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Effect of Various Maternal Positions on Labor Pain and Fetal Heart Rate duringthe First Stage of Labor.

تأثيرالأوضاع المختلفة للسيدات عليألم الولادة ومعدل نبض الجنين خلال المرحلة الأولي للولادة .

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Abstract:*Labor pain is the central and universal part of woman's experience of the childbirth, it is the most severe pain that women have during their life cycles. Hence, the effective management of labor pain is very important to promote materno-fetal wellbeing and decrease their morbidity and mortality rates.* ***The aim of this study:*** *was to determine the effect of various maternal positions on labor pain and fetal heart rate during the first stage of labor.* ***Subjects and Methods:*** *The study was conducted at labor units in obstetrics departments at Tanta University Hospital, El-Menshawy Hospital affiliated to the Ministry of Health and Population & El-Mebara Hospital affiliated to the Health Insurance. A convenience sample of 90 parturient women were selected from the previously mentioned settings according to the inclusion criteria. Five tools were used for data collection;* ***Tool I,*** *Structured interview schedule that include three parts;* ***Part 1:*** *Socio-demographic data of women.* ***Part 2:*** *Reproductive history.* ***Part 3:*** *Abdominal examination.* ***Tool (II):****Cardiotocography (CTG) was used to assess fetal heart rate and uterine contractions.* ***Tool III:*** *Visual Analogue Scale (VAS) was used to assess the severity of labor pain.* ***Tool IV:*** *A modified Version of Johansson Pain – 0 – Meter to assess the quality of labor pain.* ***Tool V:*** *Physiological and behavioral responses scale to labor pain.* ***Results:*** *The results of the present study revealed that assuming the semi-sitting and the left lateral positions during the first stage of labor were associated with normal fetal heart rate, significant improvement in the frequency, duration and intensity of the uterine contractions, marked reduction in the severity of labor pain, significant improvement of the quality of labor pain regarding sensory and affective components, also marked improvement of the physiological as well as the behavioral responses to labor pain compared to the supine position.* ***Conclusion and recommendations:****assuming the semi-sitting position as well as the left-lateral position during the first stage of labor could be considered to be effective method to improve fetal heart rate, frequency, duration and intensity of the uterine contractions, also reduce the severity of labor pain and improve the quality as well as the associated physiological and behavioral responses to labor pain. So, all parturient women should be encouraged and supported to assume the semi-sitting and left lateral positions during the first stage of labor to promote maternal and fetal wellbeing.*

Keywords:*Labor pain, Maternal positions, Fetal heart rate, First stage of labor.*

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I. Introduction

Labor or parturition is the process whereby the products of conception are expelled from the uterine cavity after the 28th week of gestation [(1)]. Generally, the childbirth process is divided into four stages [(2)]. First stage of labor starts from the onset of true labor pain and ends with full cervical dilatation and effacement, it is called (the dilation stage). Second stage (expulsive) starts with the complete cervical dilatation and effacement and ends with expulsion of the fetus [(3)]. Third stage (placental delivery) begins after the expulsion of the fetus and ends with expulsion of the placenta. The fourth stage is the first two observational hours after placental delivery. The first stage of labor is usually associated with increasing the amount of maternal pain and discomfort as it is the longest period compared to the second, third and the fourth stages of labor [(4)].

Labor pain is the central and universal part of woman's experience of the childbirth, it is an unpleasant, complex, highly individualized experience. Labor pain is the most severe pain that women have during their life cycles [(5)]. On the other hand, it is considered as normal physiological and functional process rather than pathologic as it is ends with desirable outcome(expulsion of the fetus), so labor pain differs from other types of pain that result from injury. It is caused by physical and psychological factors[(6)].

World health organization statisticsshows that caesarean section rate has been growing worldwide from the reasonable percentage 10- 15% to 50% [(7)]. In addition, according to theMinistry of Health and Population (MOHP), in 2015 the rate of cesarean section in Egypt increased from (28%) in 2008 to (52%) in 2014. This increase results from the increased number ofelective CS as women have fear, anxiety and stress from labor pain. So it is important to offer alternative methods to decrease labor pain and support women during first stage of normal labor[(8, 9)].

Nursing management of laborpain is a major goal of intra-partum care. Worldwide, there are a wide range of modern invasive and non-invasive techniques to relieve labor pain including pharmacological and non-pharmacological options [(10)]. The pharmacological options are effective but it results in many side effects. On the other hand, the non- pharmacological methods are safe, harmless, in-expansive, do not require much training and also easy to administer. These include; acupressure, acupuncture, reflexology, aromatherapy, breathing and relaxation techniques, back massage, application of hot and cold compression as well as frequent changing positions [(11, 12)].

Maternal positioning during labor affects the anatomical and the physiological adaptations needed to influence all aspects of labor including the powers, passage, passenger and psychological status. Furthermore, it influences the characteristics and effectiveness of uterine contractions, fetal well-being, maternal comfort, course of labor and enhancing the maternal satisfaction with the birth experience [(13)]. There are wide varieties of positions that the woman can assume during the first stage of labor including dorsal recumbent positions (supine and left lateral positions) and upright positions (semi- sitting, sitting, standing, squatting as well as knelling positions) [(2)].

Generally, the majority of women lie in the supine position during the first stage of labor. This helps the health care providers to monitor the progress of labor and to perform the abdominal examination in order to assess uterine contractions, fetal heart rate, lie, position, attitude and presentation [(14)]. Supine position also, facilitates the performing of vaginal examination to assess cervical dilation and effacement. Otherwise, this position increases the pressure of gravid uterus on the inferior vena cava which reduces maternal cardiac blood return from lower extremities and decreases placental blood flow that negatively affects the fetal heart rate and also, increases the number of decelerations. Additionally it may decrease the efficiency of uterine contractions leading to prolonged labor [(15,16)].

On the other hand, assuming the left lateral and the semi-sitting positions during the first stage of labor is highly beneficial for the woman and her fetus as it takes the pressure off from the inferior vena cava that results in improving the maternal cardiac output and venous return and so improves the placental blood flow, leading to normal fetal heart rate level and maintains the efficiency of uterine contractions [(14)]. Furthermore, the evidence based nursing practice supports the frequent maternal change of positions and assuming the upright positions during the first stage of labor, which speed the cervical dilation, prevents the inferior vena cava compression, encourage the descent of the fetal head and also promote fetal wellbeing and maternal comfort due to the effect of gravity [(17, 18)].

Thus, maternity nurses are in unique position to provide the women with clear, consistent, and evidence based explanation regarding the risks and the benefits of the different positions assumed during the first stage of labor. They also, can help the women to make decisions about the proper position such as (left lateral and semi-sitting positions) which will afford the most advantage for the woman and her fetus during labor [(19)]. Hence, this study aims to determine the effect of various maternal positions on labor pain and fetal heart rate during the first stage of labor.

Aim of the study

The aim of this study was to:-Determine the effect of various maternal positions on labor pain and fetal heart rate during the first stage of labor.

Research hypotheses:

Women who assumed the left lateral position and the semi- sitting position during the first stage of labor are expected to have less fetal heart rate abnormalities and less maternal pain than those who assumed the supine position.

