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Effect of Acupressure on Labor Pain for Women during First Stage of Normal Labor

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ORIGINAL STUDY

Effect of acupressure on labor pain for women during first stage of normal labor: a randomized controlled trial

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Abstract

Background: **Acupressure is thought to promote blood flow and the release of neurotransmitters, thereby maintaining the body's regular functions and offering a sense of well-being. Nevertheless, there is limited scientific evidence to substantiate the beneficial impacts of acupressure in obstetric healthcare.**

Purpose: **To assess the impact of applying acupressure at the large intestine 4 (LI4) acupoint on the pain experienced by women in the initial stage of labor.**

Research design: **An experimental study with a pretest and posttest control group design. A total of 100 women were randomly assigned to two groups. Each group received LI4 acupressure or light skin stroking.**

Setting: **It was the obstetric unit of El-Shouhdaa Hospital, Menoufia Governorate, in Egypt.**

Data: **Collected through an interviewing questionnaire, visual analog scale, and McGill pain questionnaire part I.**

Patients and methods: **Labor pain was assessed four times using labor pain scales (visual analog scale and McGill pain questionnaire part I) before, immediately after, 30, and 60 minute after the intervention.**

Findings: **A considerable decrease in labor pain during the active phase of the first stage of labor among the two groups with the more pain reduction with acupressure.**

Conclusions: **The application of LI4 acupressure demonstrated effectiveness in alleviating labor pain in the active phase of the initial stage of labor.**

Keywords: Acupressure, Labor pain, Large intestine 4 acupoint, McGill pain questionnaire, Visual analog scale

1. Introduction

Childbirth represents one of the most excruciating ordeals in a woman's life. The level of pain endured during labor has an impact on the progression of labor, the health of the fetus, and the emotional state of the mother [1,2].

Acupressure is a nonpharmacological approach that can be employed to alleviate various forms of pain. It involves the manual activation of particular body points, referred to as acupoints, through the direct application of pressure. Its aim is to preserve the equilibrium of energy within the body's meridians, which are interconnected with specific organs, all without the use of needles [3,4].

2. Patients and methods

We obtained official written approval from the Faculty of Nursing at Menoufia University's ethical and research committee (Designation: 562) before commencing data collection. We also furnished the administration of El-Shouhdaa Central Hospital in

Abbreviations: LI4, large intestine 4; MPQ part I, McGill questionnaire part I; VAS, visual analog scale.

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Menoufiya governorate with an authorized letter, outlining the study's objectives and outlining its procedures, to secure permission for conducting the research.

The researcher individually approached each participant, provided them with a study overview, and clarified the methods employed. Additionally, written consent was acquired from every participant, confirming their willingness to participate in the study. We ensured the complete confidentiality of the gathered information and upheld the privacy of each participant.

The current study was conducted on 100 primgravidae, in normal labor randomly selected from the Obstetrics and Gynecology Department at El-Shouhadaa Hospital.

2.1. Inclusion criteria

Primgravidae aged between 18 and 28 years old, gestational age between 37th and 41st week of pregnancy, in the first stage of labor (cervical dilatation from 3 to 6 cm), without any pregnancy complications, had a single baby with cephalic presentation. They naturally started labor with intact membrane, normal fetal heart rate, and regular pattern of uterine contractions (2−3 contractions per 10 minutes) correlated with progressive cervical effacement and early cervical dilatation. All had no bruises, damage, or irritation at the large intestine 4 (LI4) acupoint site, and they did not report any medical problems.

The study sample was divided randomly into two equal groups A and B (experimental group and control group), respectively. Randomization of participants was done by means of a simple technique according to week days; patients who came on Saturday, Monday, and Wednesday were rolled in group A, while, patients who came on Sunday, Tuesday, and Thursday were moved in group B.

(1) Group A (experimental group): 50 females received acupressure on LI4 acupoints on both hands from the start of the contraction to the end of the same contraction for 30 minutes.
(2) Group B (control group): 50 females received only touch without pressure on LI4 acupoints on both hands from the start of the contraction to the end of the same contraction for 30 minutes.

