



## The Effect of Giving A Vibrator with A Cooler on Pain Level in Childhood with Venipuncture in Tidore Kepulauan Hospital

Fadila Abdullah, Nursanti Anwar

Ternate Health Polytechnic Department of Nursing, Ternate Indonesia

### Abstract

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**Author Affiliation:**

Ternate Health Polytechnic  
Department of Nursing,  
Ternate Indonesia

**Author Correspondence:**

Fadila Abdullah  
Cempaka Street, West Tanah Tinggi,  
South Ternate, Ternate,  
North Maluku 97711,  
Indonesia

**E-mail:**

fadilashafiq@gmail.com

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**Background :** A traumatic care is therapeutic care that is carried out as part of an intervention to remove or suppress psychological or physical stress suffered by a child. The act of minimizing pain, stress and trauma to children when given at the time of blood collection is part of the principle of atraumatic care. One of the atraumatic actions that can be performed on children is the use of a vibrator with a cooler to minimize pain when stabbing a vein. The aims of this study was to determine the effectiveness of giving a vibrator accompanied by a cold compress against pain in children when taking venous blood.

**Methods :** The design of this research is true experimental with a post-test only control group design. Researchers divided into 2 groups, namely the intervention and control groups were taken randomly. Then the researcher made a vibrator with a cooler that had been previously tested on 30 adults, then after being declared to have passed the ethical study it would be applied to children when taking venous blood, assessing children's pain using the FLACC instrument (face, legs, activity, cry and controllability). The study was conducted at the Tidore Islands Hospital. Data processing was carried out previously by testing the homogeneity and normality test, if normally distributed it will use the independent t-test to assess the difference in the average of the two groups, while if it is not normally distributed it will be tested with Mann-Whitney.

**Results :** The results of this study indicate that the characteristics of respondents according to age are mostly 4 years old. In the control group the average age of children is 3.87 while in the intervention group the average age of children is 3.93. Most of the experience of having blood drawn in both groups had blood drawn before. Based on gender characteristics, most of the control and intervention groups were women. There are differences in pain scores in the control and intervention groups. The mean pain score in the intervention group was 3.13 and the mean pain score in the control group was 7.87. The results of statistical tests using Mann Whitney showed that there was a significant difference in pain during venipuncture in the intervention group and the control group ( $p=0.013$ ).

**Conclusion :** The results of the statistical test show that there was a significant difference in pain in the intervention group and the control group ( $p=0.013$ ). The use of a cooling vibrator can be an alternative to reduce pain in children during venipuncture.

**Keywords :** Atraumatic care, pain, children, cooling vibrator. Venipuncture

## INTRODUCTION

A healthcare facility or hospitalization is an environment that is foreign to both children and their parents, a condition which can lead to feelings of anxiety, fear, helplessness, anger and loss of control. Treatment procedures performed in hospitals are generally considered a threat to children. Efforts can be made to prevent and reduce the physical stress experienced by children and families, and nurses and other health workers recommend an atraumatic treatment approach.<sup>1</sup>

The condition of the disease that causes the child to require various diagnostic procedures, treatment and hospitalization. One procedure that is often performed is venipuncture (drawing venous blood). Pain is a common experience and serves as an important sign that the body is damaged.<sup>2</sup> Several studies show that the pain experienced by children when taking blood is sometimes ignored so that the treatment given becomes inadequate. Children who are admitted to the hospital often undergo various invasive procedures that need to be carried out. Venous puncture is an invasive procedure that is often carried out by nurses or laboratory personnel in hospitals, where this action is carried out by inserting a needle into a child's blood vessel which can cause pain.<sup>3</sup>

A punctured venous blood examination is the second source of pain most felt by children after their illness.<sup>4</sup> Inappropriate pain management can have a major impact on a child's life. Pain can cause difficulty sleeping, reduce the child's interest in activities, and increase anxiety. Failure to reduce pain can result in helplessness and hopelessness.<sup>3</sup>

To reduce pain, pharmacological therapy can be done, namely using drugs and non-pharmacological therapy without using drugs such as relaxation, hypnosis, guided imagery, massage, music therapy, warm compresses and cold compresses.<sup>5</sup> Giving cold compress therapy is a suitable therapy given before a venous puncture examination is carried out. The cold effect caused can cause numbness before pain occurs. Cold compress therapy can provide a local anaesthetic effect on puncture wounds during infusion.<sup>6</sup> Cold compresses using ice can slow the conduction of peripheral nerve fibres and reduce the release of inflammatory mediators and nociceptors, causing a faster skin anaesthetic effect.<sup>7</sup> The act of reducing pain, trauma and feelings of pressure in children when taking blood is part of the principles of atraumatic care.