II. Subjects and Method

Subjects

Study Design:

A quasi experimental design was used to conduct this study. Such design fits the nature of the study under investigations, in which the researcher tried to investigate the effect of various maternal positions on labor pain and fetal heart rate during the first stage of labor.

Setting: The study was conducted at labor units in obstetrics departments at:

1. Tanta University Hospital.
2. El-Menshawy Hospital affiliated to the Ministry of Health and Population.
3. El-Mebara Hospital affiliated to the Health Insurance.

Subjects:

A convenience sampling of 90 laboring women were selected from the previously mentioned settings (30 subjects from each hospital) according to the following inclusion criteria: aged from 20-35 years,primi-para women, normal course of pregnancy, gestational age from 37- 42 weeks, no history of medical or obstetrical diseases or complications, had a single fetus with cephalic presentation, with normal spontaneous onset of labor, at the first (1^{st}) stage of labor, willing to participate in the study.

The subjects were divided equally into three groups:

- **Group I:** 30 women who were assumed the supine position during the first stage of labor.
- **Group II:** 30 women who were assumed the left lateral position during the first stage of labor.
- **Group III:** 30 women who were assumed the semi-sitting position during the first stage of labor.

Tools of data collection: To achieve the aim of the study. Five tools were used.

Tool (I): A structured interview schedule: This tool was developed by the researcher after reviewing the related literature[6,7]. It was used to collect basic data about women. It was consisting of three parts:-

Part 1: Socio demographic data including: age, educational level, occupation, residence, income and the type of family.

Part 2: Reproductive history including: last menstrual period, gestational weeks, antenatal follow up visits, number and place of antenatal visits, number of gravida, number of abortion, previous health education provided to women about the preparation and the different positions can be used during labor.

Part 3:Abdominal examination (palpation): to ensure gestational age, fetal lie, presentation, position and engagement.

Tool (II): Cardiotocography (CTG): This tool was adopted from**Khadrawy M (2015)** [20]. It is a technical means of recording (-graph) the fetal heart beats (cardio-) and the uterine contractions (-toco-) through simultaneous recordings performed by two separate transducers, the first one detecting the fetal heart rate (FHR). The second one for estimating the uterine contractions (frequency and duration). The researcher was measured the fetal heart rate and the uterine contractions then the values were recorded on the measurement schedule included the following: the baseline fetal heart rate, fetal bradycardia, fetal tachycardia, baseline variability, acceleration and deceleration.

- The uterine contractions were measured by using toco transducer of the cardiotocography machine for the three different groups (supine, left lateral and semi-sitting) to record frequency and duration of contractions. The intensity of uterine contractions was evaluated by the researcher through palpating the uterine fundus during the uterine contractions. It was recorded as mild, moderate or strong.

Tool (III): Visual Analogue Scale (VAS):

The severity of labor pain was assessed by using Visual Analogue Scale. It is self-reported device consisting of 10 cm straight line, which represents a continuum of pain intensity and has verbal anchors at opposite ends representing no pain to severe pain. Pain intensity was evaluated by asking the women to point to the line that represented the intensity of their pain [21].

The scoring system included: (Zero) represented no maternal pain, from (1-3) represented mild maternal pain, from (4-6) represented moderate maternal pain and from (7-10) represented severe maternal pain.

Tool (IV): A modified Version of Johansson Pain – 0 – Meter:

A modified version of Johansson pain – 0 – meter was used to assess the quality of labor pain was adopted from***Johansson (1988)*** **[22].**This tool measured the intensity of sensory and affective components of labor pain. It is composed of 12 sensory and 11 affective pain words descriptors.

The scoring system included:

- Sensory wordsdescriptors: was rated as follows:cutting (5), tearing (5), sharp (5), burning (4), cramping (4), pressing (4), aching (3),gnawing (3), pinching (2), stinging(2), pricking (1) and sore (1).

- Affective wordsdescriptors: was rated as follows: torturing (5), killing (5), terrifying(5), suffocating(5), dreadful (4), fearful (4),troublesome (3),tiring (3), irritating (2), nagging (1) and happy (0).

Tool (V): Physiological and Behavioral Responses to Labor Pain Scale (PBRPS):

This tool was adopted from ***BelalGh (2006)*** [23]**.** It included two parts:

Part I: Physiological responses:-: included

a. Physiological measurement:-Vital signs (pulse, respiration and blood pressure).

b. Physiological responses:Gastrointestinal tract responses as (nausea and vomiting).Skin responses (skin color and diaphoresis).

Part II: Behavioral responses to labor pain: it is included four major behavioral responses: posture, gross motor activity, facial and verbal expressions.

The scoring system includes:

For each of the four major behavioral responses one of three alternative choices was elicited by the researcher. Each of the 12 alternatives is scored as (0) absent or (1) present. The total scores range from 0-12, this score was translated to the corresponding behavioral responses to labor pain as follows: (0) represented no pain, (<4) represented mild pain, (4-6) represented moderate pain, (7-10) represented severe pain &(≥ 11) represented Unbearable pain.

III. Method

The study was implemented according to the following steps:

1. Administrative approval:

Official permission was obtained from the responsible authority before conducting this study through official letters from Faculty of Nursing Tanta University after clarifying the purpose of the study directed to hospitals directors of obstetrics departments at three setting (Tanta University hospital, El-Menshawy hospital and El-Mebara Hospital) to obtain their approval and cooperation for carrying out the study.

2. Tools development:

- Tool I was developed and used by the researcher after extensive review of recent and relevant literature.
- It was tested for its reliability by test- retest technique.
- The content validity of the developed tool was tested by a jury of five experts in the field.
- Tool II, Tool III, Tool IV and Tool V were adopted, necessary modifications were done; then, these tools were translated into Arabic language.

3. Ethical consideration:

- An informed written consent was obtained from all the study participants after explaining the purpose of the study. The researcher was assured that the nature of the study will not cause any harm and /or pain for the entire sample. Also, confidentiality and privacy was put into consideration regarding the data collected and the participants' rights to withdraw from the study at any time.

4. Pilot study:

- After the development of tools, a pilot study was carried out on 10% of the total sample (9) laboring women who were excluded from the main study sample (3 from each group). This pilot study was conducted one month before the data collection.

5. Data collection:

- Collection of data covered a period of one year (from the beginning of September 2018 to the end of September 2019) from Tanta University hospital, El-Menshawy hospital and El-Mebara Hospital. The researcher was attended the sites of data collection three days per week at the (morning, afternoon, and night shifts) until the predetermined sample were collected. All cases were presented at the time of data collection had the inclusion criteria at each setting were included in the study. The researcher was started with the group I (women who were assumed the supine position) and completed before starting with the other two study groups to avoid contamination of the sample.

