

Effect of Infrared Lamp Therapy versus Warm Sitz Bath on Episiotomy Wound Healing and Pain among Puerperal Mothers

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Abstract:

Background: Episiotomy is one of the most common procedures performed during delivery. It can cause severe complications such as infection, wound dehiscence and perineal pain ...etc. Effective and high quality postpartum episiotomy care might decrease pain and improve wound healing.

The aim of this study was to compare the effect of infrared lamp therapy versus warm sitz bath on episiotomy wound healing and pain among puerperal mothers. A quasi-experimental **research design** was utilized.

Setting: The study carried out at the postpartum inpatient ward and the outpatient clinic at Damanshour National Medical institute affiliated to ministry of health/ El-Behira governorate.

Sample: A purposive sample of 80 postpartum women with episiotomy was recruited. They were divided into two equal groups (infrared group and sitz bath group). Three tools were used for data collection; a structured interview schedule, numerical pain rating scale and the standardized REEDA scale.

Results: The study revealed that episiotomy pain intensity was statistically significantly decreased among the infrared group after the intervention ($P = 0.000$). The episiotomy wound healing had improved after the application of infrared lamp therapy among the infrared group ($P = 0.000$). Meanwhile, such improvement was not observed among the sitz bath group after application of warm sitz bath.

Conclusion: The application of infrared lamp therapy has a significant effect on reducing episiotomy pain and promoting wound healing among postnatal mothers.

Recommendation: Nurses and midwives should be encourage the postnatal mothers to apply the infrared lamp therapy at the hospital as well as home to improve their episiotomy wound healing and decrease their discomfort.

Keywords: Episiotomy, infrared lamp therapy, warm sitz bath, puerperium, pain management

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I. Introduction

Giving birth is a powerful and life changing event with a lasting impact on women and their families. Following the birth of the baby and expulsion the placenta, the woman enters a period of physical and psychological recuperation, this period is called the puerperium. ⁽¹⁾ During this period a postnatal mother is going through the physiological process of uterine involution and at the same time adapting to her new role in the family. ⁽²⁾ The puerperium is a vulnerable period for women. Mothers experience some discomforts during puerperium although they are considered normal. These discomforts are after pain, perineal pain, constipation, breast engorgement, cracked nipples, fatigue, backache and headache can lead to physical discomfort, psychological distress and a poor quality of life for the mothers. ⁽³⁾

Pain during puerperium is a universal experience for postnatal mothers. It may be due to an episiotomy, a spontaneous tear or a combination of both. One of the major problems during puerperium is episiotomy wound and pain. ⁽⁴⁾ Episiotomy is one of the most common surgical procedures performed during second stage of labor. It is done to enlarge the vaginal opening to facilitate easy and safe delivery of the fetus, shortens the pushing times and thus decreases the chance of oxygen deprivation in the fetus and also it protects the fetal skull and brain from damage, minimizes overstretching, and ruptures of perineal muscles. ⁽⁵⁾ Episiotomy can be at midline or at an angle from the posterior end of the vulva, performed under local anaesthesia and it is sutured immediately after delivery. ⁽⁶⁾ Episiotomy types are mediolateral, lateral, median, and J-shaped episiotomy. Mediolateral episiotomy is the most frequent type used. Each type of episiotomy has its advantages and disadvantages. ⁽⁷⁾

Worldwide, the incidence of episiotomy was ranged from 20% to 62.5%. The occurrence of episiotomy in primiparous women is described to vary among countries. ⁽⁸⁾ In Sweden, the episiotomies rate was 9.7% compared to 100% in Taiwan, while, it was 71% in Germany and 49% in Nigeria as well as in India it was 56% of women. ^(9, 10) In Norway episiotomies rate was 22.7%, ⁽¹¹⁾ while in Guatemala it was 100%. ⁽⁹⁾ In addition, episiotomies rates in Arab countries were 51.2% in Saudi Arabia ⁽¹²⁾, 66% in Oman ⁽¹³⁾, and 91% in Jordan ⁽¹⁴⁾.

Furthermore, a study from Palestine reported that routine episiotomy is practiced in six out of eight government hospitals during delivery of primiparous women⁽¹⁵⁾. In Egypt, Benha University Hospital, Statistical Department reported that; in 2015 episiotomy rate had been 94% of vaginal births, while in 2016 it was 93% of vaginal births.⁽¹⁶⁾

Significant complications are also associated with episiotomy such as pain, edema, hematoma, infection, and ultimately dyspareunia due to the presence of tender vaginal scar or narrowing of the vagina.⁽¹⁷⁾ However, proper treatment can resolve all these complications. The prompt use of the best selected treatment for episiotomy ensures it will heal completely, in the shortest possible time, with the least amount of complications. So midwives have an important role to play in the care of perineal wounds following child birth. The maintenance of effective pain relief must be balanced with the need to promote wound healing.^(18, 19)

The discomfort of episiotomy is an added concern in the already overstressed situation. A delay in wound healing may increase the duration of perineal pain. The pain and discomfort resulting from episiotomy can interfere with basic daily activities for the woman such as sitting, walking, and passing urine, mother infant interaction, breastfeeding, reestablishment of relationship with partner even emotional recovery after birth.^(20, 21) The comfort and healing of the perineum wound site should be ascertained by the nurse –midwife, in the postnatal period, during which the continued attendance of a nurse midwife on the mother and baby is requisite.⁽¹⁸⁾

The mother undergoing episiotomy is characterized by greater blood loss in conjunction with delivery, and there is a risk of improper wound healing and increased pain during early puerperium. Healing of an episiotomy is the same as any surgical incision. Healing should occur within 2 to 3 weeks postpartum.⁽¹⁹⁾ Infection of episiotomy wound incision causes delayed wound healing and pain. Signs of infection (pain, redness, warmth, swelling, or discharge) or loss of approximation may occur. Redness of the wound may indicate the usual inflammatory response to injury. If accompanied by excessive pain or tenderness, however, it may indicate the beginning of localized infection. Ecchymosis or edema indicates soft tissue damage that can delay healing. No discharge should come from the wound. Rapid healing necessitates that the edges of the wound be closely approximated.⁽²²⁾ With proper episiotomy care, the infection can be prevented and healing takes place faster.⁽¹⁴⁾

Care of episiotomy would begin immediately after delivery and should include a combination of local wound care and pain management. The care of episiotomy is different from hospital to hospital. Many interventions are in practice to relieve pain and thus enhance the healing of episiotomy wound. Management of episiotomy wound and pain during puerperium could be pharmacological and/or non-pharmacological methods. Pharmacological methods include non-steroidal anti-inflammatory drugs, antibiotics, oral analgesics, local anaesthetics and opioids. These methods provide certain degree of wound healing and pain relief but can cause adverse effects on the mother and fetus such as; constipation, gastric irritation, passage of the drug to maternal milk, and prolonged bleeding time. Non-pharmacological methods include cleanliness, application of ice packs, and performance of Kegel's exercise, infrared lamp therapy and warm sitz bath application.^(3, 5, 23)

