



Comparison of the Effects of Drawing Pictures and Inflating Balloons on Anxiety and Pain Caused by Diphtheria-Pertussis-Tetanus Immunization in School-Aged Children

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Abstract

Background: Frequent experience of pain and anxiety can cause neuro-developmental disorders, reduced learning ability, and behavioral problems in children.

Objectives: For this reason, the present study aimed at comparing the effects of drawing pictures and blowing up balloons on the anxiety and pain intensity arising from diphtheria-pertussis-tetanus (DPT) immunization (triple vaccine) in school-aged children.

Methods: The present study was a quasi-experimental research conducted on children, who had been referred to Ilam clinics for DPT immunization during year 2016. 120 children, who met the inclusion criteria were enrolled in this study. They were randomly divided to three groups, namely experimental group A (drawing pictures before immunization up to its completion), experimental group B (inflating balloons before immunization up to its completion), and control group C (routine care group). The data collection instruments in this study included numeric pain rating scale, behavioral scale of pain responses (for the assessment of the child's pain), Pieri's pictorial anxiety scale, and self-rating scale of clinical phobias (for the assessment of the child's anxiety). The SPSS version 16 (IBM Corp., Armonk, N.Y., USA) was used to analyze the data through descriptive statistics.

Results: The results showed that no statistically significant differences were observed in demographic characteristics of children under the study among the groups ($P < 0.05$). The results also showed that the practice of distraction technique via drawing pictures reduced the children's anxiety and pain caused by the vaccine. However, only anxiety decreased in the group that experienced the distraction method through inflating balloons. Additionally, the implementation of this technique did not have a statistically significant effect on the level of perceived pain in patients that inflated balloons ($P < 0.05$).

Conclusions: The implementation of these non-pharmacological and low-cost distraction techniques is suggested to be incorporated in care and treatment routines, particularly in clinical setting. It is also recommended that the personnel receive training in this field and that research be conducted to determine the willingness of health care workers to perform distraction techniques and eliminate the existing barriers.

Keywords: Triple Vaccine, Pain, Anxiety, Distraction

1. Background

One of the main objectives of public health is the prevention of diseases through vaccination (1). However, vaccination injections are among the most common invasive and painful procedures for children, and are administered many times (2). Pain is one of the most important complications associated with vaccination (3, 4).

Pain is an unpleasant sensory and mental experience that results from actual or potential tissue damage. Today, pain is considered as the fifth vital sign in clinical care (5). Pain causes increased activity of the neuroendocrine system, and leads to increased tachycardia, need of my-

ocardium to oxygen, immunosuppression, catabolism, hypercoagulability, lung problems, limited mobility, and delay in patient's discharge (6).

According to the Iranian vaccination program, a child undergoes 10 injectable vaccines up to the age of six years, which produces pain (7). Repeated experience of pain can cause neuro-developmental disorders, learning disorders, and behavioral problems in children (8). In this regard, results of related studies indicate that 25% of adults explicitly have fear due to painful experiences of previous medical practices, where 10% of these people have gone through such painful experience before the age of 10 years (9). Re-

response to pain in children is caused by factors, such as genetics, experience, and developmental characteristics. Therefore, specific life experiences that lead to certain responses in the person have a very important role (10).

According to the current standards in nursing, pain relief in patients should be given priority in healthcare; for this reason, it is highly important for nurses to pay attention to the concept and meaning of pain in patients. The identification of pain, examination method, and familiarity with different methods of pain relief and pain control are very important in the method of nursing care and achievement of preset goals (8). Health care workers sometimes need to keep the child motionless and hold him/her firmly for vaccination. This causes an unpleasant experience of injection and causes the child to show negative response to the next injection and other health care and treatment interventions (11, 12).