6. The study was carried out in four phases:

a. Assessment and planning phase:

- The assessment was done at the beginning of the latent phase at early stage of 1st of labor. The researcher had met every woman from each group individually, greeted her respectfully with kindness to gain her cooperation and introduced herself to the woman, explained the aim of the study, time needed for data collection, and take the oral and written consent. Then, each woman assigned to (group I, or group II or group III) according to her choose. After that, the researcher asked the woman questions in Arabic language and recorded the answers in the pre-developed tool I (***A structured interview schedulepart 1 and 2***) this interview take15 minutes.

b.Implementation phase:

- The researcher had met every woman in each group individually to explain the technique of the selected positions, how to assumed it and its benefits by using (poster presentation and video show) for 10 minutes to gain more confidence on how the woman assumed the selected position. Before the woman assumed the selected position, the researcher asked her to assume the dorsal recumbent position and then palpating the woman's abdomen to determine the height of uterine fundus, fetal lie, presentation, position and engagement then recorded this data in the pre-developed tool I (**Part *3***).
- The researcher, then applied gel on the woman's abdomen, then placed the ultrasound transducer where the fetal heart rate is best heard (on the fetal anterior shoulder) to monitor the fetal heart rate and placed the toco transducer over the uterine fundus to assess the uterine contractions. Then the researcher secured the two transducers by the belts for 10 minutes until the fetal heart rate and uterine contractions become graphed on the monitor. The researcher used tool II ***(CTG)*** to record fetal heart rate and uterine contractions (frequency and duration).
- After all, the researcher removed the transducers from woman's abdomen and palpated the fundus during the uterine contractions to assess its intensity and recorded it in tool II. The level of maternal pain was assessed and recorded using tool III (***VAS***). The quality of labor pain (sensory and affective) was assessed and recorded using tool IV (***A modified version of Johansson pain – 0 – meter*****)**. Finally, the physiological responses to labor pain were assessed as follow: - vital signs, gastrointestinal tract responses as (nausea and vomiting), skin responses (skin color and diaphoresis) and the behavioral responses including (postures, gross motor activity, facial and verbal expressions) were measured and recorded using tool V***(PBRPS)*** for the three study groups.
- At the beginning of the active phase, woman in ***group I*** asked to assume the supine position on which the woman is lying flat on her back on the bed for 15-20 minutes every hour until complete cervical dilation. The woman in ***group II***had instructed to assume the left lateral position in which she is lying on her left side with pillow between legsfor 15-20 minutes every hour until complete cervical dilation while women in ***group III***had instructed to assume the semi- sitting position where the woman is setting on the bed with the head of the bed elevated at a 45° anglewith pillows used for support for 15-20 minutes every hour until complete cervical dilation. Women of the three groups were allowed to change their position for 10- 15 minutes for rest according to their comfort.
- All women among the three groups had kept under continuous assessment every hour. The researcher had recorded fetal heart rate parameters as follows: baseline FHR, any abnormality such as tachycardia, bradycardia, acceleration and/or deceleration (early, late, variable and prolonged). Also, the uterine contractions including (frequency, duration) had recorded used **tool II** and the intensity of contractions evaluated by the researcher. The level of maternal pain was assessed using **tool III.** The quality of labor pain assessed and recorded using **tool IV**. The physiological and behavioral responses also were assessed and recorded using **tool V**.

7. Results

Table (1): Shows the socio-demographic characteristics of the studied women (supine, left lateral and semi-sittinggroups). It was noticed that the mean age of the supine, semi-sitting and left lateral groups were (25.03±2.40, 24.40±1.81 &23.90±1.32 respectively), It was also, observed that nearly two thirds (63.3%) of the supine and semi-sitting groups corresponding to more than half (56.7%) of the left lateral group were housewives. As regard the residence, it was demonstrated that (73.3%, 60.0% & 56.7%) of the supine, semi-sitting and left lateral groups respectively were born in rural areas. Also, it was recorded that nearly half (46.7%) of the left lateral, and semi-sitting groups had preparatory education corresponding to two fifth (40.0%) of the supine group. Regarding the income of the studied women it was clear that (80.0%) of the left lateral and semi-sitting groups corresponding to two thirds (66.7%) of the supine group had enough income. Furthermore, almost half (56.7%) of the supine and semi-sitting groups corresponding to most (90.0 %) of the left lateral group were

living in nuclear family with statistically significant difference between the three groups (X^2 =11.100, P= 0.004*).

Table (1): Percent distribution of the studied women (supine, left lateral and semi-sitting groups) regarding their socio-demographiccharacteristics.

Variables	The studied women (N=90)						χ^2	P
	Supine group (N=30)		Left lateral group (N=30)		Semi-sitting group (N=30)			
	N	%	N	%	N	%		
Age years:								
Range	20-31		22-26		22-28			
Mean±SD	25.03±2.40		23.90±1.32		24.40±1.81			
F value	2.691							
P	0.073							
Job:								
House wife	19	63.3	17	56.7	19	63.3	0.374	0.829
Employee	11	36.7	13	43.3	11	36.7		
Residence:								
Rural	22	73.3	17	56.7	18	60.0	2.010	0.366
Urban	8	26.7	13	43.3	12	40.0		
Education level:								
Illiterate	1	3.3	0	0	0	0	6.947	0.326
Primary or preparatory	12	40.0	14	46.7	14	46.7		
Secondary	10	33.3	7	23.3	13	43.3		
University or postgraduate	7	23.4	9	30.0	3	10.0		
Income/month:								
Not enough	10	33.3	6	20.0	6	20.0	4.013	0.236
Enough	20	66.7	24	80.0	24	80.0		
Family type:								
Nuclear family	17	56.7	27	90.0	17	56.7	11.100	0.004*
Extended family	13	43.3	3	10.0	13	43.3		

***Significant (P<0.05)**

Table (2): shows the percent distribution of the studied women (supine, left lateral and semi-sitting groups) regarding the mean fetal heart rate according to CTG findings before and at the 1st, 2nd, 3rd and at the 4th hour after assuming the selected position. It was illustrated that the mean fetal heart rate was (131.00±10.26, 131.00±9.44& 127.00±6.34 respectively) among the supine, semi-sitting and left lateral groups before assuming the selected positionwith no statistically significant difference (F=0.992, P= 0.7332).At the same respect, at the 1st, 2nd, 3rd and at the 4th hour after assuming the selected position there were significant decrease in the mean scores of FHR among the supine group compared to significant increase within the normal range among the semi-sitting and left lateral groups. This was so marked at the 4th hour after assuming the selected position where the mean scores of FHR was decreased from (131.00±10.26 to 115.00±12.48) after assuming the supine position where the mean scores of fetal heart rate were increased from (131.00±9.44 and 127.00±6.34 respectively) to (137.00±11.05 and 136.00±7.43 respectively) after assuming the semi-sitting and left-lateral groups with statistically significant difference (F= 31.522, P= 0.0001*).

