

# Effect of Helfer Skin Tap Technique on Reducing Pain levels Among Newborn Receiving Hepatitis B - vaccine

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## Abstract

**Background:** The neonatal reactions to painful procedures are equal to but stronger than adult reactions, especially for an invasive procedure. Helfer skin tapping technique is an important intervention to be practiced by nurses and parents for effective pain management in children. **Aim:** To evaluate the effect of Helfer skin tap technique on reducing pain levels among newborns receiving the Hepatitis B- vaccine. **Research design:** Two groups post test quasi-experimental research design (control and study groups) was used in this study. **Sample:** A purposeful sample of 80 newborns was divided into two equal groups control and study group. **Setting:** The current study was conducted in the delivery unit at Minia General Hospital. **Tools:** **Part 1:** Personal characteristics of the newborn such as age/hours after birth, sex, and type of delivery. **Part II:** Neonatal Infant Pain Scale (NIPS) for assessing pain level in newborns during and immediately after administration of hepatitis B-vaccine. **Results:** There was a reduction in the total mean scores of pain level in the study group were 2.0 and 1.7 during and immediately after intramuscular injection of hepatitis B- vaccine respectively, while in control group means were 2.6 and 3.4 respectively with statistically significant differences. But no statistically significant differences between total pain level and the newborns' age, sex, and mode of delivery. **Conclusion:** The current study concluded that applying Helfer skin tapping technique is more effective for pain reduction among newborns receiving the hepatitis B -vaccine with statistically significant differences. There were no statistically significant differences between the level of pain and the newborn's demographic characteristics. **Recommendations:** Training programs on applying Helfer skin tap technique during vaccination of newborn infants should be conducted for nurses in the hospital setting as well as in immunization centers to reduce pain.

**Keywords:** Pain, Helfer tap technique, Hepatitis B- vaccine, Newborn

## Introduction

Pain is a condition that extends all over the world. The health condition due to pain can result in complications that may be short-term or long-lasting. Short-term complications include increased respiratory rate, heart rate, blood pressure, and decreased oxygen saturation. Endocrine and biochemical effects such as hypoglycemia, increased cortisol level, and decrease in insulin are among reported problems in neonates caused by pain (Zargham-Boroujeni, Elsagh & Mohammadzadeh, 2017).

The newborn's reactions to invasive procedures are the same but stronger than adult reactions, including hormonal, physiologic, metabolic, and behavioral responses to invasive procedures. Although the nervous system of the

newborn's still developing, it can transport, anticipate, respond to, and remember noxious stimuli. pain relieve measures are very beneficial for the newborn as it helps in reducing physiological changes, hormonal and metabolic stress, and the behavioral reactions accompanying painful procedures (Gardner et al., 2016)

Pancekauskaitė and Jankauskaitė (2018) cleared that infant's pain and its evaluation and treatment are difficult for the health care team. Pain-related to pediatric procedures is some times undervalued and neglected because of various misconceptions, difficulties, and beliefs in its estimation and management. It is known that infants and children can perceive pain and have long-lasting problems that persist through childhood into adulthood.

Pain due to exposure of the newborn to a painful procedure is an important issue in the last two decades. A neonate is susceptible to an approximate 7-17 procedures per day during the first 14 days of life after birth. During neonatal care, neonates are exposed to painful procedures such as intramuscular injections of Vitamin K, vaccination like Hepatitis B-vaccine, BCG, blood sampling, and venipuncture (Cruz, Fernandes & Oliveira, 2015).

The nurses use different approaches to decrease pain produced by intramuscular vaccination, such as applying pressure, tapping the skin, application of cold and heat. Helper skin taps or tapping over the skin is one of those methods that make the muscles comfortable (Kochman et al., 2017).

Helper's skin tap technique is tapping over the intramuscular part with the palmar part of the fingers 16 times before and the three counts during the procedure. Tapping the skin in the area surrounding the site of an injection activates A-beta neuron, which will obstruct the gate. Transmission of pain signals that arise from the injection site will, therefore, be hindered at the spinal cord level. Tapping near the injection site would facilitate gating for the suitable spinal neuronal (Menaka, 2018).