Another problem that commonly occurs during vaccination is anxiety arising due to the injection. Anxiety is the vague feeling of fear and response to both the internal and external stimuli that can produce behavioral, emotional, cognitive, and physical symptoms. In fact, anxiety is the most common psychological response that is followed by stress and all human beings normally experience some level of anxiety (13). Anxiety in children appears in multiple forms. Some children display anxiety through ongoing concerns about the inconvenience that may happen to themselves or their families. Some others go through general social anxiety and some show unrealistic fears (14). Anxiety and psychological tension lead to patients' physical and mental malfunctioning (15). Moreover, anxiety significantly affects children's response to treatment and its results (16). Accordingly, it is of utmost importance for nurses to pay attention to this phenomenon (15).

There are several methods, either pharmacological (17) or non-pharmacological (18), to reduce anxiety and pain. Today, the use of non-pharmacological methods of pain reduction has attracted the attention of nurses. The reasons for using non-pharmacological approaches to reduce pain include inexpensiveness, simplicity, low risk nature, no medical complications, and no need for costly equipment (5, 19). The employment of distraction techniques, such as use of toys, bubble-making devices, drawing pictures, inflating balloons, music play, handheld video games, three-dimensional glasses of virtual space, and use of various cards, for example, has been as effective as the use of pharmacological methods in controlling pain and anxiety (20-23).

Distraction techniques are divided to active and passive methods. In active methods, such as drawing pictures and inflating balloons, children are personally involved in the task, as opposed to passive methods (24). Most pre-

vious studies have been carried out on pain in breastfed infants, which is a passive distraction method. However, Robabi et al. (7) carried out a study regarding the effect of children's active distraction through inflating balloons and watching television on pediatric pain during vaccine injection. No study has compared the methods of drawing pictures and inflating balloons on children's perceived pain and anxiety.

2. Objectives

The present study aimed at comparing the effects of drawing pictures and inflating balloons on anxiety and pain caused by the injection of triple vaccines among school-aged children in Ilam.

3. Methods

The present study was a quasi-experimental research conducted during year 2016 in Ilam. School-aged children, who had been referred to clinics of Ilam for DPT immunization, constituted the statistical population of this study. According to previous studies (7, 11), 120 participants (40 subjects in each group) were enrolled in the study.

The inclusion criteria were as follows: being a school-aged child, who had been referred to clinics of Ilam, ability to communicate verbally and eating breakfast, the ability to communicate verbally, and no earlier pain during vaccination, such as severe abdominal pain. The exclusion criteria were taking part in another non-pharmacological pain control during the procedure, suffering from any acute illness with fever, respiratory disorders, or any progressive brain lesions, such as epilepsy and seizures as well as taking painkillers or sedatives during the 24 hours before the intervention. The research objectives were explained to children indirectly, because if explained to children directly, it would cause bias due to greater anxiety created in the control group.

During the days when the children referred to the clinic for vaccination, the researcher attended the clinic and allocated the patients by simple random sampling to three groups, namely experimental group A (drawing pictures), experimental group B (inflating balloons), and control group C (routine care group). Thus, the terms I1, I2, and C were written on colored cards to represent intervention A, intervention B, and control groups, and each of these cards was placed inside an envelope. The researcher then introduced himself, explained the research objectives, and asked the children to choose one of these cards. In this way, the children were allocated to one of the three groups.

The data collection instruments in this study included numeric pain rating scale, behavioral scale of pain responses (for the assessment of child pain), Pieri's pictorial anxiety scale, and self-rating scale of clinical phobias (for the assessment of child anxiety). Interviews and observations were used to measure perceived pain in children. The degree of perceived pain was evaluated as per the standard numeric pain rating scale between 0 and 10. This scale has been used in various studies and its validity and reliability have been confirmed (25). Behavioral scale of pain responses examines changes in the person's face, the status of legs, the activity method, crying, and relief potential. Participants' scores ranged from zero (lack of response in that aspect) to two (maximum response to the stimuli in children). The total scoring of this scale was as follows: a pain score from 0 to 3 represents mild pain, a score from 4 to 7 suggests moderate pain, and a score from 7 to 10 indicates severe pain. The validity and reliability of this questionnaire was approved by several studies in Iran and other countries (26-28).