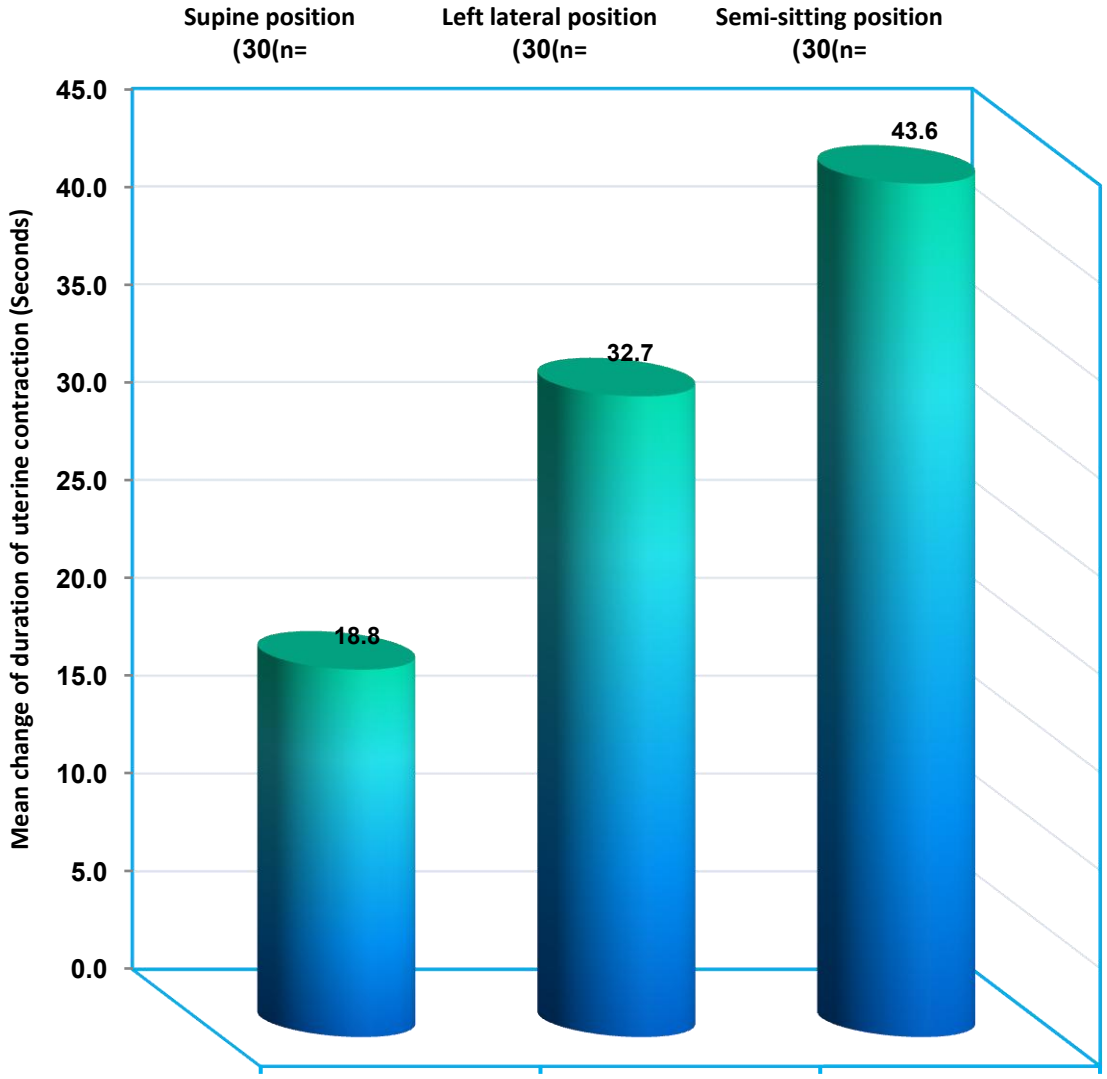
Table (2): Percent distribution of the studied women (supine, left lateral and semi-sitting groups) regarding the mean scores of fetal heart rate according to CTG findings before (during the latent phase) and at the 1st, 2nd, 3rd and at the 4th hour after assuming the selected position (during the active phase).

Mean scores of fetal heart rate (FHR).	The studied women (N=90)			F value	P
	Supine group (N=30)	Left lateral group (N=30)	Semi-sitting group (N=30)		
Before assuming the selected position (during the latent phase):					
Range	110-150	110-150	110-150	0.992	0.7332
Mean±SD	131.00±10.26	127.00±5.67	131.00±9.44		
After assuming the selected position during the active phase:					
1st hour					
Range	110-150	120-140	110-150	5.411	0.006*
Mean±SD	125.00±10.33	129.00±6.65	132.00±9.60		
2nd hour					
Range	105-140	120-140	120-150	14.240	0.0001*
Mean±SD	121.00±9.82	132.00±6.34	133.00±10.01		
3rd hour					
Range	105-140	120-150	120-155	28.934	0.0001*
Mean±SD	116.00±9.25	133.00±8.60	134.00±9.28		
4th hour					
Range	105-155	120-150	120-150	31.522	0.0001*
Mean±SD	115.00±12.48	136.00±7.43	137.00±11.05		

***Significant (P<0.05).**

Figure (1): illustrates the mean change of the uterine contractions duration/seconds according to CTG findings between before and at the 4th hour after assuming the selected position among the studied women (supine, left lateral and semi-sitting groups).It was evident that the mean duration of the uterine contractions has been significantly increased↑by(43.6% & 32.7% respectively) at the 4th hour after assuming the semi-sitting and left lateral positionsthan before compared to slight increase ↑ by(18.8%) after assuming the supine position at the 4th hour than before with statistically significant difference (F=46.335 and P=0.0001*****).

Figure (1): Mean change of uterine contraction duration according CTG findings between before & at the 4th hourafter assuming the selected position among the studied women (supine, left lateral and semi-sitting groups).



F =46.335
P= 0.0001*

Table (3): demonstrates themean scores of labor pain among the studied women (supine, left lateral and semi-sitting groups)according to Visual Analogue Scale (VAS) before (during the latent phase) and at the 1st, 2nd, 3rd and at the 4th hour after assuming the selected position (during the active phase). It was clear that the mean scores of labor pain was (3.00±0.48, 3.00±0.40 & 2.00±0.67 respectively) among the semi-sitting, left lateral and supine groups before maintaining the selected position with no statistically significant difference (F=2.636 & P= 0.077). Moreover, it was evident that the mean scores of labor pain according VAS weresignificantly increased among the supine group compared to the left lateral & semi-sitting groups. This was so significant at the 4th hour after assuming the selected position where the mean scores of the supine group was (9.00±0.68) compared to (7.00±0.74 & 6.00±0.50 respectively) among the left lateral and semi sitting groups with statistically significant difference (F= 105.237 &0.0001*)

Table (3): Mean scores of labor pain among the studied women (supine, left lateral and semi-sitting groups)according to Visual Analogue Scale (VAS) before (during the latent phase) and at the 1st, 2nd, 3rd and at the 4th hour after assuming the selected position (during the active phase).

