common occurrence and often a grave concern to parents. Misconceptions and unfounded fears regarding fever exist among parents and pediatric providers alike, despite the evidence that fevers are not harmful in most circumstances. In addition, fear of fever can lead to aggressive and dangerous practices, including overdosing with antipyretics and sponge bathing with alcohol (Clarke, 2014) [5]. Avner (2009) [2] describes fever as a complex physiologic response. A series of actions occur within the body after exposure to viral or bacterial pyrogens which result in increased prostaglandin production. Prostaglandin stimulates the hypothalamus to raise the "set point" of the body, similar to raising the temperature on a central thermostat. As a result, the body acts to raise its temperature to the new set point. There is a need for pediatric caregivers to understand the physiology of the febrile response as well as common misconceptions regarding fever in order to promote safe and evidence based fever management for their young children (Clarke, 2014) [5]. Childhood fever is a common symptom managed by parents at home; most parents do not know the definition of fever, its effect, or its management. To establish simulation-based education for parents and evaluate its effectiveness for fever management at home are essential for nursing care (Chang *et al.,* 2016) [4]. Fever accounts for 20-40% of the chief complaints of children seeking medical advice every year (National Institute for Health and Care Excellence, 2013) [17]. When children had fever, parents were concerned that it would cause brain damage, febrile convulsions, and death (Erker, *et al.,* 2010; Chang *et al.,* 2013) [8, 3]. Fever has been acknowledged as a one of the most common symptoms found in pediatric care units. Unlike adults, children can easily experience febrile convulsions if the fever is not controlled (Hockenberry 2005; Potts and Mandleco, 2011) [11, 21].

Moreover, Walsh *et al.* (2006) [26, 27] suggested that parents may even have "fever phobia," or a fear of febrile seizures, and therefore provide inadequate fever management. Nursing management of fevers remains static (Poirier *et al.*, 2000; Sarrell *et al.,* 2002) [20, 24], and the incidence of fever-induced febrile convulsions in children supports this notion. Accordingly, simulation modules may help to provide a comprehensive understanding of fever and fever management (Prion, 2008) [22]. Simulation-based education is an innovative (Lupien, 2007) [15] and interactive teaching strategy (Gaba, 2004) [10]. The effectiveness of simulation-based education is still largely unknown despite its use in health care providers' education for more than 50 years. Over the past 10 years, simulation has been rapidly expanded in training for health care professionals; this provides many benefits (Nehring *et al.,* 2001) [18]. It provides virtual experiences of situations frequently encountered in a clinical setting (Moule, 2011) [16]. Simulation is defined as "An event or situation made to resemble clinical practice as closely as possible" (Jeffries, 2007) [13] and is categorized according to the level of fidelity or realism along a spectrum of low fidelity to high fidelity. The uses of simulation in nursing education dates as far back as 1874 when anatomical models were used in the form of jointed skeletons (Nehring and Lashley, 2009) [19]. The formal use of manikins to enhance student learning began a century ago with the introduction of 'Mrs. Chase' a full body static manikin in 1911 (Jansen *et al.*, 2009) [12]. However, simulation only became popular in the 1950s when it was realized that using manikins helped students put theory into practice (Roberts and Greene, 2011) [23]. In the 1960s the use of low fidelity manikins such as 'resusci-Annie' became popular, and is still in use today (Roberts and Greene, 2011) [23]. This study assesses the effectiveness of simulation-based education on information, motivation, behavioral skills, and behaviors related to parental fever management.

1.1 Hypothesis of the study

There will be a difference in fever management between experimental group who participated in the simulation-based education and control group who did not.

1.2 Significance of the study

Educational interventions have successfully reduced parents' unnecessary use of healthcare services for childhood fever (O'Neill-Murphy *et al.,* 2001) [14]. Currently, most health education programs for parents use a traditional fever education brochure or leaflet. By the important part of real life scenario, a person has better awareness and understanding of scenario (Anderson *et al.,* 2008) [1]. Providing education on fevers to parents with a simulation strategy that will help them rehearse the appropriate management of childhood fevers specially that health education for the public in a community has less stress and urgency.

2. Study Methodology

2.1 Study design

This study was designed as a quasi-experimental study, using control group and a pretest posttest design to examine the effectiveness of simulation-based education on information, motivation, behavioral skills, and behaviors related to parental fever management.

