Original Article

Effect of the Evidence-Based Pediatric Fever Management Training given to Nursing Students

Ahmet Komeagac, MSc, RN,
Urla State Hospital, Urla, Izmir, Turkey

Murat Bektas, PhD, RN
Associate Professor, Dokuz Eylul University Faculty of Nursing, Inciraltı, Izmir, Turkey

Correspondence: Murat Bektaş, PhD, RN, Dokuz Eylul University, Faculty of Nursing, Inciralti, 35340 Izmir, Turkey E-mail: mbekta@gmail.com

Abstract

Background: In the literature, it is seen that there are no specific education, program or course on evidence-based management of pediatric fever in the undergraduate education and this subject is discussed only as part of other courses, and nurses' level of knowledge on this subject is low
Aim: This study was performed to evaluate the effect of the evidence-based pediatric fever management training given to nursing students.
Methods: The sample of the study consists of 110 3rd year nursing student. The data were collected by the Socio-Demographic Data Form and Students' Evidence-Based Pediatric Fever Management Knowledge Level Evaluation Form. Shapiro-Wilk normality test, t-test, Mann-Whitney U test, correlation analysis, regression analysis, power and effect size were used in the evaluation of the data.
Results: A statistically significant difference was found between pre-test and post-test point of the intervention and control group ($p < 0.01$). While the training program explains 24,8% of the increase in the level of knowledge of fever ($R^2 = 0.248$), getting training increases the level of knowledge of fever by 0.498-fold ($\beta = 0.498$).
Conclusions: Evidence-based training given to the nursing students on the management of pediatric fever has caused the students' level of knowledge to increase.

Keywords: Management of Fever, Nursing Students, Fever, Pediatric

Introduction

Fever is the increase in body temperature caused by the initiation of a series of complex reactions due to the entry of substances such as bacteria, viruses, and other antigens into the body (Avner, 2009; Gordon, 2014). It is the natural defense mechanism of the body and it is not a disease but a symptom of diseases at their early stages (Çöl Araz, 2013). Fever is the most common symptom of childhood diseases (Avner, 2009; Ward, 2016). The studies have shown that the ratio of children presenting to the emergency department due to fever is 20-30% while this ratio increases up to 71% in Turkey (Celasin Şen, 2008; Öztürk et al., 2015). Fever, which appears to be the symptom of many diseases during the childhood, can cause many serious complications such as dehydration and febrile convulsion depending on the age group of the child (Celasin Şen, 2008). Thus, correct diagnosis and evaluation of fever are of utmost importance. Inadequate knowledge of fever and its management, and mistakes made when detecting high fever set ground for unnecessary procedures and harmful effects of fever (Pul, 2006). Studies have reported that improper practices are common among both the healthcare personnel and the families in terms of treating the child with a fever (Celasin Şen, 2008; Öztürk, 2015; Walsh, 2005). Although it is an easily identifiable, and most of the times, an easily manageable symptom, healthcare personnel's and families' lack of knowledge on this subject make it hard to appropriately intervene in fever. Each time the body temperature rises, the family suspects the presence of an infection and this causes families to worry (Çöl Araz, 2013). The smallest increase in the body temperature of the child triggers the idea that the temperature must be cooled down,

causing the families to panic (Özkan, 2013). This panicked and anxious state of the families is described as "fever phobia"(May, 1992; Rosti, 2002). Fever phobia causes the families to needlessly use the health centers and start drug treatment in children redundantly (Arıkan, 2012). The most important preventive measure is to educate the families. In this regard, nurses have the most important task. However, in the literature, many factors that prevent nurses from measuring the body temperature from the right area, making the correct diagnosis and performing efficient management of fever according to the evidence-based guidelines have been identified (Pul, 2006; Sökün, 2014). The most important of these factors is the level of knowledge of nurses on this subject. The studies have shown that the level of knowledge of nurses on pediatric fever management is low, and at times although they have the correct knowledge theoretically, they have practical inadequacies (Khanh Tran, 2014; Pul, 2006; Sökün, 2014). In the 2014 study by Sökün, it was found that despite the revision of medical device regulation regarding the prohibition of the use of mercury thermometer, of 167 nurses included in the study, 21,4% still used a mercury thermometer. The same study also found that the nurses knew about the harms of mercury thermometer use, but did not use this theoretical knowledge in practice (Sökün, 2014). Studies in the literature corroborate that there are many wrong interventions and knowledge in terms of measurement, evaluation, and efficient and evidence-based management of body temperature (Considine, 2006; Crocetti, 2001; Greensmith, 2013; Sökün, 2014). There is a direct correlation between the nurses' ability to increase their level of knowledge and perform efficient nursing interventions and nursing education they received during their undergraduate degrees (Durmaz Edeer, 2015; Göriş, 2014). In the literature, it is seen that there are no specific education, program or course on evidence-based management of pediatric fever in the undergraduate education and this subject is discussed only as part of other courses, and nurses' level of knowledge on this subject is low (Kim, 2013; Sökün, 2014). However, no programs that discuss this subject directly were found at the undergraduate level. This study was planned to increase the undergraduate nurses' level of knowledge of evidence-based management of pediatric fever. The objective of the study is to increase the undergraduate nurses' levels of knowledge of evidence-based management of pediatric fever.