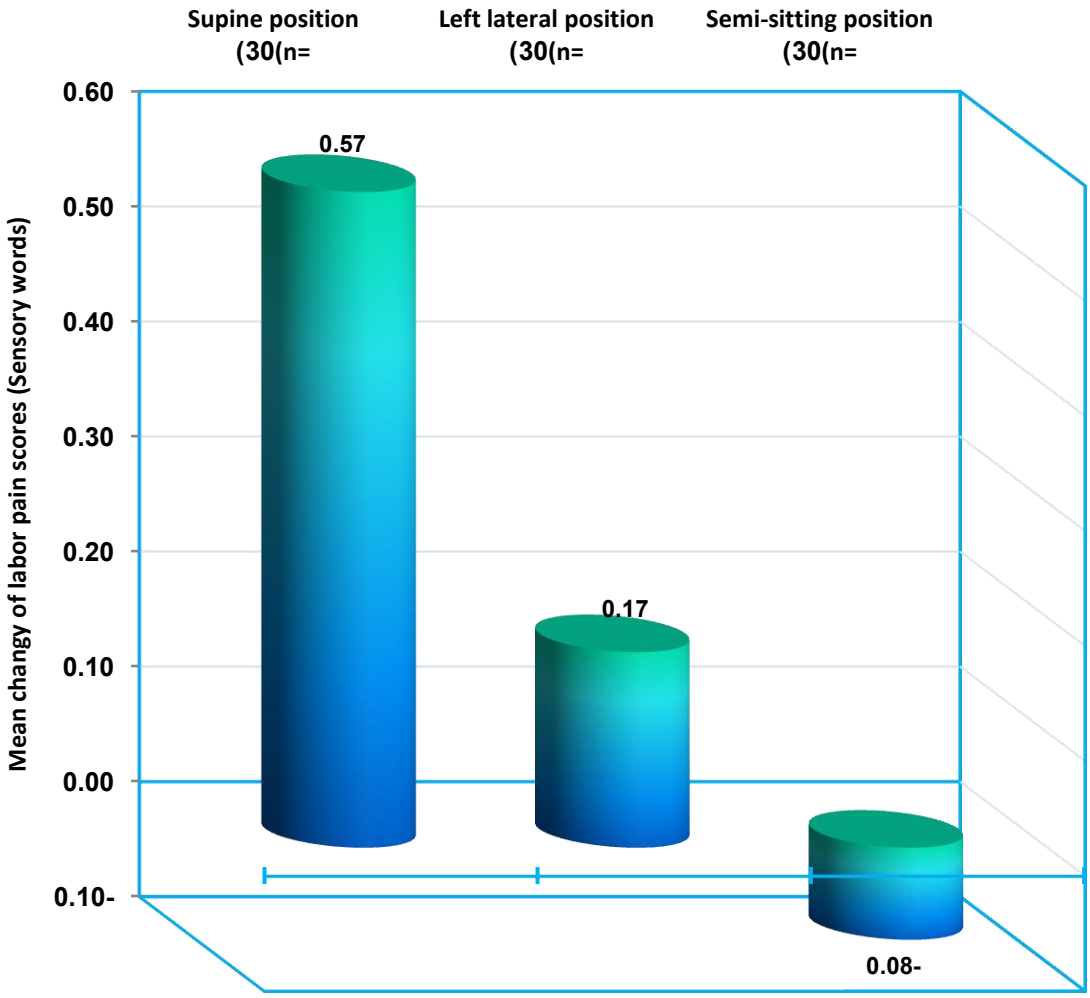
	The studied women (N=90)	F value	P

Mean scores of labor pain among the studied women according to (VAS)	Supine group (N=30)	Left lateral group (N=30)	Semi-sitting group (N=30)		
•**Before maintaining the selected position(during latent phase):**					
Range	2-5	2-4	2-3	2.636	0.077
Mean±SD	2.00±0.67	3.00±0.40	3.00±0.48		
•**After maintaining the selected position during the active phase:**					
1st hour					
Range	3-6	3-5	3-6	3.590	0.032*
Mean±SD	4.00±0.78	4.00±0.41	4.00±0.65		
2nd hour					
Range	5-7	4-6	4-6	20.287	0.0001*
Mean±SD	6.00±0.69	5.00±0.37	5.00±0.64		
3rd hour					
Range	6-8	5-7	5-7	37.049	0.0001*
Mean±SD	7.00±0.63	6.00±0.48	6.00±0.66		
4th hour					
Range	8-10	6-9	6-7	105.237	0.0001*
Mean±SD	9.00±0.68	7.00±0.74	6.00±0.50		

***Significant (P<0.05)**

Figure (2): displays the mean change of labor pain severity according to sensory words description of Jahansson pain -0- Meter between before & at the 4th hour after assuming the selected position among the studied women (supine, left lateral and semi-sitting groups).It was significant that the mean scores of labor pain intensity had been increased according to the sensory words description of Jahansson pain -0- Meter by (↑0.57 & ↑0.17 respectively) at the 4th hour after assuming the supine and left lateral positions than before compared to significant decrease by (↓-0.08) at the 4th hour after assuming the semi-sitting position than before with statistically significant difference (F= 42.745 &P= 0.0001***)**

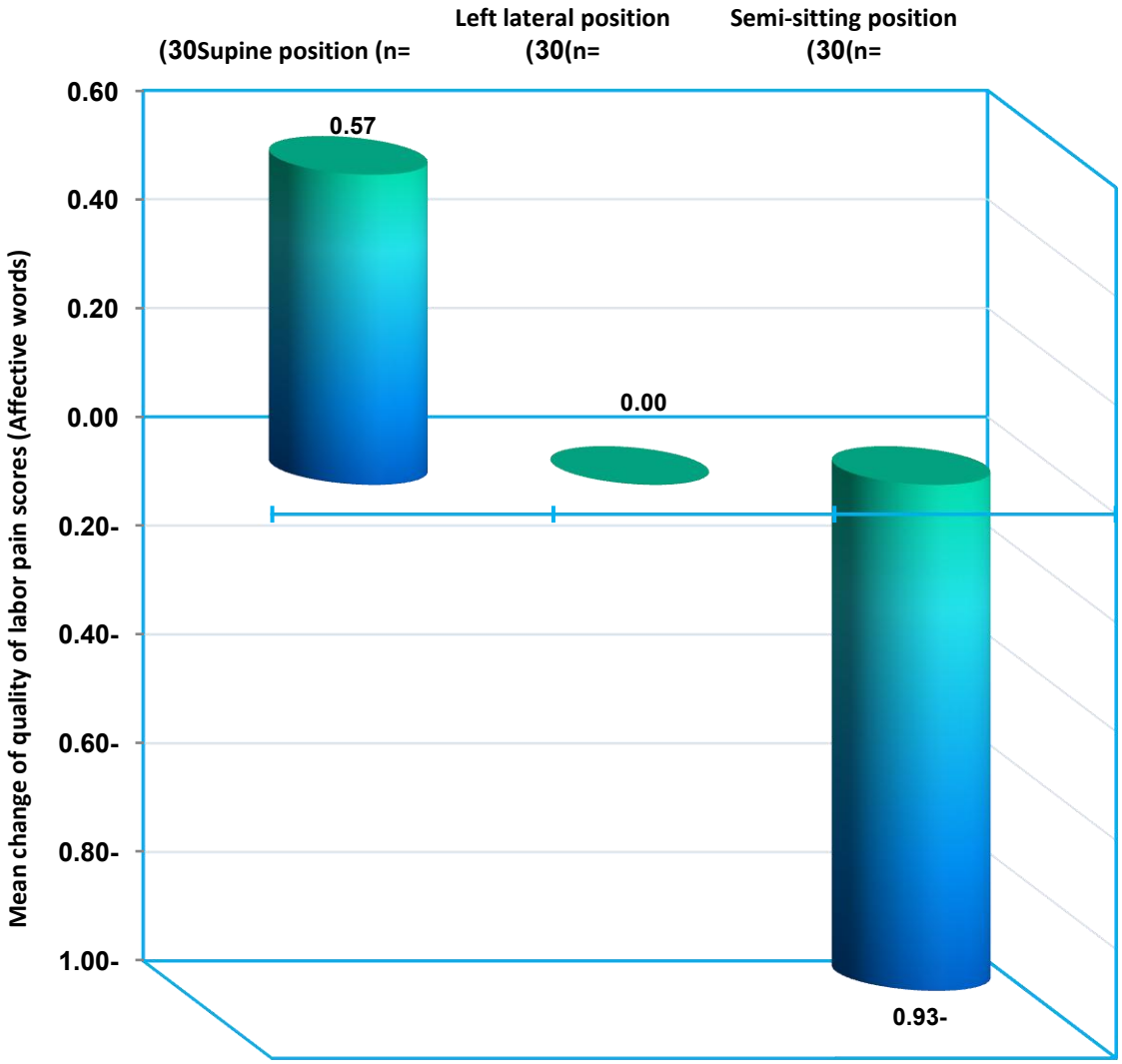
Figure (2): Mean change of labor pain severity according to sensory words description of Jahansson pain -0- Meter between before and at the 4th hour after assuming the selected position among the studied women (supine, left lateral and semi-sitting groups).