Negi (2019) Proved in his study that Helper Skin Tap Technique was effective than the traditional technique in giving intramuscular injection, and there is a significant reduction in the pain score during intramuscular injection with the Helper skin tap technique. This reduction in pain by this method provide more adaptation of the infants. As well as the study by Peter and Mathew (2019) about the pain level of infants receiving Helper skin tap during vaccination cleared that the infants experienced mild to moderate pain only with the Helper skin tap technique. The mean pain signifies that the average infant had only mild pain.

Nurses have a vital role in pain management in the hospital as well as in the community. The Helper skin tapping technique is an effective intervention to be practiced by nurses and parents for efficient pain management in children (Peter & Mathew, 2019).

Efficient treatment of infant pain needs the nurses to cooperate with each other, with doctors, and with the infant's parents. Nurses must efficiently develop assessments and recommendations objectively, precisely and advocate for pain relief strategies with responsible healthcare team members. Neonatal nurses must remain knowledgeable about professional criteria and clinical guidelines related to pain investigation and treatment in neonates. The nurse should also participate in ongoing pain training and new and scientific research development (Kenner, Altimier & Boykova, 2020).

### Significance of the study

About 16 thousand million injections are administered every year only in underdeveloped countries, and most of them are given for medical objectives ; 5 to 10% are given as preventive services such as immunization and family planning. Pain is the most common side-effect developed from I.M injections ,it resulted whe the sharp needle penetrate the skin ,chemical and mechanical effects are also leading factors to pain (Tomar & Kalyani, 2019).

Chronic hepatitis B-virus infection constitutes a significant burden as the coverage of the birth dose evaluated as 39% globally is still deficient World Health Organization (WHO) Position paper 2017 states that hepatitis B- vaccine (HBV) should be provided as a birth dose, preferably within 24 hours (timely birth dose) (World Health Organization, 2020).

IM injection administration with a good method helps decrease pain and suffering to achieve the greatest therapeutic effect. A nurse uses many methods to reduce the pain of IM Injection, such as skin tapping, applying pressure, heat, and cold compresses. The most effective methods are applying manual pressure and tapping the skin before injection (Neupane, Thomas, & Thakur, 2019).

Helper skin tap technique provide a less painful injection experience. It provides mechanical manipulation and distraction during intramuscular injection, decreases pain as known in gate control theory. rhythmic tapping prior to injection at the injection site keeps the

muscle comfortable and stimulates large-diameter fibers (Soliman, & Hassnein, 2016).

Nurses are the milestone for pain prevention, detection, and management in children. They stay with newborns more than any other healthcare members and have the chance to assess pain throughout their shift. When the pain is diagnosed, the nurse can plan the most appropriate interventions for newborns (Wrona, Michelle & Czarnecki, 2019).

Hopefully, the results of the current study will help reduce the suffering of newborn infants during immunization. Eventually, the present study results will provide guidance and recommendations that should be reflected in pediatric nursing education and provide evidence-based data that can develop nursing practice and research in the field of neonatal nursing and neonatal pain.

## **Aim of the study**

### **The aim of the current study was to**

Evaluate the effect of Helfer skin tap technique on reducing pain levels among newborns receiving Hepatitis B- vaccine.

### **Research hypothesis:**

**H0:** Helfer skin tap technique will not reduce pain levels among newborns receiving hepatitis B- vaccine

**H1:** Helfer skin tap technique will reduce pain levels among newborns receiving hepatitis B- vaccine.

**H2:** There will be a statistically significant difference between newborn demographic characteristics and pain level in both the study and control groups.

## **Subjects and methods**

### **Research design**

Two groups, quasi-experimental research design (control and study groups) was used in this study. A quasi-experimental research design is one type of experimental design that is the same as the true-experimental design except that there is no random allocation of the participants to groups. Quasi-experiments are

exposed to concerns regarding internal validity because the study and control group may not be comparable at baseline.