2.2. Evaluative procedures

Three tools were used in this study.

2.2.1. A constructed interview questionnaire

The questionnaire employed was designed by the researcher, drawing upon relevant literature for guidance. It was directed and written in a simple, clear Arabic language. It consisted of four components:

(1) Part I: assessed sociodemographic traits of females as name, age, education, marital status, and occupation.
(2) Part II: assessed biomedical information, which include medical and family history.
(3) Part III: assessed information about current pregnancy and labor as gestational age, last menstrual period, expected date of delivery, and type of labor.
(4) Part IV: assessed data about the impact of acupressure on labor as: does this method assist in reducing pain? If yes, what is the degree of pain? Do you prefer the use of this method in the coming labors?

2.2.2. Pain rating scales

Both visual analog scale (VAS) and McGill pain questionnaire (MPQ) part I were used for the evaluation of pain sites and intensity before, closely after intervention, then 30, and 60 minute after the intervention.

(1) VAS to assess pain intensity during labor:

The VAS is a measurement tool consisting of a 10 cm line, vertically or horizontally oriented, connecting two points. One end represents the complete absence of pain, while the other denotes the most excruciating pain conceivable. Each participant was instructed to indicate the pain level they were experiencing at the given moment by marking a point on the scale, which corresponds to a scale of 0−10. In this scale, 0 signifies no pain, 1−3 indicates mild pain, 4−6 indicates moderate pain, and 7−10 signifies severe pain [5].

(1) MPQ part I to assess sites of pain [6]:
    (a) The MPQ part I was employed to evaluate the pain location. Women were asked to mark on provided diagrams the specific areas where they experienced pain. The scoring system was as follows: marking no pain site equated to a score of 0. A single site of pain was categorized as follows: lower back pain (1), lower abdomen pain (2), inguinal pain (3), and thigh pain (4). Two-site pain included combinations like lower back pain + lower abdomen pain (5),

lower back pain + inguinal pain (6), and lower back pain + thigh pain (7). Three-site pain entailed combinations such as lower back pain + lower abdomen pain + inguinal pain (8), and lower back pain + lower abdomen pain + thigh pain (9). Finally, four-site pain was represented by lower back pain + lower abdomen pain + inguinal pain + thigh pain, scored as 10.

Then, write 'E' if external or 'I' if internal near the areas where they marked. Write 'EI' if both external and internal for determining the site or sites of pain according to the following scale: internal pain = I, external pain = II, internal and external pain = III.

2.3. Treatment procedures

In the obstetric ward, participants were in the initial stage of active labor, exhibiting cervical dilatation ranging from 3 to 6 cm, and experiencing regular uterine contractions. All participants in the study groups were educated about the benefits and potential outcomes of LI4 acupressure. To begin, the anatomical location of the LI4 acupoint was identified as the webbing between the thumb and index finger, specifically at the highest point of the muscle when the thumb and index finger were brought into proximity. In the experimental group, LI4 acupressure was administered at the onset of each uterine contraction during the active phase, spanning from the commencement of the contraction to its conclusion, and this treatment was sustained for a duration of 30 minutes. In contrast, the control group received touch at the LI4 point, without the acupressure technique being applied. The application of acupressure was carried out using the round parts of both thumbs.

The gathered data underwent a process of organization, categorization, tabulation, and subsequent statistical analysis through the utilization of SPSS (statistical package for social sciences; SPSS Inc., Chicago, Illinois, USA) and the statistical significance at a confidence of 95 % (α-level of 0.05). The presentation of the data in tables incorporated descriptive statistics encompassing frequencies, the χ^2 test, percentages, mean scores, SDs, and paired t tests for the comparison of means. The relationships between variables were assessed through the calculation of Pearson correlation coefficients. Significance was recognized when P values were less than 0.05, indicating the significance of the interpretation of the results.

3. Results

The data collected in Tables 1 and 2 confirmed a nonstatistically significant difference between both groups concerning sociodemographic characteristics and family history.

