Influence of Ambulation during the First Stage of Labor on Labor Progress of Primi Parturients

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Abstract

Background: The first labor stage is the longest. Progress of labor is usually assessed by changes in cervical dilatation, the descent of the fetal head, and uterine contractions. Normal labor progress might be attained by providing evidence-based practices. Ambulation during labor is one of the practices that may affect the progress of labor. **Aim:** This study aimed to assess the influence of ambulation during the first stage of labor on labor progress of primi parturients. **Methods:** A quasi-experimental research design was conducted at the Labor and Delivery unit, Mansoura University Hospital, Egypt. A purposive sample of 86 primi parturient mothers at the early active phase was allocated either to the control group who received the usual labor care or to the ambulation group who were ambulated during the active phase besides the usual care. Data were collected using a structured interview schedule and the modified Partograph sheet. **Results:** The labor progressed faster in the ambulation group compared to the control group giving a shorter active phase, second stage and third stage of labor with a mean difference of 2.3 hours, 20.1 minutes, and 3.0 minutes respectively; $p<0.001$) and lower Cesarean Section deliveries (11.6% vs. 41.9% respectively; $p = 0.002$). **Conclusion:** The current study hypotheses were accepted; where the ambulation during the active phase of the first stage of labor was an effective intervention for enhancing the labor progress compared to the usual care only. Thus, it is recommended for the primi parturient mothers to ambulate at the early active phase of labor.

Key words: Ambulation, Labor progress, Primi, Parturients, First stage of labor

Introduction

The labor process is an inimitable and exciting experience. Yet, it is sometimes worrisome for some parturient mothers. Each one is worried about labor pain, duration, and the progress of labor. The current practice in the Egyptian labor units during the first stage of labor is that the maternity nurses are routinely restrict the parturient mothers in one of the recumbent positions; including supine, semi-recumbent, or lateral **(Abdel Ghani and Berggren 2011 & David et al., 2017).**

Multi factors are known to affect the progress of labor. Among these factors are maternal age, parity, body mass index, fetal size, labor augmentation, and the woman's position. Adopting a recumbent position makes the gravid uterus compress on the aorta; thus reducing or even obstructing the uterine blood flow, causes maternal hypotension, and decreases fetal oxygen **(Withers et al., 2018 & WHO 2019).** Positioning a laboring woman on her back directs the bearing down power against the gravity, delaying descent of the fetal head, and prolong the duration of the labor process.

The prolonged time of labor causes numerous maternal adverse effects and increases the woman's chance of being booked for Cesarean Section (CS) deliveries and instrumental deliveries **(Diorgu 2016).**

Contrariwise, evidence supports adopting upright positions during the first stage of labor; such as sitting standing, ambulation, or kneeling. It was found that adopting upright positions increases the woman's anteroposterior and transverse pelvic outlet diameters, around one hour shorter first stage of labor, less pain intensity, lower instrumental deliveries, and improves the labor progress through natural gravity force **(Nokomis 2016).**

Ambulation during labor is becoming widely held although a review of the previous literature about its effect on the labor outcomes revealed heterogeneity and unclear evidence. Certain literature revealed evidence of frequent strong contractions, progress in fetal head descent, and reposition a fetus from the Occipto-posterior position that is not ideal for birthing to the Occipto-anterior the more favorable for birthing among ambulated women **(Zileni et al., 2017, WHO 2017, & Chang 2018).** Meanwhile, other studies showed no difference between ambulated and non-ambulated groups for the mode of deliveries, labor duration, maternal-neonatal wellbeing, and other outcomes **(Lawrence et al., 2011 & Gizzo et al., 2014).** The investigators of such studies suggested more well-designed clinical trials for evaluating the effect of ambulation on the labor outcomes. This inspired authors of the current study to assess the influence of ambulation during the first stage of labor on labor progress of primi parturients.

Significance of the study

There is a continuous rise in the national and international CS rates. A prospective observational study conducted at Mansoura University Hospital, Egypt revealed a significant increase from 47.25% in 2013 to 65% in 2016 in the same setting **(Zayed and Al-Diasty 2019).** The failure in the progress of labor accounts for 12.44% from the leading causes of CS; stimulating the medical and nursing staff to search for safe noninvasive interventions to enhance the progress of labor. Therefore, the current study was conducted to assess the influence of ambulation during the first stage of labor on labor progress of primi parturients.

Aim of the study

The current study aimed to assess the influence of ambulation during the first stage of labor on labor progress of primi parturients.

Hypotheses of the study

To achieve the aim of the current research two hypotheses were examined.

Hypothesis I: The primi parturients who ambulate during the active phase of the first stage of labor go through faster labor progress compared to those in the control group.

Hypothesis II: The primi parturients who ambulate during the active phase of the first stage of labor have a lower rate of CS deliveries compared to those in the control group.

Subjects and method

Research design

The current research fits the quasi experimental research design. In this design, the effect of manipulating the independent variable (i.e., ambulation) on the dependent variable (i.e., labor progress) was assessed in the absence of any attempt for randomization.

Research setting

This research was conducted at the Labor and Delivery unit of Mansoura University Hospital, Egypt. It is a 19 bedded unit, with 2 delivery tables and a long corridor giving a space for the parturient mothers to ambulate.