Perineal discomfort from episiotomy wound continues to be a problem for many post partum women. The Infrared light therapy and warm sitz bath are used to relieve perineal discomfort and to identify the sustaining effect on wound. Infrared lamp therapy is a unique form of treatment where the healing effect of the light is utilized for treating episiotomy. In this therapy, the incision site or the diseased part of the perineum is exposed to infrared radiation with a light source of 230 volts at a distance of 45- 50 cm from it, and for 10 – 15 minutes which provides relief from the discomfort. It is very simple, absolutely painless and no side effects.⁽⁵⁾ Infrared rays relax muscles, stimulate circulation, reduce the level of edema and relieve pain. A good blood circulation is essential for wound healing, prevents infection and destroying the bacteria. The use of infrared light will cause vasodilatation of the blood vessels and to increase the fluid exchange for reducing the level of edema. Sitz bath is one of the techniques that can be improved episiotomy wound healing.⁽²⁴⁾ A sitz bath is a warm water bath and it involves immersion of the perineal area/ buttocks in warm water at a temperature of 40 to 45 degree celcius for 15 to 20 minutes. It may be used for healing of the wounds and relieve pain, itching or muscle spasms. Sitz bath may be promotes wound healing by cleaning the perineum and anus, increasing circulation, reducing edema and inflammation, it also promotes muscle relaxation.⁽²⁾

Today when the cost of medical treatment and care is rising, the core objective of medical treatment is to provide cost effective care to its client. Cost effective interventions can be provided if nurse and midwives realize the relevance of their care in the episiotomy wound healing. The best way of providing care is to empower nurses and health care providers to bring change in their daily practices.⁽²²⁾ It is important that midwives recognize the need for research based practice. The midwife's responsibility is to identify the ways of preventing and reducing maternal morbidity as well as to identifying the cost effective measures in relieving pain and wound healing.⁽²⁵⁾ Nurses and midwives play a vital role in the overall management of perineal pain and wound healing after episiotomy including continuous pain assessment and wound healing evaluation,

application of interventions for episiotomy wound, instruct the women about perineal self assessment and care, and communicating relevant information about pain and healing process.⁽¹⁹⁾

Significance of the study:

In developing countries such as Egypt, episiotomy is a common procedure to facilitate vaginal delivery. Episiotomy continues to be a frequently used procedure in Obstetrics despite little scientific evidence for its routine use.⁽²⁶⁾ A current medical literature documented that 60% of women with episiotomies reported severe postpartum pain, 25% experienced infection at the site and 20% had problems with intercourse for up to 3 months after birthing. Many mothers are suffering with delayed healing of episiotomy wound during postpartum period. This delayed healing was due to wound infection.^(6,7) Infection of episiotomy wound can lead to puerperal sepsis which is one of the major causes of maternal morbidity and mortality. 11.5 % of the postnatal mothers are dying with puerperal sepsis.⁽¹⁷⁾ Hence it is evident that special care must be taken to prevent infection, hasten healing and reduce scar. The nurse should be aware of the effective treatment of episiotomy wound healing which can reduce the suffering of mothers and enhance healing. Many types of research had been done in this respect, but they have contradicting results regarding the most effective strategies in relieve episiotomy pain and enhance the wound healing.^(2,5,27) Therefore, this study conducted to compare the effect of infrared lamp therapy versus warm sitz bath on episiotomy wound healing and pain among puerperal mothers.

Aim of the study

This study was aimed to compare the effect of infrared lamp therapy versus warm sitz bath on episiotomy wound healing and pain among puerperal mothers

Research hypothesis

H0: Puerperal mothers who apply infrared lamp therapy on their episiotomy wound experience the same wound healing and pain as those who apply warm sitz bath.

H1: Puerperal mothers who apply infrared lamp therapy on their episiotomy wound experience faster wound healing and less pain than those who apply warm sitz bath.

H2: Puerperal mothers who apply warm sitz bath on their episiotomy wound experience faster wound healing and less pain than those who apply infrared lamp therapy.

II. Materials And Method

Materials

Research design: A quasi-experimental research design was utilized.

Setting: This study carried out at the postpartum inpatient ward and the outpatient clinic at Damanshour National Medical institute affiliated to ministry of health/ El-Behira governorate. This hospital provides free services for rural and urban areas in El-Behira governorate.

Sample: A purposive sample of 80 postpartum women with episiotomy was recruited. The sample size was estimated based on the Epi-Info 7 program using the following parameters:

- (1) Target population 340 per 3 months;
- (2) Expected frequency $p = 50\%$;
- (3) Acceptable error = 10%;
- (4) Confidence coefficient = 95%;
- (5) Sample size = 80.

The studied women were selected from the aforementioned settings according to the following inclusion criteria: aged 20-35 years, had normal vaginal delivery with episiotomy, during the first 2 hours after delivery, having a telephone for contact and agree to participate in the study. The women who were illiterate, had labor or postpartum complications, diabetes and anemia were excluded from the study.

The selected women were randomly assigned in a 1:1 ratio to infrared and sitz bath groups. Randomization had occurred by asking the eligible woman to select one closed envelope from a set of 80. The envelope has contained a card with the groups' allocation (infrared or sitz bath) groups.

Tools:

Three tools were used for data collection.

Tool I: A structured interview schedule:

This tool was developed by the researchers after extensive literature review. It included three parts: **the first part:** included the personal data such as age, level of education, occupation, current residence, marital status

and family income/month. **The second part:** included reproductive history as gravidity, parity, having antenatal visit and number of antenatal visits. **The third part:** included data about episiotomy such as, indications of episiotomy, and type of episiotomy.

Tool (II): Numerical Pain Rating Scale (NPRS):

It was developed by **McCaffery and Pasero (1999)**.⁽²⁸⁾ It is a standardized self-report device consisting of a horizontal line used to estimate the subjective level of pain intensity. It is a 10 points numerical scale, corresponding to the degree of pain. Where 0 indicates no pain, 1 up to 3 indicates mild pain, 4 up to 6 indicates moderate pain, 7 up to 9 indicates severe pain. Finally 10 indicate the worst unbearable pain. The postnatal women were asked to select from that 10 points numerical continuum the number that corresponds to her perceived pain intensity.