Method

Aim

This research is of pre-post test quasi-experimental design with un-match group model and is performed to evaluate effect of the evidence-based pediatric fever management training given to nursing students.

Setting and sample

The research was performed on junior year students who took a pediatric nursing class at Dokuz Eylul University, Faculty of Nursing, between January-June 2017.

In order to determine the number of samples to be included in the study, GPOWER3.0 program was used to determine Type I error 0.05 and Type II error:20 (80% power), and the required sample size was found to be 34 people for each one of the two groups. This study took place between January-June 2017 with junior year students at Dokuz Eylul University Faculty of Nursing, Department of Pediatrics nursing who took a pediatric nursing class in the spring semester. The number of students who took a pediatric nursing class in the 2016-2017 spring semester in Faculty of Nursing is 130. The number of students who agreed to participate voluntarily in the study is 110. Sample selection method was not used and all students who agreed to participate in the study were included in the study. The pediatric nursing class was taught in two groups. 59 students in the first group constitute the control group, and 51 students in the second group constitute the intervention group. The control group was trained using the material in the normal curriculum. Within the scope of the normal curriculum, the students receive fever management in adult patients in previous classes, which lasts one hour in total; and in pediatric nursing class, the students receive fever management in child patients. In addition to the normal curriculum, intervention group also received training on evidence-based management of pediatric fever. After the completion of the study, to the control group was given the same training. Criteria for inclusion in the sample group;

- Taking pediatrics classes
- Agreeing to take part in the study voluntarily

Research Variables

The independent variable of the research is the evidence-based training given to students on the management of pediatric fever. Dependent variables of the research are the mean scores obtained from the Students' Evidence-Based Pediatric Fever Management Knowledge Level Evaluation Form.

Data Collection

In the study, the data were collected using "Socio-Demographic Data Collection Form" and "Students' Evidence-Based Fever Management Knowledge Level Evaluation Form". In order to collect data, between January 2016-June 2017, the forms were given to the control group before and after the pediatric nursing class, whereas the forms were given to the intervention group before the class begun, the course was taught, and then the forms were given once more after the class finished.

Socio-Demographic Data Collection Form:

Socio-Demographic Data Collection Form comprises eight questions that aim to determine student's age, gender, whether the student follows occupation-related publications, whether the student considers him/herself sufficient in terms of pediatric fever management, whether the student works at another hospital after school, and whether the student previously had any training on fever management.

Students' Evidence-Based Pediatric Fever Management Knowledge Level Evaluation Form:

Students' Evidence-Based Pediatric Fever Management Knowledge Level Evaluation Form comprises 23 multiple choice questions (1-23) on the definition of fever, etiology of fever, measurement methods and evaluation of fever, physiopathology of fever, fever phobia, complications of fever; 13 multiple choice questions (23-36) on the mechanism of action of antipyretic drugs used for the pharmacologic management of fever, their adverse effects, daily and maximum doses, and non-pharmacologic methods of fever management; and 36 true/false type questions on correct and incorrect practices of fever management in general. The highest score from the survey is 72 while the lowest is 0.