### **Sample:**

A purposeful sample of 80 newborns participated in the current study. A simple random sampling technique was used to allocate the neonates into the control and study groups. The study group, consisting of 40 newborns who received hepatitis B- vaccine using the Helfer tapping technique, and the control group consisted of 40 newborns who received hepatitis B- vaccine with routine care. Depending on the mean pain scores of the control and experimental group from a previous study (Sivapriya and Kumari, 2015), the sample size was calculated by G power software program to be 36 in each group. 4 cases were added for each group to reach 40 newborns in each group.

### **Inclusion criteria:**

1. Healthy full-term newborn with gestational age 37-40 weeks.
2. Newborns who delivered by spontaneous vaginal delivery and lower segment C. S.
3. Newborn with normal APGAR score from 7-10.

### **Exclusion criteria**

1. Preterm infant
2. Newborn's infant with central nervous system disorders or any serious illness.

### **Operational definitions**

**Neonatal Infant Pain Scale (NIPS):** Is a behavioral assessment method for preterm and term neonates who are subjected to needle puncture. NIPS scores indicate an increase in behavioral responses during the procedures and a decrease in response scores after the procedure.

**Helfer skin tap technique:** Tapping the muscle by using the palmar part of the fingers 16 times nearly 5 seconds before the insertion and counts 1, 2 and 3 while removing the needle during intramuscular injection.

**Setting:**

The current study was conducted in the delivery unit at Minia General Hospital. The hospital is one of the ministry of health hospitals that provide Hepatitis B- vaccine to the newborns.

**Data collection tool**

One tool was used in this study. The researchers developed the tools after reviewing the related literature. It included two parts:

**Part I:** Interview questionnaire sheet was used to collect personal characteristics of the newborn, which include the following three items: Age of newborn/ hours, sex, and type of delivery.

**Part II:** Neonatal Infant Pain Scale (NIPS) for assessing pain level in newborn during and immediately after administration of hepatitis B- vaccine. It included six items, the neonate's facial expression, cry quality, breathing pattern, arm and leg state, and state of arousal. The crying item is scored between 0 and 2 points, and the other parts are scored between 0 and 1 point. The total score differed between 0 and 7 points, and a higher score indicates intense pain. The scale was developed by (Lawrence et al., 1993) with reliability at 0.92 and 0.97.

**Maximum score: -7 Minimum score: -0**

Pain is classified according to severity to No pain =0, mild pain = 1-2, moderate pain= 3-5, severe pain 6-7 according to (Maj et al. 2017)

**Ethical considerations**

Written primary approval was obtained from the Research Ethics Committee of the Faculty of Nursing, Minia University. Written formal consent was obtained from the newborn's parents who participated in this study. The researcher explained the study's purpose and nature through direct personal interviews before parents participation in the study, ensuring that the data were confidential and used for the research purpose only; the study adhered to common ethical principles to participate in the research, anonymity, and privacy was present through coding the data,

and parents have the right to reject participation in the study without any justification.

**Pilot study**

To provide viability, objectivity, applicability, clarification, adequacy of the research tool, and to define potential tool issues, a pilot test was performed on 10% (8 newborns) of the total sample and included in the study.

**Tool validity**

Three experts from Minia University, pediatric nursing department evaluated the data collecting tool's content validity. Content coverage, clarity, relevance, application, language, length, structure, and overall look were evaluated.

**Data collection procedure:**

Written formal consent was taken from parents after full explanation of the study's nature and purpose, the parents were informed about the right to refuse participation in the study. The researchers conduct a direct personal interview with parents after that gathered demographic data of newborns from the medical sheet. The study sample includes 80 full-term newborns divided into two equal groups, the study group and the control group who received hepatitis -B vaccine. The data collection procedure was done at the period of two months, from the beginning of February to the end of April 2021.

**For the study group,** the infant was placed in a supine position, the nurse fills the syringe with the vaccine from a vial and select the site of injection, which is the right vastus lateralis muscle, disinfect the skin by using a swab of alcohol then make a large V with the thumb and index finger of the non-dominant hand while applying Helfer skin tapping technique, the researcher does this technique through tapping over the intramuscular injection site with the palmar aspect of fingers 16 times before administration during the intramuscular vaccination and continue the tapping till needle was removed, then the researchers assess pain level during and immediately after intramuscular vaccination using full video record, and used neonatal infant pain scale to evaluate the level of pain

during and immediately after injection of vaccine. The syringe used for vaccination was BD Solo shot 0.5 ml auto-disable with 23 needle gauges and 25mm in length.