Self-rating scale of clinical phobias was used to assess patients' anxiety. This questionnaire includes four domains, namely fear of medical procedures, fear of the surrounding environment, internal issues, and intrapersonal issues. The scoring methodology of this scale was from zero (no fear) and one (low fear) to two (extreme fear). Thus, the total score of the scale ranged from zero (the minimum score) to 54 (the maximum score) (29). Pieri's pictorial anxiety scale was used to determine the anxiety score. This instrument consists of seven painted faces and the subjects express their anxiety level by choosing their favored face (30).

For conducting the intervention, the children in the I1 group were encouraged to draw pictures two minutes prior to the completion of vaccination. In I2 group, the members were encouraged to inflate balloons one minute prior to the completion of vaccination. The control group received no intervention. In all three groups, the same conditions were used for vaccination, performed by a person from the clinic personnel. In this way, the injected body parts of all children referred to the clinic, were disinfected by cotton soaked in alcohol before injection. The vaccination was administered intramuscularly in the deltoid muscle with a two-milliliter syringe at a rate of 0.05 cubic centimeters. Aspiration was not performed for vaccination and the injection took from two to three seconds and, then, the needle was drawn (7).

Ethical considerations in this study included obtaining an informed consent from the parents and children for participation in the research, detailed explanation of the intervention procedure, imposition of no costs on children, observance of Helsinki declaration and Belmont

report, and providing the parents with the researcher's phone number for asking questions related to possible problems. In addition, the parents and children were assured that participation or lack of participation in the intervention would not have any impact on the process of child vaccination.

The research data were analyzed using SPSS 16 through descriptive indexes (mean and standard deviation) and one-way analysis of variance (ANOVA) to assess the mean difference between the groups.

4. Results

The number of patients that performed each tasks was as follows: drawing pictures, 16 (40) males and 24 (60) females, inflating balloons 17 (42.5) males and 23 (57.5) females, the control group 19 (4.5) males and 21 (52.5) females ($P = 0.79$). The mean age and standard deviation ($M (SD)$) for the groups was as follows: drawing pictures 6.17 (0.44) years, inflating balloons 6.32 (0.57), and control group 6.45 (0.63) years ($P = 0.11$). The findings of this study showed that there were no significant differences in demographic characteristics of children in groups A (drawing), B (inflating a balloon), and C (control group), which corresponds to routine care ($P > 0.05$).

According to the results of analysis of variance in perceived pain, the pain of the group that did painting was less than the balloon inflating and the control groups ($P < 0.05$). Tukey's test results also showed that the difference in the amount of severity of anxiety in the balloon group and in the control group was not statistically significant ($P > 0.05$) (Table 1).

Analysis of variance in perceived pain showed that the drawing group perceived less pain than the inflating balloon group and the control group ($P < 0.05$). The post-hoc test showed the amount of perceived pain in the experimental group A (drawing) and the experimental group B (inflating balloons). No significant difference was observed between the two techniques in reducing anxiety in children ($P > 0.05$). However, the differences in anxiety between each experimental group and the control group was statistically significant ($P < 0.05$) (Table 2).

5. Discussion

The results showed that drawing pictures was a more effective distraction technique than inflating balloons and had an impact on both perception of pain and anxiety. Robabi et al. (7) conducted a study regarding the impact of children's active distraction on pain during vaccine injection and compared the effects of distraction via inflating

Table 1. Comparison of the Intensity of Perceived Pain Caused by Vaccination in the Test Group and the Control Group

Score Range of Kind of Tool	Drawing Pictures	Inflating Balloons	Control
Questionnaire, No. (%)			
Mild pain (0 - 3)	33 (82.5)	15 (37.5)	12 (30)
Moderate pain (0 - 3)	7 (17.5)	22 (50)	17 (42.5)
Severe pain (0 - 3)	0 (0)	3 (5)	11 (27.5)
Numeric rating, mean \pm SD			
Score pain (1-10)	2.92 \pm 1.65	4.50 \pm 1.60	4.85 \pm 1.33