Likewise, most participants had no persistent medical problems or previous operations and had no pregnancy complications. Similarly, there were no statistically significant variations between both groups concerning gestational weeks, the passage of show or labor pain in both lower abdomen and back as shown in Tables 3 and 4.

Table 1. Sociodemographic characteristics of the studied groups.

Socio-demographic characteristics	Studied groups [n (%)]		χ^2	P value
	Study group (N = 50)	Control group (N = 50)		
Age (years)				
18–19	3 (6.0)	2 (4.0)	1.24	0.53
20–26	44 (88.0)	42 (84.0)		NS
27–28	3 (6.0)	6 (12.0)		
Education				
Illiterate	3 (6.0)	2 (4.0)		
Read and write	3 (6.0)	5 (10.0)	3.43	0.32
Secondary	22 (44.0)	29 (58.0)		NS
University	22 (44.0)	14 (28.0)		
Occupation				
Housewife	42 (84.0)	45 (90.0)	1.21	0.54
Workers	8 (16.0)	4 (10.0)		NS
Marital status				
Married	48 (96.0)	50 (100.0)	2.04	0.49
Divorced	2 (4.0)	1 (2.0)		NS

χ^2, χ^2 test.
NS = not significant ($P > 0.05$).

Table 2. Family history of the studied groups.

Family history	Studied groups [*n* (%)]		Fisher's exact test	*P* value
	Study group ($N = 50$)	Control group ($N = 50$)		
Family history of any chronic diseases				
Yes	3 (6.0)	4 (8.0)	0.15	1.0
No	47 (94.0)	46 (92.0)		NS
Family history of chronic diseases present				
Hypertension	0	2 (50.0)	2.10	0.42
DM	3 (100.0)	2 (50.0)		NS

DM, diabetes mellitus.
Significant ($P < 0.05$).

Table 3. Medical history of the studied groups.

Medical history	Studied groups [*n* (%)]		Fisher's exact test	*P* value
	Study group ($N = 50$)	Control group ($N = 50$)		
Is there positive history of any chronic diseases				
Yes	2 (4.0)	1 (2.0)	0.34	1.0
No	48 (96.0)	49 (98.0)		NS
If yes, what is it?				
Hypertension	1 (50.0)	0	0.75	1.0
DM	1 (50.0)	1 (100.0)		NS
Past history of any surgical operation				
Yes	3 (6.0)	0	3.09	0.24
No	47 (94.0)	50 (100.0)		NS

DM, diabetes mellitus.

Table 4. Characteristics of the current pregnancy and labor of the studied groups.

Variables	Studied groups [*n* (%)]		χ^2	*P* value
	Study group ($N = 50$)	Control group ($N = 50$)		
Duration of current pregnancy (weeks)				
38 weeks	2 (4.0)	3 (6.0)	0.71	0.70
39–40 weeks	43 (86.0)	44 (88.0)		NS
42 weeks	5 (10.0)	3 (6.0)		
Passage of the show				
Yes	8 (16.0)	5 (10.0)	0.79*	0.37
No	42 (84.0)	45 (90.0)		NS

All participants of both groups complained of birth pains in lower back and abdomen and were primigravida, nulliparous with no history of abortion.
* Significant ($P < 0.05$).

Table 5. Results of abdominal examination findings for the studied groups.

Variables	Studied groups [*n* (%)]		Test of significance	*P* value
	Study group ($N = 50$)	Control group ($N = 50$)		
Fetus lie				
Longitudinal	50 (100.0)	50 (100.0)	NA	NA
Fetus presentation				
Cephalic	50 (100.0)	50 (100.0)	NA	NA
Fetus position				
Right occipital–anterior	46 (92.0)	45 (90.0)	$\chi^2 = 2.04$	0.56
Left occipital–anterior	3 (6.0)	3 (6.0)		NS
Right occipital–posterior	0	2 (4.0)		
Left occipital–posterior	1 (2.0)	0		
Fetal heart rate				
120–160 b/min	50 (100.0)	50 (100.0)	NA	NA

Fisher's exact test.
Significant ($P < 0.05$).

Table 6. Initial vaginal examination of the studied women.