**For the control group,** the nurse place the newborn in a supine position, fill the syringe with the vaccine from a vial ,then the nurse selects the injection site, disinfect the skin by using a swab of alcohol, by using the dominant hand, make a large V with the thumb and index finger of the non-dominant hand and then insert the needle at a 90 degrees angle into the muscle. After that,she inject the medication slowly into the muscle, remove the needle, press the area gently, wash hands and discard the needle carefully in a puncture-proof container.

### **Statistical Analysis**

Data entry was done using a compatible personal computer. And the content of each tool was analyzed, categorized, and then coded. After collected data, it was revised, coded, and fed to statistical software (SPSS) IBM 25. All statistical analysis was performed using two-tailed tests and an alpha error of 0.05. P-value less than or equal to 0.05 is considered to be significant. Chi-square and percent to describe the scale and categorical data, respectively and fisher test was used for qualitative data and responses less than five. The presented graphs were developed using Microsoft Excel software

### **Results**

It was evident from table (1); 65% and 57.5% of the study and control groups their age ranged from 13-24 hours after birth, respectively. It found that 67.5% and 60% of study and control groups were male, respectively, while lower segment CS bore 85% and 72.5% of study and control groups.

It was clear from figure (1) that 67.5% and 52.5 % of the newborns in the study and control groups experienced mild pain, respectively, and no one (0.0%) in the study group compared to the minority (12.5%) of the control group experienced severe pain during intramuscular injection of hepatitis B vaccine, with statistically significant differences P-value at .005. On the other hand, 77.5% of the study group compared to 35% of the control

group experienced mild pain immediately after intramuscular injection of hepatitis B vaccine with statistically significant differences *P* -value at 0.0001.

It was evident from table (2) that 50% and 55.5% of the study group versus 72.5% and 92.5% of control group respectively, experienced intense facial expression during and immediate after intramuscular injection of hepatitis B. vaccine. with statistically significant differences P-value at 0.039 and 0.001 respectively. Regarding cry item of pain scale 2.5% versus 20% of the study and control group respectively, experienced vigorous crying with statistically significant differences at P- value at 0.004 immediately after intramuscular injection of Hepatitis B. vaccine.

On the other hand, 27.5% and 22.5% of the study group compared to 52.5% and 62.5% of control group experienced flexed arms during and immediate after I.M injection of hepatitis - B vaccine with statistically significant differences p. value at 0.02 and 0.002 respectively on the other hand 77.5% and 80% of the study group compared to 52.5% and 30% of control group experienced relaxed legs during and immediate after intramuscular injection of Hepatitis B-vaccine respectively, with statistically significant differences P-value at 0.019 and 0.001, Respectively.

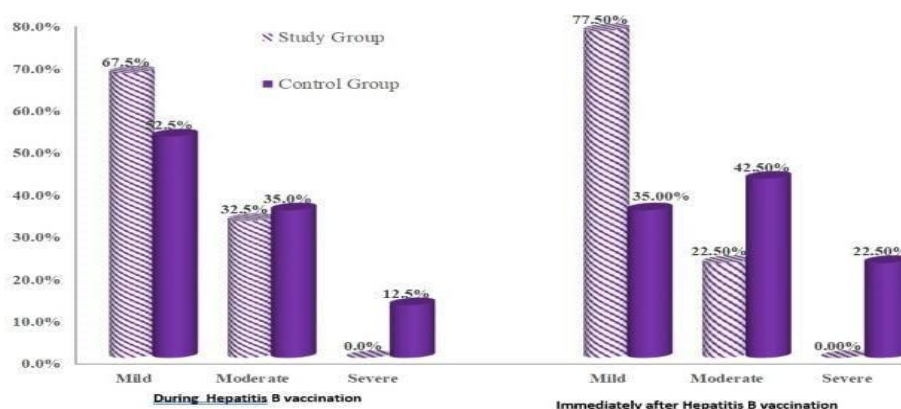
Table (3): Show that the total mean score of pain level in the study groups were 2.0 and 1.7 respectively, during and immediately after intramuscular injection of hepatitis B- vaccine, while in the control group, means were 2.6 and 3.4 respectively with statistically significant differences *P* -value at 0.02 and 0.0001 respectively.