Implementation of the Program

The training program, which includes management of fever, was performed in three 60-minute sessions. The training schedule, duration, and contents are listed below (Table 1). The training program was conducted by researchers. Program content is based on American Academy of Pediatrics, The Italian Society of Pediatrics, international healthcare institute's current guidelines, evidence studies on fever management in children, and expert opinion (Chiappini, 2017; NICE, 2013). The opinions of two pediatricians and four pediatric nursing professors were obtained regarding the content.

Ethical considerations

In order to perform the study, institutional approval (dated 14.09.2016, No. 19396244-302-01-06-1912) was obtained from the Office of the Dean of Faculty of Nursing, XXX University. After the approval of the Dean's Office, written approval (dated 03.11.2016, No. 2016 / 28-16) was obtained from the of Non-Invasive Researchs Ethic Committee of Dokuz Eylul University. Written and verbal consents of the participating students were obtained upon explaining the objective of the research.

Data analysis

In the analysis of the data, the percentile and mean for descriptive statistics, the coverage validity index for compatibility analysis of expert opinions, the Shapiro-Wilk normality test for the normal distribution of the data, the t-test for the comparison of the knowledge of fever score averages of the intervention and control group, Mann- Whitney U test, regression analysis, power and effect size were used (Akgül, 2003; Gözün & Aksayan, 2003; Özdamar, 2005; Şencan, 2005; Şimşek, 2007). The significant level was accepted to be .05.

Results

The mean age of the students in the intervention group was 21.71 ± 1.67 and 86.4% (n = 51) were female, whereas the mean age of the students in the control group was 21.82 ± 0.97 and 80.4% (n = 41) were female. It was found that 1.7% (n = 1) of the students in the intervention group and 2% (n = 1) of the students in the control group have been working in a health facility other than the school. It was found that 80.1% (n = 41) of the students in the control group did not receive any training on fever management, whereas this ratio was 83.1% (n = 49) in the intervention

group. It was found that 91.5% (n = 54) of the students in the intervention group and 76.5% (n = 39) of the students in the control group consider their knowledge on fever management in children sufficient. There was no statistically significant difference between the participants in the intervention and control groups (p> 0.05) in terms of age, gender, employment status and previous training on fever management.

Table 1. Training Program Content and Duration

Session	Content	Method
Session I 1 hour	➢ **Fever** • Generation of body temperature • Regulation of body temperature • Definition of fever • History of fever ➢ **Physiopathology of Fever** ➢ **Etiology of Fever** • Viral and bacterial diseases • Mechanical reasons • Etiology of non-disease fever ➢ Advantages and Disadvantages of Fever ➢ Measurement and Evaluation of Body Temperature • Oral-Axillary-Tympanic-Frontal-Rectal Fever Measurements and Normal Ranges ➢ Physical Evaluation and Diagnosis of Child with Fever • History • Physical Evaluation	Powerpoint presentation and student discussion with patient scenarios
Session II 1 hour	➢ Types of Fever • Continuous-Sub Febrile-Undulant-Remittent-Intermittent-Septic Fever ➢ Complications of Fever • Febrile convulsion • Dehydration ➢ Fever Phobia ➢ Incorrect Practices in Fever Management ➢ Non-Pharmacological Methods in Fever Management • Warm compress • Nutrition • Temperature of the Environment • Child's Clothing	Powerpoint presentation and student discussion with patient scenarios
Session III 1 hour	➢ Pharmacological Methods • Paracetamol • Ibuprofen • Metamizole Sodium • Ketoprofen • Paracetamol + phenobarbital • Acetylsalicylic acid • Pharmacokinetic-dynamic effects of drugs • Adverse effects of drugs	Powerpoint presentation and student discussion with patient scenarios

Table 2. Comparison of the Knowledge Scores of the Intervention and Control Groups

Group	Pre-test score	Post- test Score	Difference	t	p
Intervention	39.05±5.07	46.56±5.94	7.51±5.93	**9.713**	**0.000**
Control	44.31±7.08	44.78±5.79	0.47±6.42	**0.523**	**0.603**
t/U	**4.521**	**1.579**	**635.00**		
p	**0.000**	**0.117**	**0.000**		

Table 3. Correlation between the study variables

Variables	1	2
1. Intervention (training)	1.000	
2. Pre-test post-test Difference score	0.501*	1.000

* significant at p <0.01

Table 4. Regression Analysis of Variables

Variable	Level of Fever Management Knowledge				
	B	**SH**	β	**t**	**p**
Intervention*	7.038	1.179	0.498	5.970	0.000
r	0.498				
r^2	0.248				
F	35.643				
p	0.000				
DW (1.5-2.5)	1.942				

* When the intervention program was encoded, the intervention group was encoded as "1" and the control group as "0".