F = 42.745
P= 0.0001*

Figure (3): portrays the mean change of quality of labor pain severity according to affective words description of Jahansson pain -0- meter between before & at the 4th hour after assuming the selected position among the studied women (supine, left lateral and semi-sitting groups). It was clear that the mean scores of labor pain intensity according to affective words description of Jahansson pain -0- meter had increased by (↑0.57) at the 4th hour after assuming the supine group than before. On the other hand, there were decrease of the mean scores of labor pain by (↓-0.93) at the 4th after assuming the semi-sitting position than before with statistically significant difference (F=40.384, P=0.0001*)**.**

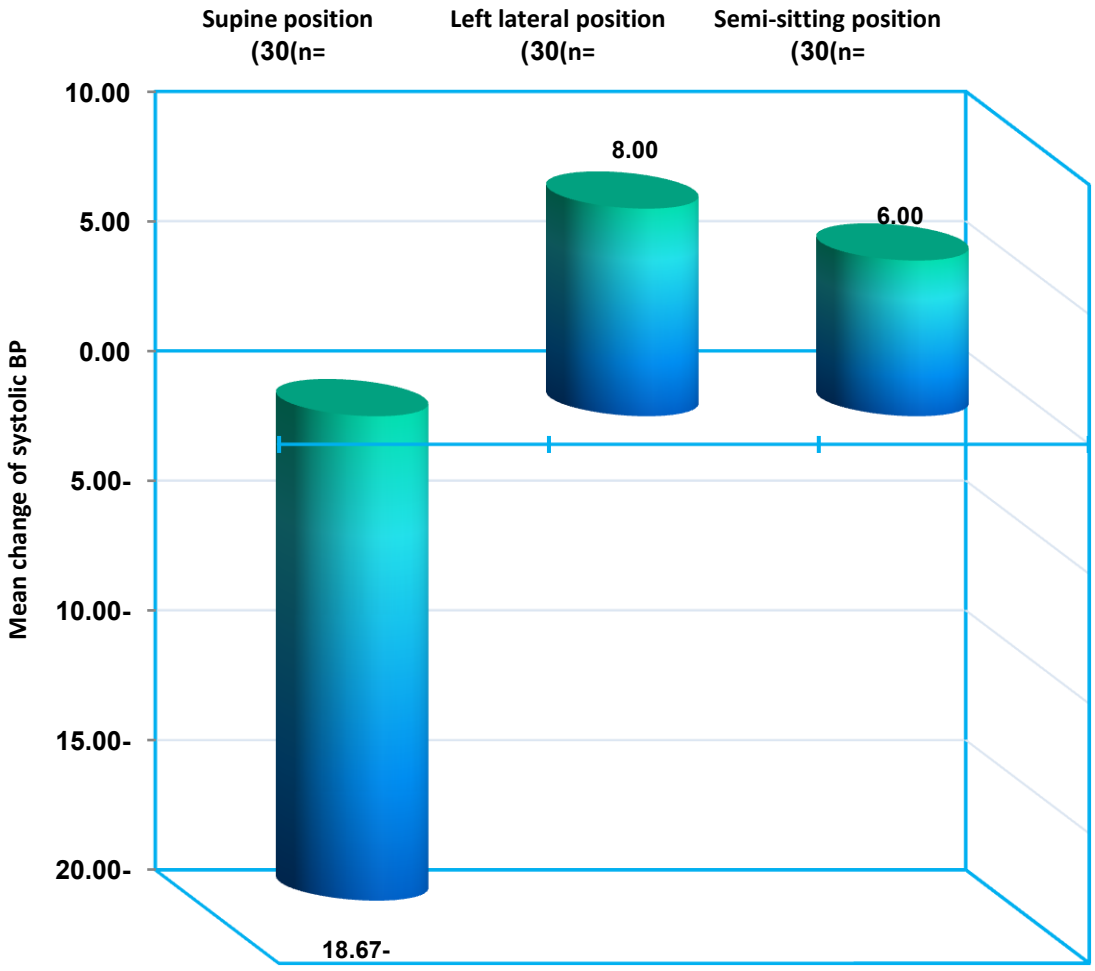
Figure (3): Mean change of quality of labor pain severity according to affective words descriptors of Jahansson pain -0- Meter between before & at the 4thhour after assuming the selected position among the studied women (supine, left lateral and semi-sitting groups).



F =40.384
P= 0.0001*

Figure (4): displays the mean change of systolic blood pressure between before & at the 4th hour after assuming the selected position among the studied women (supine, left lateral and semi-sitting groups).It was noticed that the mean systolic BP had been decreased by (↓-18.67) mmHg at the 4th hour after assuming the supine position than before compared to significant increase within the normal range by (↑8) mmHg after assuming the left lateral position & (↑6) mmHg after assuming the semi-sitting position at the 4th hour than before with statistically significant difference (F= 55.411, P= 0.0001*).