2.2 Setting and Subjects

The study was implemented at three kindergartens in Nasr City, Egypt, between October and December 2014. An advertisement has been suspended in entrance hall and letters distributed to parents of children enrolled in the three kindergartens resulted in recruitment of 150 of interested parents in all. Eligibility criteria included aged 20 years or older, educated, and being a parent and primary caregiver for a child aged between six months and five years.

2.3 Questionnaires

The first data collection's questionnaire concerning demographic data, which included the participant's formal education, number of children, and birth order of the children participated in this study, the child's gender, date of birth, and any other medical conditions. The second tool (pretest/posttest) comprised two sections; the first section included a hypothetical 'fever' scenario and participants considered their child or children under the age of five years as the subject(s) of the scenario. For scenario development, the author depend on extensive review of nursing care from child health nursing textbooks (Hockenberry, 2005; Potts and Mandleco, 2011) [11, 21] and nursing journal (Walsh *et al.,* 2006) [26, 27]. The second section included questions regarding fever information (FI), fever motivation skills (FMS), fever management behaviors (FMB) which developed by Chang *et al.,* (2015) using the information-motivation- behavioral skills model (Fisher *et al.,* 2006) [9]. The FI, FMS, and FMB consisted of 18 items covering issues related to fever and its management. The six items included in the FI scale were answered with a correct choice (scored 1), or with a wrong choice or as unknown (scored 0). Thus, a possible total score ranged from 0 to 6, with higher scores reflecting higher levels of FI. The FMS scale and the 4-point Likert scale contained seven items. The M scores ranged from 7 to 28, where a higher score indicated more correct skills and more confidence in dealing with fever at home. The five items in the FMB scale were scored 1 for appropriate and 0 for inappropriate Mb; the scores ranged from 0 to 5, where a higher score showed more appropriate Mb.

2.4 Procedure

The participants were randomly assigned into equal two groups; experimental (EP) and a control (CP) group. The questionnaire was administered by author/research assistants to the parent accompanying the child at the kindergarten in the morning/afternoon according to their free time and they asked to complete a consent form and a pretest questionnaire. Parents in the EP group had to attend a 20-minute fever care simulation session. They had to obtain specific knowledge from the scenario simulation to complete the learning mission. Parents received a fever education brochure after completing the simulation session and then they were requested to complete the first post-test questionnaire. The entire process took about 35 minutes in the EP group. Parents of CP group were given only the fever education brochure and then they were requested to complete the post-test questionnaire. The second post-test questionnaires were completed through phone calls after three months and which lasted between 5 to 10 minutes each.

2.5 Data analyses

The Statistical Package for Social Sciences software (SPSS 18.0) was used for data analysis (SPSS Inc., Chicago, IL, USA). The general demographic characteristics of the experimental group and the control group were analyzed with descriptive analysis. A two-sided p value ≤ 0.05 was considered statistically significant. To test the effects of simulation-based education, an independent t-test was applied to test for any difference between pretest and posttest data for the control and experimental groups.

3. Results

The subjects of this study were parents of young children with an experimental group size of 75 and a control group size of 75, for a total of 150 participants. Table (1) shows the demographic characteristics of participated parents. Most of participants are mothers (93.3%), and their mean age is around 32 years; 32.21± 3.11 years in the EP group and 32.78 ± 3.91 years in the CP group; p =0.07. There were no statistically significant differences in all demographic characteristics between the EP and CP groups which indicated the homogeneity between the two groups.

Mean comparisons between the EP and CP groups were illustrated in table 2; there were no significant differences in the pretest between the two groups regarding all aspects of fever management (fever information, fever motivation, behavioral skills, and fever management behaviors), while significant differences (p<0.001) are shown in the posttest and follow up (Month 3) between the two groups. The study hypothesis is "There will be a difference in fever management between experimental group who participated in the simulation-based education and control group who did not". Fever information scores of the experimental group that participated in simulation-based education increased 2.4 points from 3.41 ±1.54 to 5.81±0.41 and the score for the control group increased 1.13 points from 3.92±1.53 to 5.05±1.10, indicating a significant difference between the two groups (t=5.86, P<0.001). The same table shows statistically significant differences between the experimental group and control group regarding Motivation **(**t=7.11, P<0.001)**,** Behavior skills **(**t=6.52 P<0.001), and Management behaviors (t=8.91, P<0.001). Thus, hypothesis was supported.