The mean pre-test total score of the intervention group was 39.05 ± 5.07, while the mean post test score was 46.56 ± 5.94. The difference between the mean pre-test and post-test scores of the intervention group was 7.51 ± 5.93. A statistically significant difference was found between the pre-test total score and the post-test total score of the intervention group (t = 9.713, p = 0.000).

The difference between the pre-test and post-test score of the intervention group was 7.51 ± 5.93 while the difference between the pre-test and post-test score of the control group was 0.47 ± 6.42. A statistically significant difference was detected between the difference between the pre-test and post-test scores of the intervention and control groups (U=635.000, p=0.000).

While the mean total pre-test score of the control group was 44.31 ± 7.08, the mean post-test total score was 44.78 ± 5.79 and the mean difference between the mean total pre-test score and post-test total score of the control group was 0.47 ± 6.42. No significant difference was detected between the mean pre-test total score and post-test total score of the control group (t = 0.523; p = 0.603) (Table 2). There was a significant, moderate, positive correlation between the training program and the level of increase in the knowledge of fever (p <0.01). (Table 3)

The training program explains 24.8% of the increase in fever knowledge level (r^2= 0.248), and training increases the level of fever knowledge 0.498-fold (β = 0.498) (Table 4).

The power of the study was found to be 0.99 and the effect size was 0.12.

Discussion

When the pre-test scores of the students were compared, it was found that the pre-test knowledge score of the control group was significantly higher than the intervention group (p<0.05, Table 2). It was thought that the high pre-test score of the control group can be due to the students' interest in the subject. This is because the control and intervention groups received the similar training in similar periods, and they had similar characteristics. On the other hand, no significant difference was detected between the post-test scores of the students (p > 0.05, Table 2). The reason behind this can be that the pre-test score of the control group is higher than the intervention group and the post test score of the control group is slightly higher than the intervention group. To evaluate the efficiency of the intervention, it is recommended that post test-pretest score differences of both groups should be obtained, and analysis should be performed. In this study, while the difference between the post test-pretest score of the intervention group was 7.51 ± 5.93, the difference between the post test-pretest score of the control group was 0.47 ± 6.42 (Table 2). A statistically significant difference was detected between the difference between the post test-pretest scores of the intervention group and the control group (p<.001). This result suggests that a significant increase in students' knowledge level was achieved with the training. There are only a limited number of studies on fever management in the literature (Kim et al., 2014; Kim & Choi, 2011; Kang et al., 2016). The study by Kim et al. (2014), which was performed on147 nursing students, evaluates the efficiency of simulation-based fever management training on children with febrile convulsion, and reports that the simulation-based training is effective in improving the fever management knowledge and skills of the students. In the studies by Kim and Choi (2011), which were performed on nursing students and were on Simbaby- and scenario-based fever management in emergency departments, it was found that the training is efficient in terms of improving the knowledge and skills of nursing students and providing more quality care to children and parents. In the study by Kang et al. (2016) in which the effect of team-based simulation training on the competence of 74 nursing students in different fields of nursing was evaluated, fever management was discussed as a specific subject and it was found that this training model significantly increases the knowledge level of nursing students on fever management.

It can be seen that the findings of this study are similar to the findings of the limited number of studies on nursing students in the literature (Kim et al., 2014; Kim & Choi, 2011; Kang et al. 2016). It is thought that the efficiency of the training increases particularly because the training comprises information in the clinical field that the students need, emphasizes incorrect practices, holds sample discussions with real cases from the clinic, makes students use critical thinking and problem-solving skills in these real cases, and the students find the opportunity to implement the knowledge since the training is

provided at the time when the student goes to practice. However, when the general knowledge level of the students was evaluated, it was found that the level of fever management knowledge was moderate in both the intervention and the control groups, and despite their training, the post test result of the intervention group revealed that they still haven't achieved the desired level of knowledge (Table 2). The reason behind this can be that almost all of the students in the intervention group, in particular, considered their knowledge on fever management adequate even before the training, thought that the training was redundant, and believed that fever is a normal symptom and the nurses can perform fever management easily with their existing knowledge. The number of studies in the literature are limited not only on the students but also on the nurses working at pediatric clinics (Sökün, 2017; Celasin Şen, 2008; Baş Gürarslan, 2016; Considine et al., 2007; Walsh et al., 2006; Walsh et al., 2005). In the studies, it is seen that the training provided to the nurses increased their knowledge level and increased positive attitude and correct practices (Sökün, 2017; Celasin Şen, 2008; Baş Gürarslan, 2016; Considine et al., 2007; Walsh et al., 2006; Walsh et al., 2005).