The principle of atraumatic care can be applied both pharmacologically and non-pharmacologically. Pharmacological techniques can be done in various ways, including the use of EMLA cream, lidocaine and L.M.X.4. Management of pain relief non-pharmacologically when taking blood includes various physical and cognitive-behavioural pain management strategies. Various non-pharmacological physical intervention efforts include

distraction, massage, hot and cold compresses, acupressure techniques, and contralateral stimulation.<sup>8</sup>

Non-pharmacological methods to reduce pain during blood collection procedures have been proven to be effective and efficient to be applied to pediatric patients.<sup>9</sup> Distraction is the most frequently performed action, however, the use of cold compresses and vibrators has been studied to reduce pain in children. The action of cold compresses provides a cold sensation and reduces pain by inhibiting conduction and nerve impulses, which results in numbness, increases the pain threshold and causes an anaesthetic effect.<sup>10</sup> Research conducted by<sup>11</sup> concluded that the use of ice cubes was significantly more effective in reducing pain than the use of vapour coolant spray when conducting a skin test as an injection drug. Another study conducted by<sup>10</sup> found that the use of a cooling vibrator was more effective in reducing pain than the standard procedure when performing venipuncture in children aged 4-18 years. Different things were expressed by<sup>12</sup> who researched 47 children aged 4-17 years, the results of the study found that there was no significant difference between the combination of using cold compresses and vibrations with the control group using standard procedures. Younger children have different cognitive development from older children, this will affect the ability to tolerate pain.<sup>13</sup>

Research on the use of cold compresses and vibrators is effective in reducing pain in children aged 4-18 years, but research in the early childhood group or commonly called early childhood (1-4 years) needs further studies. This is following the recommendation of<sup>12</sup> to conduct research on a more uniform age group. In addition, actions that combine various methods to reduce pain and reduce children's distress need to be taken.<sup>9</sup> Based on a preliminary study conducted at the Tidore Hospital, the action of reducing the pain of taking blood for children was only limited to involving parents, namely by holding and inviting children to talk. The act of giving cold compresses has not been carried out. So researchers are interested in conducting research on the effect of vibrators with cooling on pain in children when blood is drawn in the Tidore Islands Hospital area.

## RESEARCH METHODS

This research uses true experimental with a post-test-only control group design. Researchers divided into 2 groups, namely the intervention and control groups were taken randomly.

Group design	Treatment	Post Test
Intervention	X	I-1
Control		C-1

I-1 = Measurement of the dependent variable in the cold pack and vibration intervention group  
X = Vibration and cold compresses intervention  
C-1 = Measurement of the dependent variable in the control group

The population in this study were all children who had blood drawn at Tidore Kepulauan Hospital.

The sample in this study was selected using random allocation. Determination of the intervention group and the control group is taken randomly, the sample will be given an explanation before being included in the study.

For simple experimental research using experimental groups, a minimum of 10–20 samples each can be used. The research will use 30 child respondents and 30 adult respondents for the preliminary study. The inclusion criteria in this study were children aged 1–7 years, children who were not in a critical condition or decreased consciousness, children who did not suffer from red sickle cells, children who did not experience skin abrasions in the tool attachment area. Meanwhile, the exclusion criteria are if the parent/guardian resigns during data collection.

The place where this research was conducted was at the Tidore Kepulauan Hospital. Previously, a preliminary study would be carried out at the hospital.

The research process began in March 2022 starting with the process of assembling the tool, testing it on adults. Data collection was carried out September–November 2022. The preparation and reporting of research results was carried out in December 2022.

Research Ethics in this research conducted by considering ethical principles aimed at protecting research subjects. By paying attention to the basic principles of research ethics.<sup>14</sup> The respondent's right to autonomy includes the right to agree or refuse to participate in this study. Respondents (children and parents) received an explanation of the research procedures, benefits and risks of this study before being included in the study.