Tool III: The standardized REEDA scale:

The REEDA scale is an observational check list used for assessing perineal healing that was primarily developed by **Davidson**⁽²⁹⁾ and later reviewed by **Carey**⁽³⁰⁾. It can be used to assess all types of postpartum perineal trauma. The acronym REEDA is derived from five components that have been identified to be associated with the healing process: Redness, Edema, Ecchymosis, Discharge and Approximation of the wound edges. Each component takes a score ranged from 0 to 3 as follows: **Redness** (0=None, 1= mild "within 0.25cm of incision bilaterally", 2= moderate "within 0.5cm of incision bilaterally", and 3= severe "beyond 0.5 cm of incision bilaterally"), **Edema** (0=None, 1= mild "perineal, less than 1cm from incision", 2= moderate "perineal and/or vulvar, between 1-2cm from incision", and 3= severe "perineal and/or vulvar, greater than 2cm from incision"), **Ecchymosis** (0=None, 1= mild "within 0.25cm bilaterally or 0.5cm unilaterally", 2= moderate "between 0.25 to 1cm bilaterally or between 0.5 to 2cm unilaterally", and 3= severe "greater than 1cm bilaterally or 2cm unilaterally"), **Discharge** (0=none, 1=serous, 2=serosanguinous, and 3=bloody, purulent) and **Approximation** (0=closed, 1= mild "skin separation 3mm or less", 2= moderate "skin and subcutaneous fat separation" and 3= severe "skin and subcutaneous fat and fascial layer separation"). Total REEDA score ranges between 0 and 15. Higher score indicates poor wound healing while lower score indicates good wound healing. The total score of REEDA scale was categorized as follows: 0 to 2 – Healed, 3 to 5 – Moderately healed, 6 to 8– Mildly healed, and 9 to 15 – Not healed.

III. Methods

The study was executed according to the following steps:

1. Approvals

An official letter from the Faculty of Nursing, Damanhour University was directed to the responsible authorities to take their permission to conduct the study after explaining its purpose.

2. Tools:

Three tools were used for data collection :(as previously mentioned)

- Tool I was developed by the researchers after extensive review of recent and related literature and tested for content validity by a jury of five experts in the related field.
- Tool II (Numerical Pain Rating Scale) was adopted from McCaffery and Pasero (1999). Its reliability was assessed by a test -retest method, $r = 0.896$.
- Tool III (The standardized REEDA scale) was adopted from Davidson (1974) and its reliability checked by Alvarenga et al (2015)⁽³¹⁾ by using Karl Pearson's correlation coefficient formula, where $r = 0.9454$.

3. Pilot study:

A pilot study was carried out on 8 puerperal women, who were excluded from the study sample to test the relevance and applicability of the tools, and to estimate the time needed to complete the sheet as well as to detect any problem peculiar to the tools.

4. Procedure of data collection:

- Collection of data covers a period of 7 months from the beginning of January to end of July 2019 in the postpartum inpatient ward and the outpatient's clinic from 8 AM to 1 PM, three days per week.
- Each woman was randomly assigned to one of the (infrared or sitz bath) groups, and then interviewed for 15-20 minutes during the first two hours after delivery at the hospital stay to collect necessary data.
- Data of tool (I) was collected from both groups through an interview schedule, which was conducted individually and in total privacy, on the first two hours after delivery during hospital stay.
- Pre test was conducted for both infrared and sitz bath groups on the first 2 hours after delivery and before starting intervention. The episiotomy pain was assessed by tool II (Numerical Pain Rating Scale) the researchers provided a clear and concise explanation of the pain scale and asked the woman to circle the

number that demonstrates the level of her pain. The researchers inspect the episiotomy site for Redness, Edema, Ecchymosis, Discharge and Approximation of the wound edges using tool III (REEDA scale) within 2 hours after episiotomy repair to evaluate wound healing.

- After that the researchers provided clear and concise information through illustrative pamphlet for the both groups included the following: encouraged women to wash her hands before and after each perineal care, remove soiled pad from front to back and discard in waste container, clean the perineum by using two spoons betadine in 4 glasses of warm water. Pour the solution over the perineum without opening labia and ensuring that the solution flow is from the front to the back, dry the perineal area with dry tissue from front to back, and then discard it, apply clean perineal pad from front to back, always perform perineal care after elimination, perineal pad should be changed regularly to prevent infection at least every 4 hours.
- **Infrared group** included 40 postnatal women they were encouraged to place an infrared lamp at distance of 45 cm from the perineum and the heat produced with 230 volts for twenty minutes. But the mother is checked after the first five minutes to make sure that she was not being burned. The researchers were demonstrated for each woman how to use infrared lamp, and it was followed by re demonstrations and discussions. These procedure were carried out in the morning and evening for five consecutive days. The researcher give the infrared lamp device for each woman then restore it after completion of the study.
- **Sitz Bath group** included 40 postnatal women they were encouraged to sit in a basin (tub) of warm water (45 ° C -59 ° C) without pressure on the perineum and with the feet flat on the floor for 15 to 20 minutes. The researchers were demonstrated for each woman how to do warm sitz bath, and it was followed by re demonstrations and discussions. These procedure were carried out in the morning and evening for five consecutive days.
- At the end of the session the researchers gave each woman health education about the importance of follow-up to ensure woman compliance for the interventions they assigned to it and to assess wound healing. The researchers motivated the women to perform the interventions they assigned to it through daily telephone calls by reminding the women with its benefits and importance of follow up.
- At sixth day postpartum, women were assessed by the researchers during the follow up time at the obstetric outpatient clinic. The episiotomy pain and wound healing were evaluated for both infrared group and sitz bath group by using the same tools (Post test).

Ethical Considerations:

Each woman who met the inclusion criteria of selection was individually contracted and informed about the aim of the study in order to obtain her informed consent. Again each of those who agree to participate was assured about confidentiality, privacy and right to withdraw at any time.

Statistical analysis:

The collected data were fed to SPSS version 20 for investigation. Descriptive and analytical statistics were used such as number, percentage, mean and standard deviation. Chi-square, Fisher exact, and independent sample t-test were used to test differences between the two groups. Test results were considered significant at 0.05.

IV. Results

Table (I) shows absence of any significant differences between the infrared and sitz bath groups in their socio-demographic data. Where about three-fifths (62.5% & 57.5%) of infrared and sitz bath groups, respectively ranged between 20 to less than 25 years with the mean age 24.475 ± 4.320 & 24.725 ± 4.506 of them respectively. Around two-fifths (45% & 40%) of infrared and sitz bath groups, respectively had secondary education. about three-fifths (62.5% & 57.5%) of infrared and sitz bath groups respectively, were housewives. More than one-half (52.5% and 57.5%) of infrared and sitz bath groups respectively, were rural residents. Almost all (95%) of the infrared group and all (100%) of sitz bath group were married. about three-fifths (65% and 60%) among the infrared and sitz bath groups, respectively had just enough family income.