Table (4) Cleared that there were no statistically significant differences between the level of pain and the newborn's personal characteristics such as age, sex, and type of delivery during intramuscular vaccination of Hepatitis B-vaccine.

Table (5) cleared that there were no statistically significant differences between the level of pain and the newborn's personal characteristics such as age, sex, and type of delivery during intramuscular injection of Hepatitis B vaccine.

**Table (1):** Comparison between the Study and Control Groups of Newborn as regard Personal Characteristics (n = 80)

Personal data	Study Group (n = 40)		Control Group (n = 40)		Test of significance	
	No.	%	No.	%	X <sup>2</sup>	P-value
<b>Age of newborn / hours</b>						
1 – 12	14	35.0	17	42.5	0.474	0.491
13 – 24	26	65.0	23	57.5		
<b>Sex of newborn</b>						
Male	27	67.5	24	60.0	0.487	0.485
Female	13	32.5	16	40.0		
<b>Type of delivery</b>						
Normal delivery	6	15.0	11	27.5	1.867	0.172
Lower segment CS	34	85.0	29	72.5		

**Figure 1:** Comparison between the Study and Control Groups Regarding Total Pain Level During and Immediately after Receiving Intramuscular Injection of Hepatitis B- vaccine (n = 80)**Table (2):** Comparison between the study and control groups as regard items of pain scale during and immediately after intramuscular injection of Hepatitis B vaccine (n = 80).

Items	During Intramuscular injection of Hepatitis B -vaccine				Immediate After intramuscular injection of Hepatitis B – vaccine			
	Study group (n = 40)		Control group (n = 40)		Study group (n = 40)		Control group (n = 40)	
	No.	%	No.	%	No.	%	No.	%
<b>Facial expression</b>								
Relaxed muscles	20	50.0	11	27.0	18	45.5	3	7.5
Grimace	20	50.0	29	72.5	22	55.0	37	92.5
<b>X<sup>2</sup> (P - Value)</b>	<b>4.266 (0.039) *</b>				<b>14.614 (0.001) **</b>			
<b>Cry</b>								
No cry	9	22.5	13	32.5	17	42.5	6	15.0
Whimper	31	77.5	27	67.5	22	55.0	26	65.0
Vigorous cry	0	0.0	0	0.0	1	2.5	8	20.0
<b>X<sup>2</sup> (P - Value)</b>	<b>1.003 (0.317)</b>				<b>11.039 (0.004) **</b>			
<b>Breathing pattern</b>								
Relaxed	33	82.5	31	77.5	40	100.0	38	95.0
Change in	7	17.5	9	22.5	0	0.0	2	5.0

Items	During Intramuscular injection of Hepatitis B -vaccine				Immediate After intramuscular injection of Hepatitis B – vaccine			
	Study group (n = 40)		Control group (n = 40)		Study group (n = 40)		Control group (n = 40)	
	No.	%	No.	%	No.	%	No.	%
breathing								
$X^2$ / fisher (P -Value)	0.313 (0.576)				2.051 (0.152)			
<b>Arms</b>								
Relaxed	29	72.5	19	47.5	29	72.5	15	37.5
Flexed	11	27.5	21	52.5	11	27.5	25	62.5
$X^2$ (P - Value)	<b>5.208 (0.02) *</b>				<b>9.899 (0.002) **</b>			
<b>Legs</b>								
Relaxed	31	77.5	21	52.5	32	80.0	12	30.0
Flexed	9	22.5	19	47.5	8	20.0	28	70.0
$X^2$ (P - Value)	<b>5.495(0.019) *</b>				<b>20.202 (0. 001)**</b>			
<b>State of arousal</b>								
Awake	37	92.5	40	100.0	38	95.0	40	100.0
Fussy	3	7.5	0	0.0	2	5.0	0	0.0
$X^2$ / fisher (P -Value)	3.117 (0.077)				2.51 .152)			

**Table (3):** Comparison of Total Mean Score of Pain level During and Immediately after Intramuscular Injection of Hepatitis B-Vaccine of Newborn in Study and Control groups.