#### a. Right to justice

The principle of treating fairly relates to selecting respondents based on sample criteria. The intervention group in this study received cold compresses and vibration treatment, while the control group received interventions as usual at the Tidore Kepulauan Hospital.

#### b. The right to privacy

This research protects the privacy and dignity of the respondents, during the research, the confidentiality of the respondents is maintained. This right is fulfilled by

not telling other parties all the problems of the respondent and treating them kindly. Therefore the research data is coded, and the identity of the respondent will not be included in the intervention results report.

Researchers made a vibrator with a cooler that would be tested previously on 30 adults, then after being declared to have passed the ethical study it would be applied to children when taking venous blood.

Data collection instrument using a questionnaire containing questions related to the respondent's identity, including age, gender, previous blood sampling experience. The data collection tools used in this study included a vibrator accompanied by a cooling compress, stationery, observation sheets to assess pain and a video recorder.

Data collection method : for the control group, a vibrator accompanied by cooling was placed in the vein puncture area for approximately 30 seconds to 60 seconds. Then during the puncture, the tool is shifted 1–2 cm above the vein puncture area.

During the venous puncture, the child's pain response was observed. To support pain assessment, during the procedure, a video recording was also carried out by a data collector who was not involved in the procedure.

Data analysis used in this study are Univariate analysis Used to determine the description of age, gender, previous experience of blood collection and pain level when the child is pierced by a vein and Bivariate analysis of the research was carried out to prove the hypotheses that had been formulated. Prior to the bivariate analysis, homogeneity and normality tests were carried out first. If it is normally distributed, the independent t test is used to find out the mean difference between the two groups, while if it is not normally distributed, the Mann Whitney test is used.

## RESULTS

### Characteristics of Respondents

Table 1 shows the mean age of children who underwent venipuncture at Tidore Hospital in the control group was 3.87 years (3–5; 95% CI: 1.41–4.42), the youngest age in the control group was 3 years and the oldest age was 5 years. The mean age in the intervention group was 3.93 years (3–5; 95% CI: 1.38–4.37), the youngest age in the intervention group was 3 years and the oldest age was 5 years.

Table 2 shows that the experience of having previous blood drawn at Tidore Kepulauan Hospital mostly had blood drawn before. In the control group, 9 people had blood taken, while in the intervention group, 11 people had blood taken. Based on gender characteristics, the control group and the intervention group were mostly women (53% and 60%).

**TABLE 1**  
**Characteristics of Respondents Based on Age in Tidore Kepulauan Hospital**

Variable	Median	Min-Maks	Mean	SD	95% CI Lower-Upper
Control group Child's					
Age (Years)	4	3-5	3.87	2.78	1.41 – 4.42
Intervention Group					
Child's Age (Years)	4	3-5	3.93	2.76	1.38 – 4.37

**TABLE 2**  
**Characteristics of Respondents Based on Experience with Previous Blood and Gender**

Variable	Intervention Group		Control Group	
	n	%	n	%
Blood drawn experience				
Ever	11	73%	9	60%
Never	4	27%	6	40%
Sex				
Male	7	47%	6	40%
Female	8	53%	9	60%

**TABLE 3**  
**Distribution of Pain Scores in the Intervention Group and Control Group in Children with Venipuncture at Tidore Kepulauan Hospital**

Variable	n	Median	Min-Maks	Mean	SD	95% CI Lower-Upper
Control Group	15	8	6-10	7.87	1.15	1.15
Intervention Group	15	4	1-5	3.13	1.50	1.50

**TABLE 4**  
**Analysis of Pain Differences in the Intervention Group and Control Group at Tidore Hospital**

Group	n	Mean Rank	p value
Control Group	15	23.00	0.013
Intervention Group	15	8.00	

**Overview of Pain Levels in the Control and Intervention Groups during Venapuncture**

Data collection in this study used the FLACC instrument with 5 assessment components, namely face (facial expression), legs (leg movement), activity (activity), cry

(crying) and controllability (ability to be entertained).

Based on the results of the analysis in [Table 3](#), the control group's average pain score obtained was 7.87 (6-10; 95% CI: 7.20 - 8.52), while in the intervention group the average pain score obtained was 3.13 (1-5; 95% CI: 2.27 - 3.99).