Table (II) demonstrates that there were no statistically significant differences between the two study groups in their reproductive history and antenatal visits. More than two-thirds (67.5% & 70%) of infrared and sitz bath groups respectively, were primigravida. About three-quarters (75% & 77.5%) of them respectively, were primipara. Also, about three-quarters (80% & 75%) of infrared and sitz bath groups respectively, had antenatal visit. Among those who had antenatal visit about three-fifths (68.75% & 60%) of them respectively had antenatal follow up more than 4 times.

Figure(1) clarifies that about three-quarters (75% & 77.5%) of infrared and sitz bath groups respectively, their indication of episiotomy were primipara, and 17.5% & 10% of the both group respectively, their indication of episiotomy were delivered large baby, the remaining 7.5% & 12.5% of them respectively, their indication of episiotomy were prematurity.

Figure (2) displays that the vast majority of infrared group (92.5%) and sitz bath group (87.5%) had mediolateral episiotomy, while only (7.5 % & 12.5 %) of them respectively had median episiotomy.

Table (III) exhibits the distribution of the study subjects according to their episiotomy pain intensity before and after the intervention. It was found that episiotomy pain intensity was statistically significantly decreased among the infrared group after the intervention ($P = 0.000$). On the other hand, it was slightly decreased among the sitz bath group after the intervention ($P = 0.432$). The difference between the two groups in this respect after the intervention was statistically highly significant ($P = 0.000$). Specifically, more than one-half (55%) of the infrared group had severe pain before the intervention, while none of them reported such pain response after the intervention. This is compared to 42.5% and 50% of the sitz bath group who suffered severe pain before and after the intervention respectively. Moreover, one-quarter (25%) of the infrared group had experience unbearable pain before the intervention, while none of them had such pain intensity after the intervention. This is compared with 22.5% and 12.5% of the sitz bath group who had experienced such an unbearable pain before and after the intervention, respectively.

Table (IV) represents mean scores of episiotomy pain among the infrared and sitz bath groups before and after the intervention. Before the intervention, the mean scores of episiotomy pain among the infrared and sitz bath groups were (8.400 ± 1.429 & 8.100 ± 2.023 respectively), there was no statistically significant difference, where $p = 0.446$. After intervention, there was a significant decreased trend in the mean score of episiotomy pain 1.925 ± 1.385 among the infrared group than the sitz bath group 7.625 ± 2.425 . There was a highly statistically significant difference between both groups in favor of the infrared group where $P = 0.000$. In addition, there was a significant decreased trend at the mean scores of episiotomy pain from 8.400 ± 1.429 before the intervention to 1.925 ± 1.385 after intervention in the infrared group ($P = 0.000$), while no statistically significant difference was observed within the sitz bath group ($P = 0.344$).

Table (V) reveals distribution of the infrared and sitz bath groups according to healing of their episiotomy wound using REEDA scale. Before the intervention, the table clearly illustrates no statistically significant differences between infrared and sitz bath groups regarding all parameters of REEDA scale as presented by redness, edema, ecchymosis, discharge and approximation where ($P = 0.354$, $P = 0.513$, $P = 0.898$, $P = 0$ and $P = 0.602$ respectively). On the contrary, the table also reveals that the differences between the infrared and sitz bath groups after intervention were statistically highly significant in relation to the same parameters of REEDA scale, where $P = 0.000$. Where severe redness was observed among no one of infrared group, compared to more than three-fifths (62.5%) of sitz bath group. Severe edema was observed among only 2.5% of infrared group, compared to more than two-thirds (70%) of sitz bath group. Severe ecchymosis was observed among no one of infrared group, compared to more than two-thirds (67.5%) of sitz bath group. No discharge was observed among the majority (82.5%) of infrared group, compared to 42.5% of sitz bath group. Closed approximation was observed among more than three-fifths (62.5%) of infrared group, compared to only 7.5% of sitz bath group. Regarding the total score of REEDA scale, the table also clarifies that after intervention more than two-thirds (70%) of infrared group had healed episiotomy wound, compared to only 10% of sitz bath group, where the differences between the two groups were statistically highly significant $p = 0.000$.

Table (VI) compares the mean REEDA scale scores of episiotomy wound healing among the infrared and sitz bath groups before and after the intervention. Before the intervention, the redness mean scores was almost equal (2.775 ± 0.423 & 2.700 ± 0.564) among the infrared and sitz bath groups respectively, no statistically significant difference was found between the both group, where ($P = 0.503$). After intervention, the redness mean scores among the infrared group was lower than that of the sitz bath group (0.750 ± 0.670 & 2.350 ± 0.975 respectively), there was highly statistically significant difference was illustrated between the both group, where ($P = 0.000$). Regarding edema, it was observed that before the intervention, the edema mean scores was almost equal (2.750 ± 0.630 and 2.800 ± 0.516) among the infrared and sitz bath groups respectively, there was no statistically significant difference between the both group, where ($P = 0.699$). After intervention, the edema mean score among the infrared group was lower than that of the sitz bath group (0.800 ± 0.823 and 2.500 ± 0.877 respectively), the difference between the both group was highly statistically significant, where ($P = 0.000$). Concerning ecchymosis, it was noticed that before the intervention the ecchymosis mean scores was almost equal (2.825 ± 0.501 and 2.775 ± 0.577) among the infrared and sitz bath groups respectively, there was no statistically significant difference between the both group, where ($P = 0.680$). After intervention, the ecchymosis mean score among the infrared group was lower than that of the sitz bath group (0.675 ± 0.730 and 2.425 ± 0.984 respectively), the difference between the both group was highly statistically significant, where ($P = 0.000$). In relation to discharge, the table clarifies that before the intervention the discharge mean score was equal zero among the infrared and sitz bath groups. After intervention, the discharge mean score among the infrared group was lower than that of the sitz bath group (0.075 ± 0.267 and 1.100 ± 1.105 respectively), the difference between the both group was highly statistically significant, where ($P = 0.000$). As regards approximation, it was observed that before the intervention the approximation mean scores was almost equal (2.875 ± 0.335 and 2.825 ± 0.447) among the infrared and sitz bath groups respectively, no statistically significant difference was found between