Pain score	During intramuscular injection of hepatitis B- vaccine				Immediately after intramuscular injection of hepatitis B- vaccine			
	Study (n=40)		Control (n=40)		Study (n=40)		Control (n=40)	
	Mean± SD	Mean± SD	Mean± SD	Mean± SD				
Pain score	2.0 ± 1.2	2.6 ± 1.2	1.7 ± 0.8	3.4 ± 1.4				
t- test (P. value)	2.236 (0.02) *		6.514 (0.0001) **					

**Table (4):** Relation between Levels of Pain among the Study and Control Groups and Personal Characteristics during Intramuscular Injection of Hepatitis B- vaccine (n = 80).

Items	Study group				Control group					
	Mild		Moderate		Mild		Moderate		Severe	
	No	%	No	%	No.	%	No.	%	No.	%
<b>Age of newborn</b>										
• From birth -12 hrs	7	50.0	7	50.0	9	52.9	5	29.4	3	17.6
• 13-24 hrs	20	76.9	6	23.1	12	52.2	9	39.1	2	8.7
Fisher test (P-value)	3.007 (0.83)				0.965 (0.640)					
<b>Sex of newborn</b>										
• Male	19	70.4	8	29.6	14	58.3	9	37.5	1	4.2
• Female	8	61.5	5	38.5	7	43.8	5	31.3	4	25.0
Fisher test (P-value)	0.312 (0.567)				3.829 (0.147)					
<b>Type of Delivery</b>										
• Normal Delivery	5	83.3	1	16.7	8	72.7	3	27.3	0	.0
• CS	22	64.7	12	35.3	13	44.8	11	37.9	5	17.2
Fisher test (P-value)	0.807 (0.369)				2.827 (0.188)					

**Table (5): Relation between Levels of Pain Among the Study and Control Groups of Newborn and their Personal Characteristics in Immediate after Intramuscular Injection of Hepatitis B-vaccine (n = 80).**

Items	Study group				Control group					
	Mild		Moderate		Mild		Moderate		Severe	
	No	%	No	%	No.	%	No.	%	No.	%
<b>Age of newborn</b>										
• From birth -12 hrs	11	78.6	3	21.4	8	47.1	7	41.2	2	11.8
• 13-24 hrs	20	76.9	6	23.1	6	26.1	10	43.5	7	30.4
Fisher test ( <i>P</i> -value)	0.014 (0.905)				2.647(0.252)					
<b>Sex of newborn</b>										
• Male	20	74.1	7	25.9	8	33.3	10	41.7	6	25.0
• Female	11	84.6	2	15.4	6	37.4	7	43.8	3	18.8
Fisher test ( <i>P</i> -value)	0.559 (0.455)				0.299 (0.894)					
<b>Mode of Delivery</b>										
• Normal Delivery	3	50.0	3	50.0	6	54.5	4	36.4	1	9.1
• CS	28	82.4	6	17.6	8	27.6	13	44.8	8	27.6
Fisher test ( <i>P</i> -value)	3.061 (0.08)				2.732 (0.223)					

## Discussion

Every infant is exposed to obligatory vaccination in their childhood. They require enough psychological support and protection to relieve the known side effect of pain caused by vaccination. Providing pain relieve is evaluated as an important human right, and it is an important issue of the pediatric nurse (**Riddell et al.,2015**). One of the most effective methods is Helfer skin tap or tapping over the skin, which enables the muscles to be relaxed, and it is more useful to relieve the pain of intramuscular injection (**Kochman et al.,2017**).