### Analysis of Differences in Pain (Comfort) in the Control Group and the Intervention Group

The following presents the differences in pain in the intervention group and the control group in Table 4.

Based on Table 4, the Sig Value or P-Value is 0.013 < 0.05. If the p-value < the critical limit of 0.05, then there is a significant difference between the two groups or which means that H1 is accepted.

## DISCUSSION

### Overview of Pain Levels in the Intervention Group and Control Group

The results of statistical tests showed that there was a difference in the average pain score in the intervention group and the control group. The control group's average pain score obtained was 7.87 (6–10; 95% CI: 0.58–0.95), while in the intervention group the average pain score obtained was 3.13 (1–5; 95% CI: 0.75–2.38). The results of this study are in line with research conducted<sup>15</sup>, that cold compresses can relieve pain by slowing the speed of nerve conduction and inhibiting nerve impulses, causing numbness and increasing the pain threshold and can cause an anaesthetic effect. Cold therapy is widely used to reduce the process of swelling, pain, muscle spasm and the risk of cell death. Cold therapy is used in the form of ice massage, ice packs, cold bath/water immersion and vapour coolant sprays.

Assessing the level of pain can be done by looking at the response directly or indirectly. Indirect assessment includes facial expressions, crying, motor activity, and simple and complex behaviour. Assessment of physiological symptoms includes respiratory rate, heart rate, blood pressure and sweating and direct assessment using self-reporting or projection methods. This study uses the FLACC instrument which includes 5 assessment components, namely face (facial expression), legs (leg movement), activity (activity), cry (crying) and controllability (ability to be entertained). This instrument is not only able to determine pain but also can determine the comfort of the child when taking blood. Difficulty in assessing pain when the child is afraid and cries first before taking blood.

### Differences in Pain Levels in the Control Group and the Intervention Group

The results of statistical tests using Mann Whitney showed that there was a significant difference in pain in the intervention group and the control group ( $p = 0.013$ ). Cold compresses have a mechanism of pain that is transmitted from the peripheral nervous system to the central nervous system and is modulated by the gating system in the dorsal horn of the spinal cord. More

specifically, the afferent nervous system which is pain receptors (A-delta fibres carry acute pain and myelinated C fibres transmit pain slowly) is blocked by nonnoxious fast-moving (A-beta) nerves. The cold sensation stimulates C fibres and blocks the A-delta which carries pain signals so that the pain felt will be reduced.<sup>10</sup> Cold compresses and vibrations are considered effective for reducing pain in children during a venous puncture procedure.<sup>16,17</sup>

The results of this study are in line with previous research. Research conducted by I Gusti Ayu Putu Satya Laksmi stated that the pain level of children in the control group was moderate pain. Meanwhile, the level of pain in the treatment group was included in the category of mild pain. The test results show that there is an effect of cold compresses on the level of pain during infusion in school-age children.<sup>18</sup> Lingga Liwa Ati said that babies who get measles immunization will experience pain that can cause excessive anxiety and even trauma, therefore it is necessary to take atraumatic care measures such as ice packs to reduce pain so that excessive anxiety and even trauma will not arise.<sup>19</sup> The inhibition of transmission and duration of pain impulses that occur in the dorsal door are based on gate control theory so as to minimize the pain sensation formed due to needle insertion during anesthesia.<sup>20</sup>

## CONCLUSION

There are differences in pain scores in the control and intervention groups. The mean pain score in the intervention group was 3.13 and the mean pain score in the control group was 7.87.

The results of statistical tests using Mann Whitney showed that there was a significant difference in pain during venipuncture in the intervention group and the control group ( $p=0.013$ ).

Recommendation for service institutions, the results of this study are expected to provide input for nursing service providers to approach atraumatic care in taking blood in children. The treatment room is expected to be more optimal in reducing pain in children according to the child's developmental stage.

For nursing science, the results of this study are expected to be evidence-based practice in the practice of nursing children with venipuncture.

For further research, in this study, researchers only used ages 1–7 years, it is hoped that further research will pay attention to the developmental age of children more equally so that the interventions provided are more equal. Future research is expected to use a larger sample. The next research is expected to be able to develop a vibrator and cooler with a more compact form using battery resources.



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