the both group, where (P=0.573). After intervention, the approximation mean score among the infrared group was lower than that of the sitz bath group (0.450±0.639 and 2.525±0.906 respectively), the difference between the both group was highly statistically significant, where (P=0.000). Regarding the change within infrared group before and after the intervention, the table clearly revealed a statistically significant differences regarding four parameters of REEDA scale as presented by redness, edema, ecchymosis and approximation where (P = 0.000), while no statistically significant difference was observed in relation to discharge, where (P=0.080). On the contrary, the table also illustrates that no significant change was observed within the moist heat group in relation to the same four parameters of REEDA scale. While discharge significantly increased after the intervention among sitz bath group, where (P = 0.000). Considering the total REEDA scale scores, it was illustrated that before the intervention the total REEDA mean scores was almost equal (11.375±1.659 and 11.275±1.826) among the infrared and sitz bath groups respectively, no statistically significant difference was observed between the both group, where (P=0.798). After intervention, total REEDA mean scores among the infrared group was lower than that of the sitz bath group (2.750±2.629 and 10.900±4.307 respectively), the difference between the both group was highly statistically significant, where (P=0.000). The difference between the means of the total REEDA scores among the infrared group before and after the intervention was highly statistically significant (P=0.000). Whereas the same difference among the sitz bath group was not statistically significant (P=0.614).

Table (I): Number, percent and mean distribution of study subjects according to their socio-demographic data

Socio-demographic	Infrared group = 40		Sitz bath group= 40		FET/X ² (P)
	No	%	No	%	
Age (years):					
- 20-	25	62.5	23	57.5	0.213 (0.899)
- 25-	9	22.5	10	25.0	
- 30-35	6	15.0	7	17.5	
Mean + SD	24.475± 4.320		24.725± 4.506		T (P) 0.253(0.801)
Level of education:					
- Primary/ preparatory.	12	30.0	13	32.5	0.205 (0.903)
- Secondary	18	45.0	16	40.0	
- University or more	10	25.0	11	27.5	
Occupation:					
- Housewife	25	62.5	23	57.5	0.208 (0.648)
- Working	15	37.5	17	42.5	
Current residence:					
- Urban	19	47.5	17	42.5	0.202 (0.653)
- Rural	21	52.5	23	57.5	
Marital status:					
- Married	38	95.0	40	100.0	2.051 (0.152)
- Divorced & widowed	2	05.0	0	00.0	
Family income/month:					
- More than enough	2	05.0	2	05.0	0.517 (0.772)
- Just enough	26	65.0	23	60.0	
- Not enough	12	30.0	15	35.0	

Note. X²(P): Chi-Square Test & P for X² Test; FET (P): Fisher Exact Test & P for FET-Test; T (P): T-test & P for T-test.

Table (II): Number, and percent distribution of study subjects according to their reproductive history and antenatal visit

Reproductive history	Infrared group = 40		Sitz bath group= 40		FET/X ² (P)
	No	%	No	%	
Gravidity:					
- 1	27	67.5	28	70.0	1.048 (0.592)
- 2	10	25.0	7	17.5	
- 3	3	07.5	5	12.5	
Parity:					
- Primipara	30	75.0	31	77.5	0.069 (0.793)
- Multipara	10	25.0	9	22.5	
Did you have antenatal visit:					
- Yes	32	80.0	30	75.0	0.287 (0.592)
- No	8	20.0	10	25.0	
Number of antenatal visits:	n=32		n=30		
- < 4	10	31.25	12	40.0	0.518 (0.472)
- ≥ 4	22	68.75	18	60.0	

Note. X²(P): Chi-Square Test & P for X² Test; FET (P): Fisher Exact Test & P for FET-Test; T (P): T-test & P for T-test.

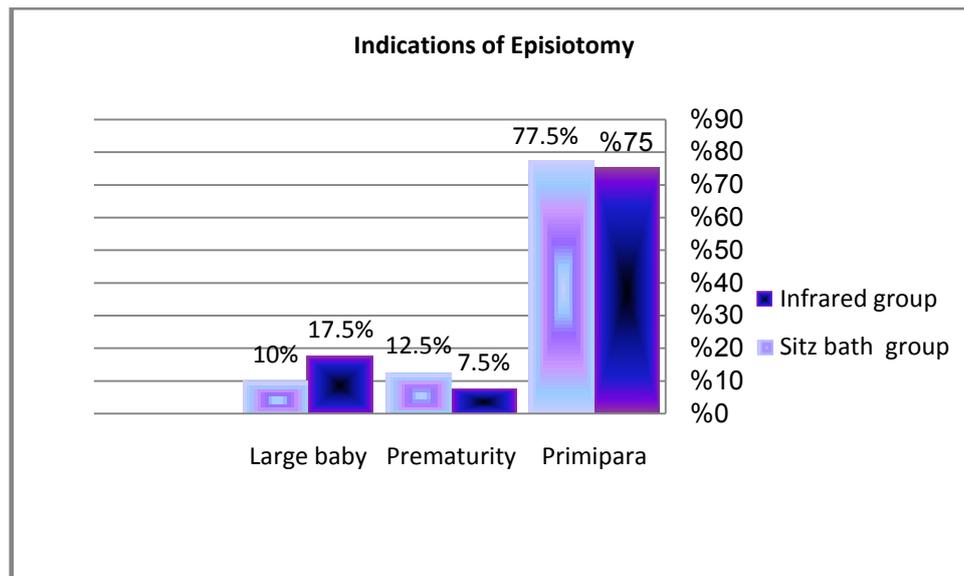


Figure 1: Graphical presentation of study subjects according to their indications of episiotomy

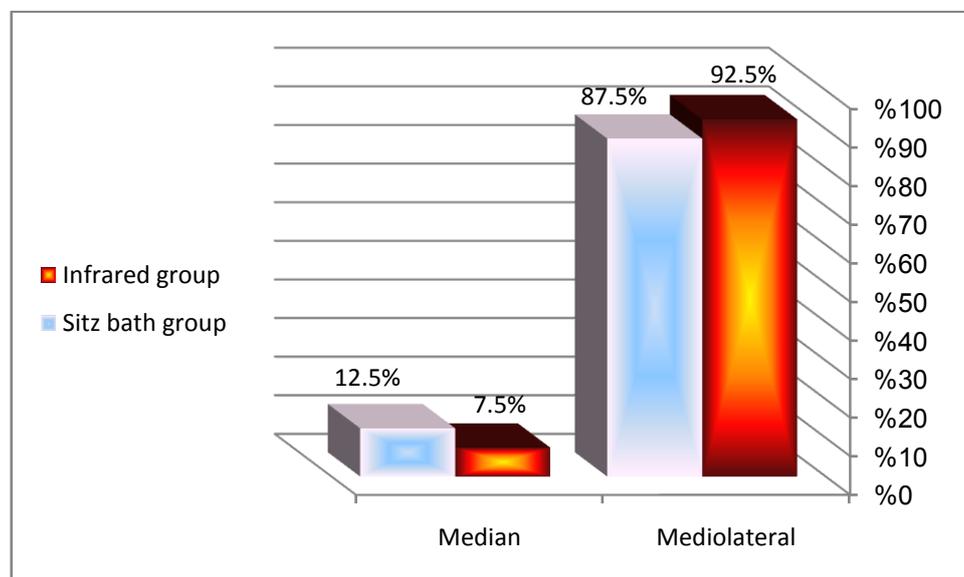


Figure 2: Graphical presentation of study subjects according to their type of episiotomy

Table (III): Number and percent distribution of the study subjects according to their perineal pain intensity before and after the intervention.