Regarding the personal data of newborns in the current results cleared that, less than two-thirds and more than half of the study and control groups, respectively, their age ranged from 13-24 hours after birth. This finding may be due to most newborns who have been receiving hepatitis B- vaccine born outside the hospital at night and wait until the morning shift to receive the vaccine in the delivery unit of the hospital.

And also, more than two-thirds and more than half of the study and control groups were male, while the majority and more than two-thirds of the study and control groups were borne by lower segment CS.

These results were in line with **Betrán et al. (2016)** studied the increasing trend in

caesarean section rates, proved that caesarean section has the greatest issue as it is considered an important lifesaving operation for both mother and her infant, and its performance has increased over the last decade. And also, the study by **Elnakib et al. (2019)** about Medical and non-medical reasons for cesarean section delivery in Egypt, cleared that Egypt has the third-highest rates of CS worldwide, the Dominican Republic and Brazil resembling more than half of global trends, CS rates in Egypt have constantly risen to reach more than half of all deliveries according to the most recent 2014 Egypt Demographic and Health Survey (EDHS) and representing more than a 100% increase in the CS rate.

The current result contradicted with **Menaka (2018)** studied the Helfer skin tap technique and its effect on pain reduction among infants receiving intramuscular vaccination in a tertiary care setting, cleared that more than one-quarter of newborns were male in the study group while in control group less than one quarter was male.

But this result was inconsistent with **Bhattacharya and Batra (2019)** studied different non-pharmacologic techniques and its effect on the pain level of infants during vaccination, and their results proved that less than one third and two-fifth of the Helfer skin tapping group and control group, respectively, was born by lower segment CS.



And also, the result was contradicted with the study by **Bhuvanewari and Thulasiya (2018)** in their study about Helfer skin tapping techniques and its effects on pain during vaccination among the infants in a primary health center, and their study result cleared that the majority of the experimental group were borne by normal delivery and the minority borne by lower segment caesarean section.

The current study result proved that more than two-thirds and more than half of the newborns in the study and control groups experienced mild pain, respectively. No one in the study group compared to the minority of the control group experience severe pain during intramuscular vaccination of hepatitis B-vaccine, with statistically significant differences P- value at 0.05, on the other hand, more than three-quarters of the study group compared to more than one-third of the control group experienced mild pain immediately after Hepatitis B- vaccination with statistically significant differences p-value at 0.0001.

The present result was in the same line with **Maj et al. (2017)** in their study about the Helfer skin tap technique and its effect on pain during intramuscular injection among neonates born in the labor room of a selected tertiary level hospital; their study results proved that the majority of the neonates having mild pain, and the minority were having severe pain during intramuscular injection in the experimental group. In addition, the majority of neonates were having severe pain during intramuscular injection by using the routine method. This study results proved that applying the Helfer skin tapping technique is more effective on pain reduction during intramuscular vaccination of the hepatitis B. vaccine.

Similarly, **Vathani, Kumari and Pandit (2017)** in their study about the Helfer skin tap technique and its effect on pain level among the patients exposed to an intramuscular injection and the study result clear that more than two-thirds of an infant exposed to Helfer skin tap technique in the experimental group had mild pain, In the control group, two-fifth of infants had severe pain. The minority of infants had mild pain during IM injection by using the traditional method. The study also showed that

there were highly statistically significant differences at P. value < 0.001

And also, the study results were supported by the study by **Menaka (2018)**, who cleared that, during vaccination in the treatment group, two-thirds of infants experienced moderate pain. In contrast, in the control group, most infants experienced severe pain, only a minority of infants experienced moderate pain.

It was evident from table (2) that half and more than half of the study group compared to more than two thirds and vast majority of control group respectively, experienced intense facial expression during and immediate after intramuscular injection of hepatitis B. vaccine. with statistically significant differences P-value at 0.039 and 0.001 respectively. Regarding cry item of pain scale the minority versus less than one quarter of the study and control group respectively, experienced vigorous crying with statistically significant differences at P- value at 0.004 immediately after intramuscular injection of Hepatitis B-vaccine.