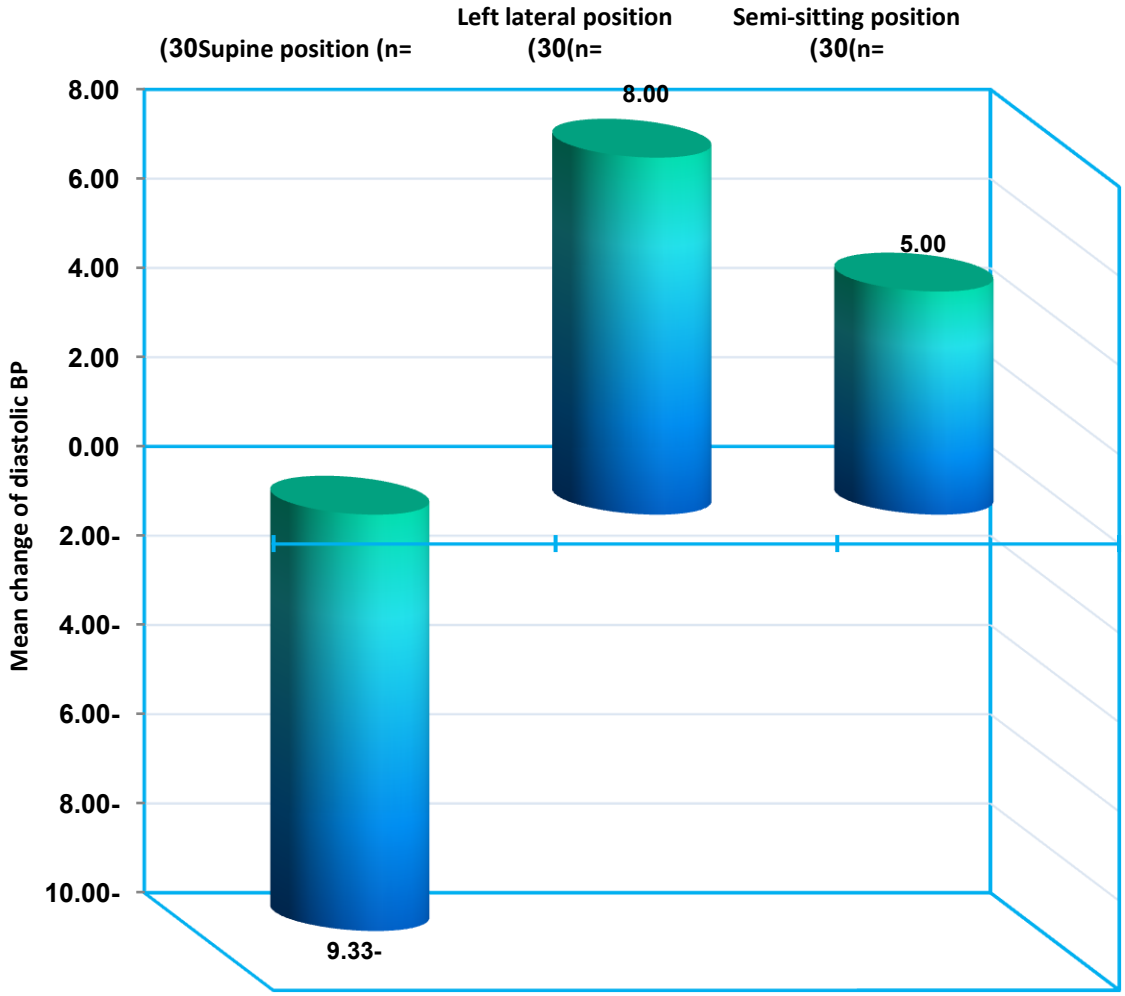
Figure (4): Mean change of systolic blood pressure between before & at the 4th hour after assuming the selected position among the studied women (supine, left lateral and semi-sitting groups).



F=55.411
P= 0.0001*

Figure (5): portrays the mean change of diastolic blood pressure between before & at the 4th hour after assuming the selected position among the studied women (supine, left lateral and semi-sitting groups). It was demonstrated that the mean diastolic blood pressure had reduced by (↓-9.33) mmHg at the 4th hour after assuming the supine position than before compared to evident increase within the normal range by (↑8) mmHg after assuming the left lateral position & (↑5) mmHg after assuming the semi-sitting position at the 4th hour than before with statistically significant difference (F= 50.134, P= 0.0001*).

Figure (5): Mean change of diastolic blood pressure between before & at the 4th hour after assuming the selected position among the studied women (supine, left lateral and semi-sitting groups).



F=50.134
P= 0.0001*

Table (4): presents the total mean scores of the behavioral responses to labor pain among the studied women (supine, left lateral and semi-sitting groups) before and at the 1st, 2nd, 3rd and at the 4th hour after assuming the selected position during the active phase. It was demonstrated that the total mean scores of behavioral responses were (7.97±0.18, 7.63±1.46& 7.00±0.00 respectively) among the semi-sitting, supine & left lateral groups before assuming the three positions with no statistically significant difference (X^2 =0.877, P=0.420). While at the 4th hour after assuming the different positions, it was marked that the mean scores were (7.80±0.80 &7.73±1.54 respectively) among the left lateral and supine groups compared to (2.67±3.83) of the semi-sitting group with statistically significant difference (X^2 =40.145, P=0.0001*).

Table (4): Total mean scores of behavioral responses to labor pain among the studied women (supine, left lateral and semi-sitting groups) before and at the 1st, 2nd, 3rd and at the 4th hour after assuming the selected position during the active phase.

Total mean scores of behavioral responses to labor pain among the studied women	The studied women (N=90)			F value	P
	Supine position (N=30)	Left lateral position (N=30)	Semi-sitting position (N=30)		
•Before assuming the selected position:					
Range	0-8	7-8	7-8	0.877	0.420
Mean ±SD	7.63±1.46	7.00±0.00	7.97±0.18		
•After assuming the selected position during the active phase: 1st hour					
Range	0-8	8-8	6-8	0.765	0.469
Mean ±SD	7.73±1.46	8.00±0.00	7.93±0.36		
2nd hour					
Range	0-8	6-8	8-8	0.765	0.469
Mean ±SD	7.73±1.46	7.93±0.36	8.00±0.00		
3rd hour					
Range	0-8	6-10	6-10	0.699	0.500
Mean ±SD	7.73±1.46	8.00±0.52	7.97±0.56		
4th hour					
Range	0-8	4-8	0-8	40.145	0.0001*
Mean ±SD	7.73±1.54	7.80±0.80	2.67±3.83		

***Significant (P<0.05)**

8. Discussion

The first stage of labor is the most stressful, painful and longer stage of the childbirth process. Labor pain is a complex phenomenon that provokes tension and anxiety leading to many complications such as abnormal fetal heart rate, fetal distress, low Apgar scores, maternal exhaustion, prolonged and also obstructed labor that eventually lead to cesarean section delivery [(24)]. However, labor pain relief is an important issue in obstetrics and midwifery care, up till now; there are no standard or accepted techniques for its relief without side effects. Generally there are two options for pain relief during labor; pharmacological and non-pharmacological. Maternal position during first stage of labor is one of the non-pharmacological options [(25)].

The effective and safe maternal position during this period is predominant for fetal and maternal wellbeing. Although, there is a growing body of evidence that support assuming the upright position during the first stage of labor is highly beneficial for fetal and maternal wellbeing, still the majority of the parturient women worldwide assuming the supine position during the first stage of labor but assuming this position not based on systematic scientific research evidence [(26, 27)].

The findings of the present study declared that the study subjects of the three groups (supine, left lateral and semi-sitting) were matching in nearly most of the aspects of their socio- demographic characteristics with no statistically significant difference. This matching is useful in limiting the extraneous variables which may interfere with the effect of the three positions on labor pain and fetal heart rate. This finding was in line with**Emam A., & Al-Zahrani A (2018)**[(28)]they reported that the study subjects of both groups upright and recumbent positions were homogenous in their socio- demographic characteristics with no statistically significant difference.