Table (3) shows intragroup comparisons of the experimental and control groups in terms of information (I), Motivation (M), Behavior skills (Bs), and Management behaviors (Mb). The post-test scores of the EP group for I, M, Bs, and Mb were significantly better than pretest scores (p<0.001). The difference between the average scores of I, M and Bs between posttest and follow up were not statistically significant. The difference between the average scores of I, M, and Bs between pretest and follow up achieve statistical significance, while the comparison of the average scores of CP for M, Bs, Mb between pretest and follow up did not show a statistically significant difference. The three posttest scores of the CP group for I, M, and Bs were statistically significantly better than their pretest scores (p<0.001). These results indicate the retention effects of the EP group for I, Bs, and Mb, but not of the CP group.

The results showed that the experimental group and control group had improved regarding fever management at the post-test assessment, while experimental group had higher scores than control group in fever information motivation, behavioral skills, and fever management behaviors (figure 1).

4. Discussion

The objective of the present study is to assess the effectiveness of simulation-based education on fever information (FI), motivation, behavioral skills (FMS), and behaviors related to parental fever management (FMB). The results of the current study revealed that simulation-based education in fever management with application of situation scenario is effective in promoting FI, FMS and FMB. Clynes and Raftery (2008) support these findings by reporting that the application of clinical scenario simulation enables learners to understand the theoretical framework and makes nursing interventions easier. In addition, Walsh *et al.* (2005) [25] and Clinch & Dale, (2007) [6] reported that fever management is an integral aspect of pediatric nursing practice and Walsh *et al.* (2006) [26, 27] added that a lack of knowledge about fever and fever management might result in inadequate treatment in children. Based on our results, simulation-based education should be considered for educating parents on fever because its efficacy is better than a health education brochure. This result was supported by O'Neill-Murphy *et al.* (2001) [14] who investigated the effects of fever education using discussion and demonstrations or written materials; their results showed that both methods were effective in reducing unnecessary clinic visits while the effects of discussion and demonstration were better than those of written education alone. The findings underline the importance of simulation based education in order to improve the parents' knowledge about fever.

In conclusion, the current study suggests that the interactive simulation-based education program on the care of childhood fevers provided significant improvement regarding FI, Bs, M, and Mb compared with a fever education brochure alone. We suggest providing community-based education about childhood fevers with scenario simulation methods to improve parental information and behavior skills to manage fevers successfully at home. The present study has potential limitations which should taking into consideration; the parents' sample (parents of children attending three nursery-schools in Nasr City) may be not representative of the entire population; they had tertiary education and were from metropolitan area; therefore findings are not generalizable and need to be interpreted with caution. Future studies with larger and more representative samples are needed to confirm the findings of this study.

5. Ethical considerations

Before conducting this study, approvals were obtained from educational administration and directors of kindergartens. The purpose and procedure of the study, voluntary participation and guaranteed anonymity were explained to the subjects and written consent was obtained. Based on the request of participants, after collecting the data, simulation-based education in fever management was also conducted for the control group.

6. Acknowledgements

The author would like to thank Dr. Mohamed Al-Banan, Faculty of Medicine, Cairo University for expert assistance with data analysis. Grateful thanks to Ms. Nahed Salman and Mrs. Omima Hegy for their support in data collection. In addition, deep thanks for parents who gave their valuable time to participate.

7. Financial support
None.

8. Conflict of interest
The author has no actual or potential of interest including any financial, personal, or other relationships with other people or organization that could inappropriately influence or be perceived to influence this work.

Table 1: Demographic data of participants (n=150)

Variable	Experimental group (N=75)		Control group (N=75)		X^2
	N	%	N	%	*P*
Participants					
Mother	70	93.3	66	88.0	0.08
Father	5	6.7	9	12.0	
Age					
20-<30	19	25.3	7	9.3	0.07
30-<40	52	69.3	61	81.4	
40-50	4	5.4	7	9.3	
Education					
High school	9	12.0	17	22.7	0.36
College & above	66	88	58	77.3	
Occupation					
Housewife	11	14.7	1	1.3	0.16
professional	28	37.3	18	24.0	
Nonprofessional	36	48.0	56	74.7	
Number of children					
One	5	6.7	11	14.7	0.23
Two	44	58.7	21	28.0	
Three& more	26	34.6	43	57.3	
Child's age					
6-<12 months	0	0.0	25	33.3	0.09
12-<36 months	22	29.3	18	24.0	
36-60 months	53	70.7	32	42.7	

Table 2: Comparison of Experimental and Control Group in fever management (*N*=150)