Variables	Studied groups [*n* (%)]		χ^2	*P* value
	Group A ($N = 50$)	Group B ($N = 50$)		
Cervical dilatation (cm)				
3–4 cm	6 (12.0)	3 (6.0)	1.09*	0.48
5–6 cm	44 (88.0)	47 (94.0)		NS
Membranes				
Rupture	8 (16.0)	5 (10.0)	0.79	0.37
Intact	42 (84.0)	45 (90.0)		NS

* Significant ($P < 0.05$).

Regarding the abdominal examination, all participants in both groups had longitudinal fetal lie, cephalic fetal presentation, and right occipital–anterior plus ordinary fetal heart rate from 120 to 160 b/min with no significant difference between both groups, as illustrated in Table 5.

While, preliminary vaginal examination of the studied women revealed cervical dilatation from 5 to 6 cm in most cases in both groups, while 12 % of the study group and 6 % of the controls had cervical dilatation from 3 to 4 cm, and intact membrane in most of participants in both groups. The comparison of both groups showed no significant difference, as shown in Table 6.

Moreover, Table 7 indicated that there was no noteworthy distinction in terms of the location and intensity of pain, as determined by MPQ part I, within each participant across all stages of the study, which encompassed assessments conducted

Table 7. Sites and depth of pain according to (McGill pain questionnaire part I) of the studied groups before, immediately after, 30, and 60 minute after intervention.

Sites and depth of pain	Studied groups [*n* (%)]		χ^2	*P* value
	Study group ($N = 50$)	Control group ($N = 50$)		
Type of pain first measure before intervention				
Internal	2 (4.0)	2 (4.0)	0.54	0.76
External	3 (6.0)	5 (10.0)		NS
Internal and external	45 (90.0)	43 (86.0)		
Site of pain first measure before intervention				
Lower back, lower abdomen, and inguinal	21 (42.0)	30 (60.0)	3.24	0.07
Lower back, lower abdomen, inguinal, and thigh	29 (58.0)	20 (40.0)		NS
Type of pain second measure immediately after intervention				
Internal	1 (2.0)	0	1.01	0.60
External	1 (2.0)	1 (2.0)		NS
Internal and external	48 (96.0)	49 (98.0)		
Site of pain immediately second measure after intervention				
Lower back, lower abdomen, and inguinal	32 (64.0)	30 (60.0)	0.17	0.68
Lower back, lower abdomen, inguinal, and thigh	18 (36.0)	20 (40.0)		NS
Type of pain third measure (30 minutes) after intervention				
Internal	1 (2.0)	0	2.0	0.36
External	0	1 (2.0)		NS
Internal and external	49 (98.0)	49 (98.0)		
Site of pain third measure (30 minutes) after intervention				
Lower back, lower abdomen, and inguinal	32 (64.0)	30 (60.0)	0.17	0.68
Lower back, lower abdomen, inguinal, and thigh	18 (36.0)	20 (40.0)		NS
Type of pain fourth measure (60 minutes) after intervention				
Internal	1 (2.0)	0	1.01*	1.0
External	0	0		NS
Internal and external	49 (98.0)	50 (100.0)		
Site of pain fourth measure 60 minutes after intervention				
Lower back, lower abdomen, and inguinal	23 (46.0)	18 (36.0)	1.03	0.30
Lower back, lower abdomen, inguinal, and thigh	27 (54.0)	32 (64.0)		NS

before, right after, and 30, and 60 minute postintervention.

Results additionally found variations in VAS scores. In the study group, pain improved with the mean value of 8.3 ± 1.14 score to a mean value of 6.38 ± 1.32 score right away after intervention and then elevated after 30 minute with a mean value of 7.38 ± 1.22 scores but still lower than before intervention. While after 60 minutes, pain scores increased with a mean value of 9.26 ± 0.85 scores. But in the control group, the mean value of pain scores before intervention was 7.8 ± 1.52 scores and nearly still the same with a mean value of 7.9 ± 1.21 scores immediately after intervention and then the pain was elevated 30 minute after intervention to reach a mean value of 8.84 ± 0.81 scores and the elevation still 60 minute after the intervention to reach a mean value of 9.7 ± 0.47 scores. All effects shown in this table suggested a highly significant difference in pain intensity scores between both groups except before intervention, in which there was no significant difference between both groups (Fig. 1).