On the other hand, more than and less than one quarter of the study group compared to more than half of control group experienced flexed arms during and immediate after I.M injection of hepatitis-Bvaccine with statistically significant differences p. value at 0.02 and 0.002 respectively. On the other side, more than three quarters and the majority of the study group compared to more than half and more than one quarter of control group experienced relaxed legs during and immediate after intramuscular vaccination of Hepatitis B-vaccine respectively, with statistically significant differences P- value at 0.019 and 0.001, Respectively.

The current study results were supported by a study by **Maj et al. (2017)** and **Bhuvanewari and Thulasiya (2018)**. cleared that there was a statistically significant difference in the items of facial tension, cry, breathing pattern, arms and legs movements, and state of arousal during intramuscular injection of a newborn with or without Helfer skin tap technique with  $p < 0.05$ .

The study results were also consistent with **Toddio et al. (2014)**, study results proved that the pain level was decreased when any

intramuscular injection is administered by using of the Helfer tap technique and illustrated that the calming of muscles would help in reducing the injection pain ( $t=4.2$ ,  $p<0.01$ ).

The study by **Pirra et al. (2014)** about factors associated with infant pain reactions following an intramuscular vaccination cleared that infants had the greatest facial pain reactions during vaccination. Also, in the study by **Johnston Celeste and Mary Ellen (2016)** about acute pain response in infants, study results suggested that facial response may be parallel to pain indicators in infants.

Regarding the total mean scores of pain level, there was a decrease in the total mean score of pain level in the study group during and immediately after intramuscular injection of hepatitis B- vaccine, while in the control group, the total mean scores of pain level were 2.6 and 3.4 respectively, with a statistically significant difference at p-value 0.02 and 0.0001 respectively during and immediately after intramuscular injection of hepatitis B-vaccine.

The study results were consistent with the study results of **Menaka (2018) and Maj et al. (2017)**, Whose study results cleared that the total mean score of pain level in the study group compared to the control group was  $5.30 \pm 1.74$  compared to  $8.70 \pm 1.02$ . respectively, and there was a significant decrease of pain score during and after the vaccination at 1st-minute p-value was 0.001.

The current study results were consistent with the study by **Chaudhary and Vageriya (2018)** about the Helfer skin tapping and its effect on pain during vaccination among infants; their study results revealed that there was a statistically significant difference in pain intensity during vaccination among study and control group at p-value 0.001.

The current study results proved that no statistically significant differences between pain level in experimental and control groups and the newborn's personal characteristics such as age, sex, and type of delivery during and immediately after intramuscular injection of Hepatitis B-vaccine.

The present result contradicted **Sivapriya and Kumari (2015)**, who studied the Helfer

skin tap technique and its effect on pain during intramuscular administration among neonates born in the labor room of a selected tertiary level hospital. **Rose, Jose, and Mary (2013)** studied the effect the skin tap technique in pain reduction .Their study results showed a significant correlation between the sex of newborn with pain intensity of infants during intramuscular vaccination in the control group p-value at 0.01 and 0.001, respectively.

Similarly, **Bhuvanewari and Thulasiya (2018)** found statistically significant differences between the demographic variables such as infant's sex, developmental stage, type of delivery, and pain level.

On the other hand, the study results were supported by **Menaka (2018) and Peter and Mathew (2019)** cleared that no statistically significant relation between the demographic variables and pain during Intramuscular administration of the vaccine for infants receiving the vaccine Helfer skin tap technique.

## Conclusion

**The study results concluded that:**

There was a reduction in the total mean score of pain in the study group during and immediately after intramuscular injection of hepatitis B- vaccine compared to the control group with statistically significant differences p. value at 0.02 and 0.0001, respectively. There were no statistically significant differences between pain level and the newborn age, sex, and mode of delivery.

## Recommendations

1. Training programs on applying the Helfer skin tapping during vaccination of newborns, infants, and children should be conducted for nurses in the hospital setting as well as in immunization centers to reduce pain.
2. The study should be done on a large sample size
3. The study should be performed on different age groups of children
4. The study should be conducted among children undergoing various types of vaccination.

5. Helfer skin tap technique should be included in the curriculum of pediatric nursing to teach nursing students how to apply during intramuscular injection

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