In this study, a significant, moderate, positive, advanced level correlation was detected between the level of fever knowledge and the training provided ($p<0.01$, Table 3). Training program explains 24.8% of the change in the level of fever knowledge (Table 4). The results of this study show that the training provided changed the level of fever knowledge, and one-fourth of the change in the level of knowledge of students is due to the effect of this training. There is a limited number of studies in the literature on nursing students (Kim et al., 2014; Kim & Choi, 2011; Kang et al., 2016). In these studies, it is emphasized that the training provided cause a change in students' level of knowledge, but how much of this change is caused by the training is not reported. Therefore, the results of this study could not be discussed based on the literature (Kim et al., 2014; Kim & Choi, 2011; Kang et al., 2016). It is seen that the training is responsible for the one-fourth of the change in the level of fever knowledge of the students. Students in the intervention group continue their undergraduate studies while receiving training on fever management and their training on the subject continues both in theoretical classes and clinical practices, and these can also be effective on the changes in the level of fever knowledge.

The power shows the statistical significance of the study while effect size gives information about practice/clinical significance (Cohen, 1988; Cohen, 1992). In this study, power and effect size were calculated based on the regression analysis and the study is considered powerful. Cohen (1988) classifies the effect sizes as small if (f^2) $0.02 \geq f^2 < 0.15$, moderate if $0.15 \geq f^2 < 0.35$, and large if $0.35 \geq f$. In this study, based on these values, it can be seen that the effect size of the study is small. These two results suggest that performing the study is significant, but the training was limited to increasing the knowledge of students. Thus, the reasons behind the small effect size of the training could be the short duration of the training, limited number of scenarios, that the students do not see sufficient number of patients with fever and the duration of the practice is short, and the failure to establish a program in which a continuous, computer-based distance education can be provided where the student can reach information from anywhere, anytime.

Conclusion

Training on fever management created a change in the knowledge level of students, and the training had a strong but small effect size. In order to evaluate the results more clearly, in the future studies, in addition to the training, clinical evaluation should be performed, long-term follow-up should be performed, training techniques such as approaches including small groups and scenario-based web applications and live class practices should be added to the intervention program in order to increase the efficiency, and special training on pediatric fever management should be added to the nursing curriculum.

References

Avner, J. R. (2009). Acute fever. Pediatrics in Review. 30: 5–13

Arikan, Z., Teksam, O., Kara, A., & Kale, G. (2012). Determining causes and frequency of misdosing of antipyretics in patients presenting with fever to the pediatric emergency department. *Turkish Pediatrics Archive*. *47*(2): 116-121.

Celasin Şen N., Ergin D., & Atman, Ü. (2008) Yüksek ateş şikayeti ile hastaneye yatırılan 0-6 yaş grubu çocukları olan annelerin yüksek ateşe ilişkin bilgi ve tutumları. Fırat Üniversitesi Sağlık Bilimleri Dergisi. 22(6): 315-322.

Crocetti, M., Moghbeli, N., & Serwint, J. (2001). Fever phobia revisited: have parental misconceptions about fever changed in 20 years? Pediatrics. 107: 1241–1246.

Considine J., Brennan D. (2006) Emergency nurses' opinions regarding paediatric fever: The effect of an evidence–based education program. Australasian Emergency Nursing Journal, 9, 101–111.

Considine, J., & Brennan, D. (2007). Effect of an Evidence-Based Paediatric Fever Education Program on Emergency Nurses' Knowledge. Accident and Emergency Nursing. 15(1): 10-19.

Chiappini, E., Principi, N., Longhi, R., Tovo, P.-A., Becherucci, P., Bonsignori, F., et al. (2009). Management of fever in children: summary of the Italian pediatric society guidelines. *Clinical Therapeutics. 31*(8): 1826-1843.