Moreover, Table 8 represents the relationship between pain scores on VAS and vaginal examination before intervention among the study group. Only eight participants had elevated pain scores with a mean value of 9.50 ± 0.53 scores through rupture of the membrane, and 42 participants had pain scores with a mean value of 8.07 ± 1.09 scores with intact membrane.

Regarding cervical dilatation, 44 participants had higher pain scores with a mean value of 8.50 ± 1.04 scores with cervical dilatation from 5 to 6 cm, and only six participants had pain scores with a mean value of 6.83 ± 0.75 scores with cervical dilatation from 3 to 4 cm. These kinds of consequences indicated a highly significant difference in pain scores that increased with cervical dilatation and rupture of membrane.

Table 8. Relationship between visual analog scale pain scores before Intervention among the study groups and vaginal examination.

Variables	Number	Pain rating scales before intervention	Student *t* test	*P* value
		Mean ± SD		
Cervical dilatation (cm)				
3–4	6	6.83 ± 0.75	3.75	≤0.001
5–6	44	8.50 ± 1.04		HS
Membranes				
Rupture	8	9.50 ± 0.53	3.60	0.001
Intact	42	8.07 ± 1.09		HS

Moreover, Table 9 represents the degrees of satisfaction of all participants towards the

Table 9. Data about the effect of the method on labor among the studied groups.

Variables	Studied groups [*n* (%)]		χ^2	*P* value
	Group A (*N* = 50)	Group B (*N* = 50)		
Does this method help in reducing pain?				
Yes	39 (78.0)	4 (8.0)	49.98	≤0.001
No	11 (22.0)	46 (92.0)		HS
What is the degree of pain after using acupressure?				
Mild	0	0	32.79	≤0.001
Moderate	28 (56.0)	2 (4.0)		HS
Severe	16 (32.0)	30 (60.0)		
Very severe	6 (12.0)	18 (36.0)		

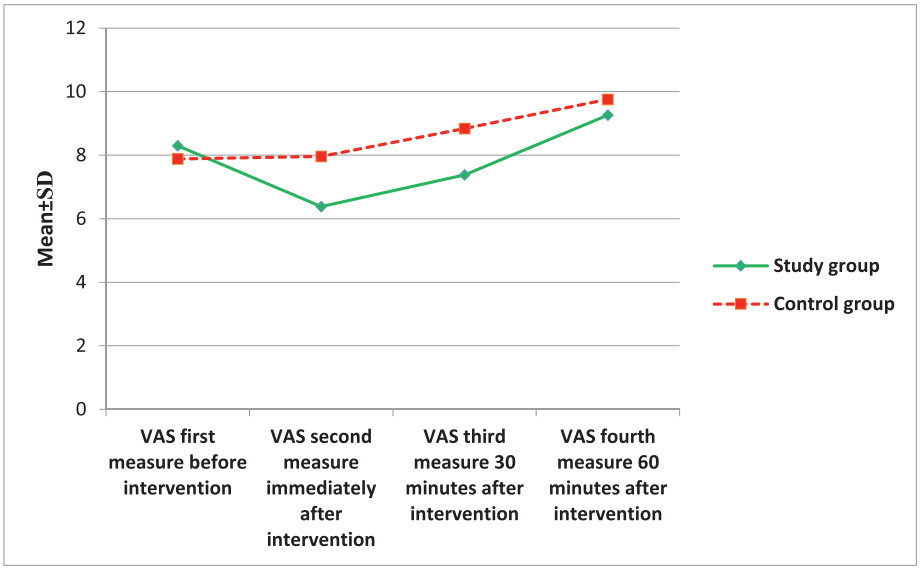

Fig. 1. VAS scores of pain before and after intervention of the studied groups. VAS, visual analog scale.

effectiveness of acupressure in relieving labor pain. Results showed that more than three-quarter of participants (78 %) in the study group granted that acupressure is effective in decreasing pain, while in the control group, most participants (92 %) revealed its poor efficacy in diminishing labor pain.