Variables	Groups	Pretest	Posttest	Follow up	Comparison		
		M±SD	M±SD	M±SD	T1 t (*P*)	T2 t (*P*)	T3 t (*P*)
Information	Exp. (n=75)	3.41 ±1.54	5.81±0.41	5.74±0.63	0.40	5.86	6.83
	Cont. (n=75)	3.92±1.53	5.05±1.10	4.84±1.01	(0.686)	(<0.001)	(<0.001)
Motivation	Exp. (n=75)	19.09 ±2.55	22.42±1.66	23.00±1.41	- 1.28	7.11	12.93
	Cont. (n=75)	18.61±2.61	19.15±2.42	19.40±2.00	(0.203)	(<0.001)	(<0.001)
Behavior skills	Exp. (n=75)	14.04±3.71	20.48±2.71	18.56±1.97	- 0.02	6.52	6.80
	Cont. (n=75)	15.95±3.83	16.23±3.46	15.76±3.10	(0.983)	(<0.001)	(<0.001)
Management behaviors	Exp. (n=75)	2.19±1.52	3.48±1.13	3.45±1.13	- 0.05	8.91	5.31
	Cont. (n=75)	2.20±1.68	1.22±1.30	1.23±1.30	(0.960)	(<0.001)	(<0.001)

Exp. = experimental group; Cont. = control group
T1 = Pretest, T2 = Posttest, T3 = Follow up

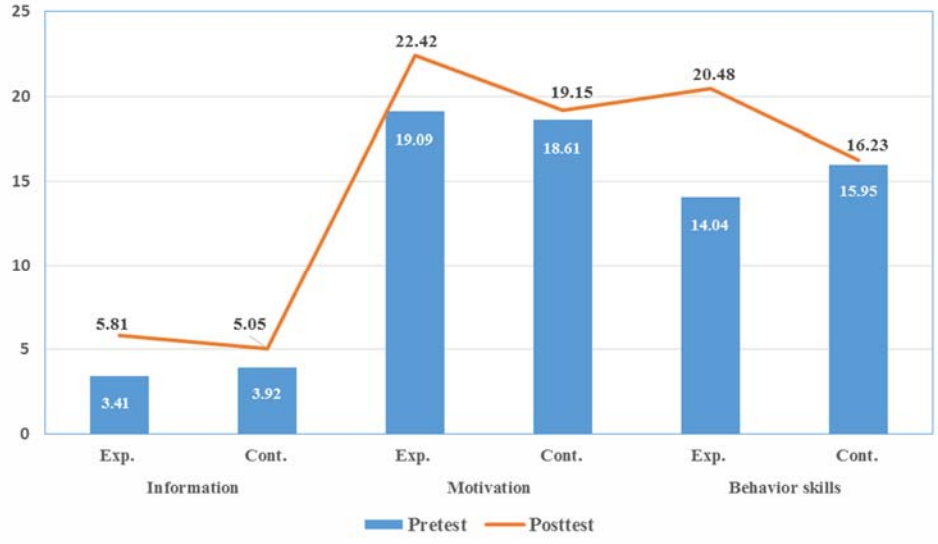

Fig 1: Pre and post-test comparisons of fever information, Motivation and behavioral skills in the experimental and control group

Table 3: Intergroup comparisons of information about fever management, motivation, behavioral skills, and management behaviors in the experimental and control group

	T2 vs T1		T3 vs T1		T3 vs T2	
	ΔM	***t p***	**ΔM**	***t p***	**ΔM**	***t p***
Experimental group						
Information	2.40	10.02 *	2.33	9.81 *	- 0.07	0.74 0.438
Motivation	3.33	13.52 *	3.91	13.61 *	0.58	3.42 0.001
Behavioral skills	6.44	16.14 *	4.52	16.70 *	- 1.92	2.43 0.017
Management behaviors	1.29	11. 54 *	1.26	3.60 *	- 0.03	3.11 0.034
Control group						
Information	1.13	8.01 *	0.96	6.10 *	- 0.21	1.70 0.094
Motivation	1.17	0.61 *	0.43	1.31 0.193	-0.75	2.44 0.036
Behavioral skills	1.52	7.50 *	0.79	3.14 0.012	- 0.75	3.01 0.004
Management behaviors	- 0.02	6.02 0.014	- 0.88	4.67 0.012	--	--

ΔM = mean difference, t = t value; T1: pretest, T2: posttest, T3: 3 Month follow up, * p<0.001.

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