Pain intensity	Infrared group = 40				Sitz bath group = 40				FET/X ² (P) Before	FET/X ² (P) After
	Before intervention		After intervention		Before intervention		After intervention			
	No.	%	No.	%	No.	%	No.	%		
- No pain =0	0	00.0	7	17.5	0	00.0	0	00.0	3.128 (0.322)	52.495 (0.000)
- Mild =1-3.	0	00.0	28	70.0	2	05.0	6	15.0		
- Moderate =4-6.	8	20.0	5	12.5	12	30.0	9	22.5		
- Severe =7-9.	22	55.0	0	00.0	17	42.5	20	50.0		
- Unbearable =10.	10	25.0	0	00.0	9	22.5	5	12.5		
FET/X² (P)	67.692(0.000)				3.815(0.432)					

Note. X² (P): Chi-Square Test & P for X² Test; FET (P): Fisher Exact Test & P for FET-Test; *: Significant at P ≤ .05.

Table IV: Mean scores of episiotomy pain among the infrared and sitz bath groups before and after the intervention

Mean Numerical Pain Rating Scale	Infrared group (n=40)	Sitz bath group (n=40)	T test (P)
	Mean + SD	Mean + SD	
Before intervention	8.400± 1.429	8.100± 2.023	0.766(0.446)
After intervention	1.925± 1.385	7.625± 2.425	12.909(0.000)
T test (P)	20.578(0.000)	0.951(0.344)	

T (P): T-test & P for T-test*: Significant at $P \leq 0.05$

Table (V): Number and present distribution of the infrared and sitz bath groups according to healing of their episiotomy using REEDA scale

Episiotomy wound healing	Infrared group = 40				Sitz bath group= 40				FET/X ² (P) Before	FET/ X ² (P) After
	Before intervention		After intervention		Before intervention		After intervention			
	No.	%	No.	%	No.	%	No.	%		
Redness:										
- None	0	00.0	15	37.5	0	00.0	3	07.5	1.731 (0.354)	42.333 (0.000)
- Mild	0	00.0	20	50.0	2	05.0	5	12.5		
- Moderate	9	22.5	5	12.5	8	20.0	7	17.5		
- Sever	31	77.5	0	00.0	30	75.0	25	62.5		
Edema:										
- None	0	00.0	17	42.5	0	00.0	2	05.0	1.318 (0.513)	43.425 (0.000)
- Mild	4	10.0	15	37.5	2	05.0	4	10.0		
- Moderate	2	05.0	7	17.5	4	10.0	6	15.0		
- Sever	34	85.0	1	02.5	34	85.0	28	70.0		
Ecchymosis:										
- None	0	00.0	19	47.5	0	00.0	4	10.0	0.364 (0.898)	46.801 (0.000)
- Mild	2	05.0	15	37.5	3	07.5	2	05.0		
- Moderate	3	07.5	6	15.0	3	07.5	7	17.5		
- Sever	35	87.5	0	00.0	34	85.0	27	67.5		
Discharge:										
- None	40	100.0	33	82.5	40	100.0	17	42.5	-	22.414 (0.000)
- Serum	0	00.0	7	17.5	0	00.0	7	17.5		
- Serosanguinous	0	00.0	0	00.0	0	00.0	11	27.5		
- Bloody /purulent	0	00.0	0	00.0	0	00.0	5	12.5		
Approximation:										
- Closed	0	00.0	25	62.5	0	00.0	3	07.5	1.000 (0.602)	63.483 (0.000)
- Mild	0	00.0	12	30.0	1	02.5	2	05.0		
- Moderate	5	12.5	3	07.5	5	12.5	6	15.0		
- Sever	35	87.5	0	00.0	34	85.0	29	72.5		
The total 'REEDA' score:										
- Healed	0	00.0	28	70.0	0	00.0	4	10.0	4.028 (0.258)	38.25 (0.000)
- Moderately healed	0	00.0	7	17.5	1	02.5	7	17.5		
- Mildly healed	5	12.5	5	12.5	11	27.5	11	27.5		
- Not healed	35	87.5	0	00.0	28	70.0	18	45.0		

Note. X² (P): Chi-Square Test & P for X² Test; FET (P): Fisher Exact Test & P for FET-Test; *: Significant at $P \leq .05$.

Table (VI): Mean REEDA scale scores of episiotomy wound healing among the infrared and sitz bath groups before and after the intervention

Mean REEDA score	Infrared group (n=40)	Sitz bath group (n=40)	T test (P)
	Mean + SD	Mean + SD	
Redness:			
- Before intervention	2.775± 0.423	2.700± 0.564	0.673 (0.503) 8.552(0.000)
- After intervention	0.750± 0.670	2.350± 0.975	
T test (P)	16.164(0.000)	1.965(0.053)	
Edema:			
- Before intervention	2.750± 0.630	2.800± 0.516	0.388(0.699) 8.941(0.000)
- After intervention	0.800± 0.823	2.500± 0.877	

T test (P)	11.899(0.000)	1.865(0.066)	
Ecchymosis:			
- Before intervention	2.825±0.501	2.775±0.577	0.414(0.680)
- After intervention	0.675±0.730	2.425±0.984	9.033(0.000)
T test (P)	15.358(0.000)	1.941(0.056)	
Discharge:			
- Before intervention	0	0	0
- After intervention	0.075±0.267	1.100±1.105	5.704(0.000)
T test (P)	1.777(0.080)	6.296(0.000)	
Approximation:			
- Before intervention	2.875±0.335	2.825±0.447	0.567(0.573)
- After intervention	0.450±0.639	2.525±0.906	11.845(0.000)
T test (P)	21.258(0.000)	1.878(0.064)	
Total 'REEDA' score:			
- Before intervention	11.375±1.659	11.275±1.826	0.256(0.798)
- After intervention	2.750±2.629	10.900±4.307	10.215(0.000)
T test (P)	17.547(0.000)	0.507(0.614)	

T (P): T-test & P for T-test*: Significant at $P \leq 0.05$

V. Discussion

Episiotomy is one of the most common procedures performed during delivery. It can cause severe complications such as infection, wound dehiscence and perineal pain ...etc. ⁽³²⁾ Therefore, episiotomy care is of special importance to postpartum maternal outcomes and can assist women's return to normal life. ⁽³³⁾ Effective and high quality postpartum episiotomy care might decrease pain and improve wound healing. At present, all efforts are focused on the early and effective treatment of episiotomy wound and its associated complications. ⁽³⁴⁾ Considering the high prevalence of episiotomy and its complications, and lack of any proven reliable and effective treatment for episiotomy wound. The present study was carried out to compare the effect of infrared lamp therapy versus warm sitz bath on episiotomy wound healing and pain among puerperal mothers.