However, when it comes to assessing the severity of labor pain following acupressure, the results within the study group indicated that the majority, accounting for 56 % of participants, experienced moderate pain, while 32 % reported severe pain, and only 12 % reported very severe pain. In contrast, the control group demonstrated a different pattern, where almost two-thirds (60 %) said severe pain, only 4 % of the women experienced moderate pain, and 36 % had very severe pain, as illustrated in Fig. 2.

4. Discussion

This study confirmed a substantial and noteworthy increase in pain scores as cervical dilatation progressed. This finding aligns with the results of numerous other studies, which have consistently reported a strong association between the highest pain intensity and the advancement of cervical dilation. This correlation is well-documented in the context of the intensity, duration, and frequency of uterine contractions [7–9].

During the dilation phase of labor, the predominant source of pain is visceral, originating from the mechanical distension of the lower uterine segment and the opening of the cervix. Additionally, high-threshold mechanoreceptors within the myometrium may also contribute to the generation of nociceptive signals in response to uterine contractions [10].

The present study proved a positive correlation between the rupture of membranes and the intensity of labor pain that had been in step with Fraser et al. [11], who reported an increase in the rate, strength, and contractions pain following membrane rupture. They perceived the difficulty of contractions to manage and needed more analgesia as the physiology of labor was disturbed.

Furthermore, Nakamura et al. [12] noted that the rupture of the amniotic sac constitutes a significant factor in the escalation of pain during the progression of labor. This is attributed to the loss of its protective function for the fetal environment against potential trauma, prompting a need for analgesia at an earlier stage. When the amniotic sac ruptures, it triggers an elevation in prostaglandin production and a reduction in the protective cushioning between the fetus and the uterus. These dual processes lead to an increase in both the frequency and intensity of contractions and, subsequently pain [13].

Furthermore, the current study established that a majority of cases reported experiencing both internal and external pain in the lower back and lower abdomen, which often extended to the hips and thighs. Importantly, there was no significant distinction in the distribution of pain sites between the two groups. These findings are consistent with those of Afefy [14], who similarly observed that nearly all women undergoing uterine contractions experienced pain in the lower abdomen. A significant portion of them also reported lower back pain, either in conjunction with contractions or, albeit less

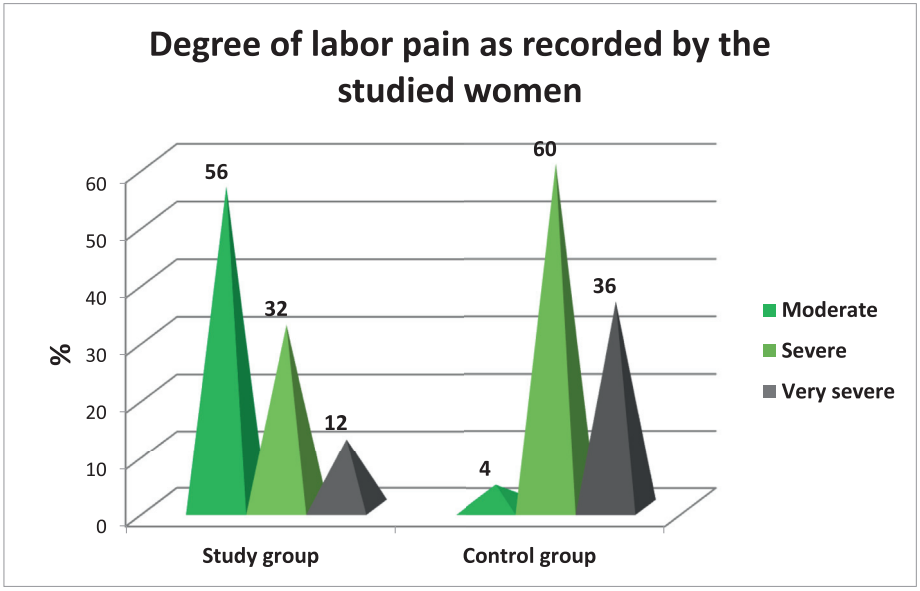

Fig. 2. The intensity of labor pain after using the acupressure.

frequently, persistently. This pain had the potential to radiate in various directions, including from front to back, back to front, or even down the thighs.