Concerning the mean fetal heart rate measured by cardiotocography the present study revealed that there was a significant decrease in the mean scores of FHR among the supine group compared to significant increase within the normal range among the semi-sitting and left lateral groups at the 1st, 2nd, 3rd and at the 4th hours after assuming the selected position. This finding aligns with **Judie A et al., (2015)**[(29)] who investigated the effectiveness of left lateral position versus upright position on fetal heart rate and labor pain among parturient mothers during the first stage of labor. They demonstrated that the parturient mothers who adopted left lateral and upright positions had normal fetal heart rate, while theleft lateral position was more effective.

Moreover the current findings also supported by **Stone P et al., (2016)** [(30)] they studied the (effect of maternal position on fetal behavioral state and heart rate variability in healthy late gestation). They illustrated that there was evident relation between maternal position and the mean fetal heart rate where the mean fetal heart rate reduced among the supine group. Furthermore, **Zwelling E (2010)** [(31)]declared that there was significant difference between the upright and recumbent positions in terms of mean fetal heart rate. **Athukorala et al., (2006)** [(32)]also, reported that using the supine position during first stage of labor was associated with decrease in the fetal heart rate.

This harmonization between the current study and the other studies is also, supported by the literature review which explained that supine position leads to aorto-caval compression syndrome in which the gravid uterus compress the abdominal aorta and inferior vena cava, this results in decrease blood supply to the uterus, decrease placental perfusion, decrease fetal oxygen supply and consequently decrease fetal heart rate. On the other hand, the left lateral position is highly beneficial for fetal wellbeing as this position reduce the pressure of the internal organs on the umbilical cord thus improving fetal circulation, oxygenation and maintaining normal fetal heart rate. In the same line, the semi-sitting position also helps to supply better oxygen to the fetus and improves fetal heart rate [33, 34].

Regarding the duration of uterine contractions, the findings of the present study clarified that there were significant increase in the duration of uterine contractions at the 1st, 2nd, 3rd, and at the 4th hour after maintaining the semi-sitting and left lateral positions compared to the supine position. These findings were in accordance with **Rana A (2103)** [35]who evaluated the effect of upright position on the duration of the first stage of labour among nulliparous mothers. The researcher revealed that intensity and duration of uterine contraction significantly increased among the upright group compared to the supine position.

Furthermore, the finding of the present study is matching with **Rinata E et al., (2018)** [36]who investigated (How do birth massage and position change affect labor pain during the active phase). They supposed that there was significant increase in the number, duration, and intensity of uterine contractions among women who assume the sitting and left-lateral positions compared to the control group. The same findings supported by **Nilsen E J et al., (2011)** [37] who reported that there were more efficient uterine contractions with higher intensity among parturient women who assumed non vertical position. This congruity between the current study and the above mentioned studies attributed to the effect of gravity which potentially reduce the aorta caval compression resulting in strengthened uterine muscles also, it aids onto the descend of fetal head into the pelvis and increase diameters of the pelvis which in turn promotes progress of uterine contractions.

Concerning, the mean scores of the quality of labor pain intensity according to sensory and affective words descriptors of Jahansson pain -0- Meter scores. It is found that there was significant increase of the mean scores of quality of labor pain among the supine group compared to the left lateral and semi-sitting groups after assuming the different positions. The findings of the present study nearly match the result of **Johansson N et al., (2018)** [38] who demonstrated that the intensity of sensory and affective component of labor pain had increased among women during the first stage of labour.

Therefore, the findings of the present study aligns with **BelalGh(2006)** [23] who justified that the intensity of the sensory and affective component of labor pain had decreased after the application of acupressure, this agreement between the two studies might be related to the effectiveness of the two techniques used. In addition, this study was in line with **Abd El-khalik R (2015)** [39]who studied (the effect of trans-cutaneous electrical nerve stimulation (TENS) on pain intensity during the active phase of the first stage of labor). The researcher reported that the mean scores of sensory and affective component of labor pain had significantly decreased after applications of TENS, this harmony attributed to the previous justifications.

Concerning, the mean scores of the maternal blood pressure, the present study declared that it was significantly increased within the normal range among the left lateral and semi-sitting groups compared to evident decrease among the supine group. These findings are supported by **Elsayed H and Mohamed S (2016**) [40]who pointed that maternal blood pressure in left lateral and semi-fowler positions was more favorable and within normal range compared to the supine position group.

This result goes hand to hand with **Farag W (2017)** [41], who concluded that, the mean maternal blood pressure decreased in the supine position group, while it is within normal range on left lateral and semi-fowler positions. Moreover, the finding of the present study was compatible with**Khadrawy M (2015)** [20]who recommended that being upright and or in left lateral position during first stage of labor was associated with normal range of maternal blood pressure compared to significant hypotension among the supine position.

This harmony, between the findings of the present study and the previous studies might be attributed to the fact that when the woman maintained the supine position, the enlarged uterus compresses the inferior vena cava resulting in decrease blood pressure, reduced venous return and cardiac output and also causing orthostatic hypotension. Meanwhile, among the left lateral and semi-sitting position groups the symptoms of aorto-caval compression are alleviated and the hemodynamic alteration in brachial blood pressure as well as heart rate are kept within normal [42, 43].

According to the total meanscores of behavioral responses to labor pain at the 4th hour after assuming the three positions it was marked that the mean scores were (7.80±0.80 &7.73±1.54 respectively) among the left lateral and supine groups compared to (2.67±3.83) of the semi-sitting group with statistically significant difference (X^2 =40.145, P=0.0001*). The findings of the present study concluded that assuming the semi-sitting position during the first stage of labor is associated with less behavioral responses to labor pain followed by the left-lateral position compared to the supine position. This conclusion of the current study disagreed with **Nilsen E J et al., (2011)** [37] and **Alus (2007)** [44]they summarized that left-lateral position provide more improvement of

the women behavioral responses to labor pain compared to semi-fowler and supine positions during the non-stress test.

So, thefindings of this study building up enough number of researches to establish evidence about importance of maintaining upright and left lateral positions during the first stage of labor. Hence an opportunity exists for nursing to demonstrate leadership in the integration of adopting semi-sitting and left lateral positions during first stage of labor to promote maternal and fetal wellbeing. As nursing is the logical discipline to be the hub of the wheel of integrative services. Thus, women who assumed the left lateral position and the semi- sitting position during the first stage of labor had less fetal heart rate abnormalities and less maternal pain than those who assumed the supine position.

9. Conclusion

Hence assuming the semi-sitting position as well as the left-lateral position during the first stage of labor could be considered to be effective method to improve the fetal heart rate, the frequency, duration and intensity of the uterine contractions, also reduce the severity of labor pain, improve the quality as well as the associated physiological and behavioral maternal responses to labor pain.

10. Recommendations

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

- All parturient women should be encouraged and supported to assume the semi-sitting and left lateral positions during the first stage of labor to promote maternal and fetal wellbeing.
- In service educational programs should be implemented for maternity nurses about the benefits of different maternal positions that should be assumed during the first stage of labor.
- Plan and develop antenatal classes for women to increase their awareness about the non-pharmacological options that used to cope with labor pain and promote fetal wellbeing including different maternal positions.

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