Table 2. Comparison of the Anxiety Caused by the Vaccine in the Test Group and the Control Group (Mean \pm SD)

Kind of Tool	Drawing Pictures	Inflating Balloons	Control
Questionnaire	13.32 \pm 8.91	15.85 \pm 8.73	42.90 \pm 10.07
Numeric rating	2.10 \pm 0.59	3.52 \pm 0.71	5.97 \pm 1.19

balloons and watching TV. The results showed that there was a lower pain severity in children taking the distraction technique of watching cartoons after vaccination than the other two groups (inflating balloons and control groups). In the same way, there was a lower severity of pain in the group treated with the distraction method of inflating balloons than the control group (7). Sadeghi et al. investigated the effect of inflating balloons on venous opening pain in children. Their results showed that this method reduced pain in the experimental group. This is not consistent with the findings of the present study regarding the ineffectiveness of inflating balloons in vaccination pain of children (31). This difference between the research findings can be accounted for by the diversity of time periods, demographic characteristics, and cultural conditions of the children under study. These factors seem to have affected the degree of perceived pain.

Several studies have been conducted on the effect of non-pharmacological techniques, such as distraction methods on the decrease of perceived pain in children and infants. However, the present researchers did not find any study that has examined the effect of drawing pictures on the severity of perceived pain. For this reason, similar studies regarding the effect of distraction techniques on pain reduction have been reported here. The study conducted by Sadeghi et al. aimed at determining the effect of distraction on behavioral pain responses during venous opening in four- to seven-year-old children. Their findings showed that the distraction technique of pressing a soft small ball has had a statistically significant reduction of perceived pain in children (5). Mahdipour et al. conducted a study to evaluate the effect of distraction methods on venipuncture pain in children with strabismus, and the findings suggested that the use of distraction methods (bubble-

making and distraction) would lead to reduced severity of pain in children (32). The study by Talwar et al. aimed at determining the impact of noise-and-light-producing toys, as a distraction technique, on vaccination-based pain wherein significant pain reduction was observed (33). This finding is consistent with that of the present study regarding the positive effect of distraction technique of drawing pictures on pain reduction in children.

In terms of the effect of distraction techniques of drawing pictures and inflating balloons on anxiety in children, the results of the present study showed that the implementation of both techniques has had a positive impact on anxiety in children undergoing vaccination. Indeed, the use of these techniques has led to reduction of anxiety caused by vaccination in children in comparison with the control group. Bagherian et al. evaluated the effect of distraction technique of bubble-making on anxiety caused by injection practices in school-aged children with thalassemia. The findings showed that the distraction technique of bubble-making has led to a decrease in anxiety in school-aged children during the injection procedure (23), which is consistent with the results of the present study. Sinha et al. showed that there was a statistically significant difference before and after distraction regarding anxiety in children while undergoing suturing (34). Sheikhzakaryae et al. investigated the effect of drawing pictures on anxiety in children hospitalized with cancer (35) and Shirabadi et al. assessed the influence drawing pictures on anxiety of children with stuttering problems (36). The findings of these two studies showed that drawing pictures reduces anxiety in children, which is consistent with the results of this study.

One of the limitations of this study was individual differences between children in terms of tolerance threshold

of pain and anxiety, which may have affected the results. Amongst the other limitations of this study, it is possible to refer to pain assessment by the researcher's observation; however, all the observations were made by the same researcher to reduce this limitation. On the other hand, the assessment of children's anxiety and pain through questionnaire (self-report) and checklist (observation) is one of the strengths of this study since previous research has not taken such approach.

5.1. Conclusions

The results showed that the implementation of drawing pictures has had a significant effect on the reduction of pain severity, and the implementation of inflating balloons has had a significant impact on anxiety reduction in children during vaccination. For this reason, it is recommended to incorporate a distraction technique, as a low-cost non-pharmacological technique, in care and treatment domain, especially in clinics. It is also recommended that necessary training should be provided to the personnel in this field, and that further research should be undertaken in this area to determine the willingness of health care workers to perform distraction techniques and eliminate existing barriers.

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