On the other hand, Hajiamini et al. [15] observed that LI4 acupressure resulted in a reduction in pain intensity among nulliparous women during the active phase of labor, with no discernible effect on the locations of pain. Furthermore, the study's findings demonstrated that LI4 acupressure effectively alleviated pain intensity among nulliparous women during the active phase of labor. Notably, the most significant impact of the acupressure was observed immediately after treatment, with a sustained decrease in pain intensity for at least 30 minute following the intervention. This difference in pain intensity between (VAS1) and (VAS4) within the study group was highly significant.

When evaluating the initial pain levels (VAS1) before the intervention, the absence of distinction between the two groups can be attributed to the fact that the pregnant women were still in the early stages of labor. However, the increase in labor pain observed at (VAS4) was marked by a shift like labor pain. This change results from the pressure exerted on the surrounding tissues and organs as the baby's head descends into the pelvis during the transition phase. It is during this period that the effectiveness of acupressure diminishes [16].

Enjezab et al. [17] corroborated these findings by demonstrating that applying ice massage to the Hugo point (LI4) led to a decrease in pain intensity, with noticeable effects as early as 30 minute following the intervention.

While, Ozgoli et al. [18], revealed the immediate effect of acupressure on relieving pain but the difference in pain scores between both groups lasted about 60 minutes. At this point, pain scores reached around the same or more than the level before treatment.

The effect of acupressure on pain can be elucidated through the ‘gate-control theory of pain.’ In this theory, acupressure triggers mechanoreceptors that stimulate thick nerve fibers (A-alfa and A-beta), instructing them to close the pain gate while simultaneously instructing fine nerve fibers (A-delta and C) to open the gate. This opening and closing of gates symbolizes the control over pain transmission through the nerves, which depends on the intensity of pressure applied. In essence, this mechanism prevents the transmission of pain signals to the spinal cord [19].

Moreover, acupressure's mechanisms for alleviating pain might involve the augmentation of endorphin and oxytocin release, which results in soothing pain signals. Additionally, it facilitates the transportation of oxygen and blood to the stimulated area, facilitating the removal of toxins that, in turn, promote muscle relaxation and supports the body's innate healing processes. Consequently, this leads to the facilitation of appropriate uterine contractions and a reduction in the duration of the second stage [20].

Furthermore, acupressure acts as a deterrent to the elevation of catecholamine, beta-endorphins, ACTH, and cortisol levels in pregnant women. This is achieved through the attenuation of the neuroendocrine response to pain. As a result, maternal metabolism accelerates, mitigating risks associated with increased oxygen consumption, acidosis, and cardiovascular complications. These combined effects contribute to facilitating of the labor process [21].

Consistent results were also observed in studies conducted by Hamidzadeh et al. [22] as well as Dabiri and Shahi [23], affirming that LI4 acupressure represents an effective, noninvasive, and readily applicable approach for pain reduction during labor, along with a shorter labor duration.

In contrast to our findings, Lee et al. [24] reported that there was no significant difference in the duration of the second stage of labor, from full dilatation to birth, between the acupressure and touch groups. However, they noted that acupressure was effective in reducing the duration of the first stage of labor.

Moreover, Ozturk and Saruhan [25] found no differences in labor pain between the two groups. In contrast, Chung et al. [26] concluded that acupressure was not effective in reducing the intensity of labor pain during the latent and transition phases of labor.

4.1. Conclusion

The findings from this study affirm that acupressure represents a noninvasive technique capable of significantly alleviating pain. Moreover, it can be readily employed within medical facilities without requiring extensive training, thus enhancing the quality of care provided to laboring pregnant women.

Conflicts of interest

There are no conflicts of interest.

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