The results of this study revealed that the puerperal mothers of both the infrared and the sitz bath groups were matching in almost all aspects of their socio-demographic characteristics. They were also matching in their reproductive history and antenatal visit, indications of episiotomy, and type of episiotomy. This matching may help understand and/or justify the relevance of the forthcoming results of the current study. It may also provide logic rational in relation to positive effects of a specific intervention over another on episiotomy wound healing and pain.

The episiotomy pain and wound healing are considered to be significant parameters in managing postpartum mothers. It becomes difficult for midwives to handle the postpartum period on these aspects. Incorporating infra red therapy as alternative for pain relief improves mothers comfort as well as enhances the quality of care. Since the therapy effective in episiotomy wound healing and improves good sleep. Midwifery is profession which incorporates the alternative therapies to meet the postpartum mother's care and to maintain the standard of postpartum care. ^(5, 27)

The present study indicated that episiotomy pain intensity had decreased after the application of infrared lamp therapy among the infrared group. Meanwhile, such a decrease was not observed among the sitz bath group after application of warm sitz bath. The difference between the two groups in this respect after the intervention was statistically highly significant ($P = 0.000$). The result of the present study is in line with at least eight studies. *First*, El-Lassy and Madian (2019) ⁽³⁵⁾ who found that The intensity of pain mean score among the study group was significantly decreased from 2.9 ± 1.44 at the first time at the base line assessment to 0.2 ± 0.09 the last time of assessment at the fourth day post-intervention. They also found that the pain mean score was statistically significant decreased after interventions among the study group than control group. *Second*, Gomathi et al (2018) ⁽³⁶⁾ who reported that significantly high proportion of postnatal mothers (92.64%) were having good pain relief while no one from control group was having good relief. Comparison between post-treatment scores of experimental and control group revealed that there was significant reduction in the score of experimental group. They also concluded that episiotomy wound pain relief is good after infrared lamp therapy; all the subjects in the experimental group had reduced pain level. *Third*, Rani (2018) ⁽³⁷⁾ who studied "the effectiveness of infrared radiation therapy on pain perception and wound healing among primi postnatal women with episiotomy". She found that the mean pain score after infrared radiation therapy was significantly less than the mean pain scores before infrared radiation therapy in the experimental group, ($p < 0.05$). There was a significant reduction in episiotomy pain score in the experimental group, ($p < 0.05$), then the control group regarding infrared radiation therapy. *Fourth*, Soren and Sangeetha (2018) ⁽³⁸⁾ who concluded that the infra red therapy is effective in wound healing and reducing postoperative pain among post abdominal hysterectomy women .there is statistical significant difference found between 2nd and 3rd post operative day on wound healing and postoperative pain (p - value.000). *Fifth*, Khosla P et al (2017) ⁽³⁹⁾ who studied "the effect of dry heat on episiotomy wound healing and level of pain among post natal mothers". They elaborated that in

experimental group (dry heat) the mean of pain was 1.3 in 1st day, 3rd day it was 1 and in 5th day it was 0. They also concluded that dry heat has intensive effect on reduction of episiotomy pain than without any intervention. Sixth, Premila (2016)⁽⁴⁰⁾ who studied " the effectiveness of infrared therapy on episiotomy pain among postnatal mothers". She found that during pretest majority of mother had severe pain, around 24% of mother had moderate pain and around 36% of mother had mild pain. Whereas during post test minority 18% of mothers had severe pain, around 20% of mother had moderate pain and majority 62% had mild pain at episiotomy. A statistical significant difference was found between pretest and posttest. Seventh, Kaur et al (2013)⁽⁴¹⁾ who concluded that the both interventions (dry heat and moist heat) were effective, but dry heat with hair drier was more effective than moist heat with sitz bath in relieving episiotomy pain among postnatal mothers. Eighth, George (2013)⁽⁴²⁾ who conducted a study to find the effectiveness of sitz bath versus infrared therapy in reducing episiotomy pain and wound healing. She reported that significant difference between the mean scores of pain in both control and experimental group before and after administration of sitz bath & infrared therapy, administration of sitz bath and infrared therapy were found to be effective in reducing episiotomy pain. She also found a significant difference between post- test pain scores of control and experimental group. It means that infrared therapy was more effective in episiotomy pain reduction

In contrast, the study of Huang et al (2019)⁽⁴³⁾ investigated the effect of far-infrared radiation on perineal wound pain and sexual function in primiparous women undergoing an episiotomy. They found no significant difference between far-infrared radiation group and control group in the intensity of perineal wound pain immediately after delivery, 1 week and 6 weeks postpartum. They concluded that the control group had perineal pain relief comparable to the far-infrared group. Their study did not show any additional benefit of postpartum far-infrared radiation therapy in this particular group of women. In addition, Chandrleka et al (2019)⁽⁴⁴⁾ concluded that both the sitz bath and infrared ray therapy was effective in reducing the level episiotomy pain among the postnatal mothers. But the sitz bath is more effective in reducing the level of episiotomy pain among the postnatal mothers. They added that this method of intervention should be routinely carried by the staff nursing and to teach the mothers to perform the sitz bath in their home itself. Moreover, the study of Amandeep et al (2015)⁽⁴⁵⁾ revealed that the application of sitz bath therapy had significant reduction in episiotomy pain as mean score of episiotomy pain got decreased from 5.20 ± 2.17 to 0.73 ± 0.78 in experimental group and 4.90 ± 2.33 to 2.73 ± 1.50 in control group ($p=0.05$). Experimental group had greater change in mean score of episiotomy pain on 1st, 2nd and day 3rd day of post-intervention which was statistically significant ($p=0.001$) as compared to control group. Furthermore, the study of Kaur et al (2014)⁽⁴⁶⁾ revealed that both infrared light therapy and sitz bath were effective in relieving episiotomy pain, however, sitz bath was significantly more effective in reducing intensity of episiotomy pain as compared to infrared light.