Chiappini, E., Venturini, E., Principi, N., Longhi, R., Tovo, P.-A., Becherucci, P., etal. (2012). Update of the 2009 Italian pediatric society guidelines about management of fever in children. *Clinical Therapeutic. 34*(7): 1648-1653.

Chiappini, E., Venturini, E., Remaschi, G., Principi, N., Longhi, R., Tovo, P. A., ... & Galli, L. (2017). 2016 Update of the Italian Pediatric Society Guidelines for Management of Fever in Children. *The Journal of Pediatrics. 180*: 177-183.

Col Araz, N., (2013). Ailelerin Ateşli Çocuğa Yaklaşımı: Bilgi, Tutum ve Uygulamaları. Türkiye Çocuk Hastalıkları Dergisi. 7(1): 27-32.

Durmaz Edeer, A., & Sarıkaya, A. (2015). Hemşirelik Eğitiminde Simülasyon Kullanımı ve Simülasyon Tipleri. KUHEAD. 12 (2): 121-125

Esenay, F.I., İşler, A., Kurugöl. Z., Conk, Z., & Koturoğlu, G. (2007). Annelerin ateşli çocuğa yaklaşımı ve ateş korkusu. Türk Pediatri Arşivi. 42 (2): 57-60.

Greensmith, L. (2013). Nurses' knowledge of and attitudes towards fever and fever management in one Irish children's hospital. Journal of Child Health Care. 17(3):305-316

Gordon, M. (2014). *Manual of nursing diagnosis*. Jones & Bartlett Publishers.

Göriş, S., Bilgi N., & Korkut Bayındır, S. (2014). Hemşirelik Eğitiminde Simülasyon Kullanımı (Use of Simulation in Nursing Education) . Düzce Sağlık Bilimleri Enstitüsü Dergisi. 4(2): 25-29.

Kim, S. J., Oh, J., Kang, K. A., & Kim, S. (2014). Development and evaluation of simulation-based fever management module for children with febrile convulsion. *Nurse education today. 34*(6): 1005-1011.

Kim, H. R., & Choi, E. J. (2011). Development of a scenario and evaluation for SimBaby simulation learning of care for children with fever in emergency units. *The Journal of the Korea Contents Association*. *11*(6): 279-288.

Kang, K. A., Kim, S. J., Oh, J., Kim, S., & Lee, M. N. (2016). Effectiveness of simulation with team□based learning in newborn nursing care. *Nursing & health sciences. 18*(2): 262-269.

Khan Tran, T. L. (2014). Fever management in children: Vietnamese parents' and paediatric nurses' knowledge, beliefs and practices. PhD thesis, Queensland University of Technology.

May, A., & Bauchner, H. (1992). Fever phobia: The pediatrician's contribution. Pediatrics. 90: 851–854.

National Institute for Health and Care Excellence (NICE). 2013 Fever in under 5s:assessment and initial management. https://www.nice.org.uk/guidance/cg160.

Özkan, H., & Öztürk, S. (2013). Doğu Anadolu bölgesinde bir kent merkezinde iki aile sağlığı merkezine başvuran annelerin çocukları ateşlendiğinde yaptığı uygulamalar. İzmir Dr. Behçet Uz Çocuk Hastalıkları Dergisi. 3(2): 121-126

Pul, S. (2006) Çocuk sağlığı ve hastalıkları kliniğinde çalışan hemşirelerin ateş ve ateş yönetimi hakkındaki bilgi düzeyleri, yaklaşımları ve etkileyen faktörlerin araştırılması. Afyonkarahisar Kocatepe Üniversitesi Sağlık Bilimleri Enstitüsü Yüksek Lisans Tezi.İstanbul.

Rosti, L. (2002). Fever Phobia. Pediatrics. 109: 555-6.

Yalnızoğlu Çaka, S., Çınar , S., & Altınkaynak, S. (2015). Ateşli Çocuğa Yaklaşım. J hum rhytm . 1(4): 133-138

Walsh, A. M., Edwards, H. E., Courtney, M. D., Wilson, J. E., & Monaghan, S. J. (2005). Fever management: pediatric nurses' knowledge, attitudes and influencing factors. Journal of Advanced Nursing. 49: 453–464.