In relation to episiotomy healing which was measured by REEDA scale, the result of the current study revealed that no statistically significant difference was observed among both groups in relation to healing of episiotomy wound before the interventions. While there was significantly improvement in healing of episiotomy wound as regard redness, edema, ecchymosis, discharge and approximation of episiotomy wound among the infrared group than to the sitz bath group after the interventions. In this respect Aruna G (2015)⁽⁴⁷⁾ found that the dry heat is more effective than moist heat for Redness by 9%, for Edema by 8%, for Discharge by 2% and for Approximation by 11%. But for Ecchymosis the dry heat application and moist heat application are found to be equally effective. She added that the application of dry heat is more effective than the application of moist Heat. In addition, Pore Y (2014)⁽⁴⁸⁾ reported that both methods of treatment i.e. moist heat and dry heat were effective in healing of episiotomy wound. The application of moist heat showed greater effect on Edema and Redness whereas it was less effective for Ecchymosis, Discharge and Approximation. The application of dry heat shows equal effect on Redness and Edema, where as it is less effective on Ecchymosis, Discharge and Approximation. She added that the comparative difference between moist heat and dry heat showed statistically significant. Also the REEDA scale score was higher before treatment but after treatment REEDA scale score was decreased. Her study concluded that dry heat proved to be more effective than moist heat.

The present study revealed that episiotomy wound healing had improved after the application of infrared lamp therapy among the infrared group. Meanwhile, such improvement was not observed among the sitz bath group after application of warm sitz bath. The difference between the two groups in this respect after the intervention was statistically highly significant ($P=0.000$). This may be due to that the heat of infrared lamp penetrates up to three inches into the body. Hence when heat applied on episiotomy wound vasodilatation occurs due to this the blood circulation increases, blood contents oxygen nutrients etc. It permits fast wound healing. Not only healing but also helps in absorption of moist and prevents growth of micro organisms, loosening tight muscles, aids in healing damaged tissue, and pain relief providing comfort reducing edema.⁽⁴⁹⁾ Infrared also has benefits to improve microcirculation, increase metabolism, relaxes the blood vessels cavity, helping the development of the body's cells, increasing the body's resistance to disease, and develop a pH in the body so they can accelerate wound healing.⁽⁵⁰⁾

Obvious discrepancy in relation to the effect of infrared lamp therapy and warm sitz bath application on episiotomy wound healing was reported by many researches. The present finding is in line with that of El-Lassy and Madian (2019)⁽³⁵⁾ who concluded that postnatal mothers who applied infrared lamp therapy on episiotomy had faster wound healing than those who applied routine care. So, infrared therapy can be applied as effective way of management by health personnel in their daily caring the postnatal mothers. The current finding also agrees with that of Kaur et al (2019)⁽⁵¹⁾ who found that there was improvement in overall healing of episiotomy wound in experimental group as compared to control group. There was a statistically significant difference between the pre-test and post- test healing score of episiotomy wound between experimental group and control group ($p < 0.05$). They also concluded that Infrared lamp therapy is an effective method of treatment on healing of episiotomy wound among postnatal mothers. In addition, this finding is in accordance with Khosla P et al (2017)⁽³⁹⁾ who concluded that the dry heat has intensive effect on episiotomy wound healing and reduction of pain than without any intervention. Moreover, the study of Nethravathi et al (2015)⁽⁵²⁾ revealed that there was significant improvement in wound healing in experimental group as compared to control group. This study concluded that Infra red lamp therapy is an effective method of treatment on healing of episiotomy wound among post natal mothers. Furthermore, Dewi and Ayuningtyas (2015)⁽⁵³⁾ concluded that infrared therapy is more effective in perineum wound healing during postpartum. Kaur et al (2013)⁽⁴¹⁾ also found that both interventions (dry heat and moist heat) were effective but dry heat with hair drier was more effective than moist heat with sitz bath in promoting wound healing at the episiotomy site among postnatal mothers. Dry heat with hair drier enhances wound healing process and reduces duration of episiotomy healing from 14 days to 7 days. Hence, it is recommended to practice at hospital as well as home after discharge

Unlikely, different findings were monitored by Chandraleka et al (2019)⁽⁴⁴⁾ who found that both the sitz bath and infrared ray therapy was effective in improvement of wound healing of episiotomy among the postnatal mothers. In that, the sitz bath is more effective in improving wound healing among the postnatal mothers. In addition, Huang et al (2019)⁽⁴³⁾ concluded that women who did not receive postpartum infrared radiation therapy, had wound healing improvement similar to the infrared group. Moreover, Devi (2019)⁽⁵⁴⁾ reported that sitz bath was found to be more effective in the wound healing of episiotomy mothers compared to postnatal mothers who have not had treatment of sitz bath. It is concluded that sitz bath is effective in wound healing process. Furthermore, Amandeep et al (2015)⁽⁴⁵⁾ found that experimental group (who received sitz bath application) had greater change in mean score of episiotomy wound healing on 1st, 2nd day and 3rd day after intervention which was statistically significant ($p = 0.001$) as compared to control group (who received only routine care). the study of Kaur et al (2014)⁽⁴⁶⁾ revealed that both infrared light therapy and sitz bath were effective in enhancing episiotomy wound healing, however, sitz bath was significantly more effective in promoting episiotomy wound healing as compared to infrared light. George (2013)⁽⁴²⁾ also concluded that sitz bath and infrared therapy were found to have same effect on episiotomy wound healing.

VI. Conclusion

Based on the findings of this study, it can be concluded that H1 is accepted; while H0, and H2 are rejected, where the puerperal mothers who applied infrared lamp therapy on their episiotomy wound experience faster wound healing and less pain than those who applied warm sitz bath. The application of infrared lamp therapy has a significant effect on reducing episiotomy pain and promoting wound healing among postnatal mothers.

VII. Recommendations

Based on the findings of the present study, the following recommendations are suggested:

- The use of infrared lamp therapy, as a non-pharmacological measure, in maternity hospitals should be ensured.
- In –service training programs for nurses in postnatal units- about the utilization and importance of infrared lamp therapy for management of the episiotomy wound is recommended.
- Nurses and midwives should be encourage the postnatal mothers to apply the infrared lamp therapy at the hospital as well as home to improve their episiotomy wound healing and decrease their discomfort.
- Relevant nursing curricula must entail a detailed portion about management of episiotomy wound by infrared lamp therapy.
- Further researches:
 - a) A comparative study can be conducted between infrared therapy and other non pharmacological measures.
 - b) Replication of the present study under different circumstances (sampling, setting, duration of management) is recommended to validate its results.

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