Sampling

A purposive sample of 86 parturient mothers in the early active phase of labor (i.e., 4-5 cm cervical dilation) was recruited during the period from the beginning of January 2016 to the end of March 2017. The technique of the sample collection depended on fulfilling the following inclusion criteria:

1. Primi parturient at a gestation age of ≥ 37 weeks.
2. Had a single, viable fetus in Occipto anterior position.
3. Had intact membranes.
4. Free from medical or obstetrical disorders that interrupt the labor progress.

Sample size calculation

This quasi-experimental research aimed to assess the influence of ambulation during the first stage of labor on labor progress of primi parturients. Based on data from a previous study by **Savitha, Nayak, and Paul (2013)** compared the effect of ambulation on the outcome of labor among the ambulated versus (vs.) non ambulated groups, considering the level of significance 5%, and study power of 80% the sample size calculated using the following formula: $n = [(Z\alpha/2 + Z\beta)^2 \times \{2(SD)^2\}]/$ (mean difference between the two groups)2. Where SD means standard deviation, $Z\alpha/2$ depends on the level of significance, for 5% this is 1.96, $Z\beta$ depends on the study power, for 80% this is 0.84. Therefore, $n= [(1.96 + 0.84)2 \times \{2(1.734)2\}]/ (1.05)2 =$ 42.8. Based on the previously mentioned formula, the sample size required per group was 43.

Groups' allocation

To avoid pollution of the collected data, data of the control group were collected first, then the ambulation practice was implemented and data were collected from the ambulation group. To recruit the total sample of 86 parturient mothers, 96 eligible parturients were invited to participate in the current research, a number of 10 parturients refused participation. The 86 parturients were allocated either to the control or to the ambulation group (n=43 per each group). During the first stage one parturient mother from the ambulation group had ruptured membranes at -3 stations, thus instructed to stay in bed to avoid cord prolapse and another one withdrawn because did not tolerate the pain of the uterine contractions. Meanwhile, the participants of the control group completed without withdrawal. The two withdrawn parturient mothers in the ambulation group were replaced and the statistical analysis was done on 86 participants. Flow chart of the study participation shown in **Figure 1.**

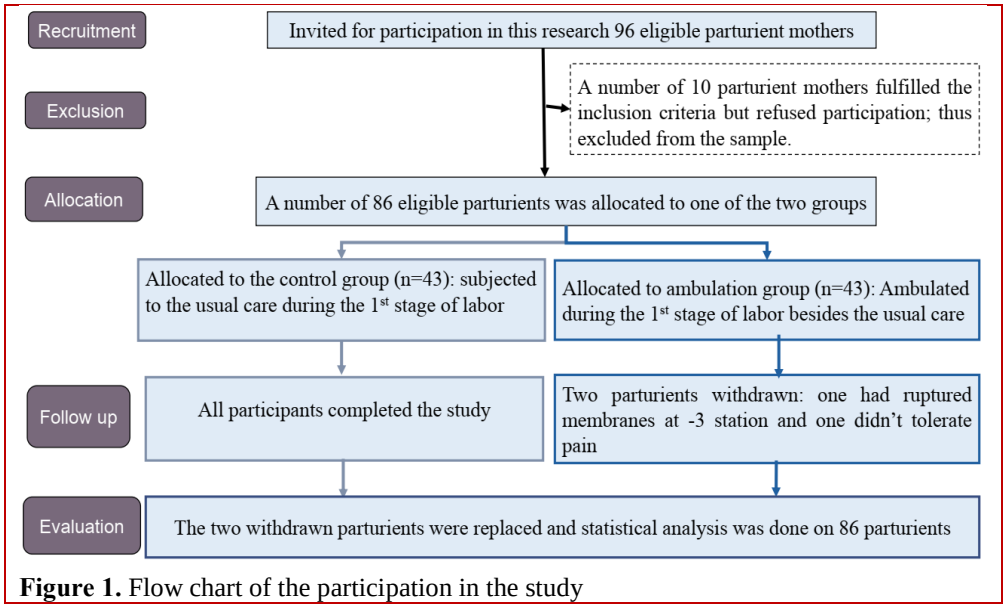

Figure 1. Flow chart of the participation in the study

Tools of data collection

Two tools were used in data collection. A structured interview questionnaire and the modified World Health Organization (WHO) Partograph.

Tool 1. A structured interview schedule

It was developed by the researchers and consisted of two parts. **Part I:** included the basic demographics and obstetrical examination findings. The basic demographics included age, height, weight, and the body mass index (BMI), while the obstetric examination findings included the gestation age on admission, the Bishop Score, and etc. **Part II:** included two-questions Opinionnaire. It was developed by the researchers; after reviewing the literature, to recognize the participants' perceptions about the practice of ambulation or the usual adopted position during the active phase of the first stage of labor. It involved two questions directed to the postpartum mothers: 1) Are you satisfied with your ambulation experience/adopted position during the first stage of labor? 2) Do you prefer to repeat this experience in the next labor process? The parturients responses were recorded as yes or no.

Tool 2. The modified WHO Partograph

It is a standardized tool that presents a continuous illustrative overview of the clinical events that occur during the labor process. It was illustrated by the WHO to enable the medical and nursing staff to timely intervene and correct the deviated labor curve and prevent the prolonged time of labor **(Orji 2008).** It differs than the original in absence of the latent phase. It is divided into three parts arranged from up to down as 1) The fetal condition, 2) the labor progress, and 3) the maternal condition. The fetal condition described by the fetal heart rates which normally range between 110-160 beats/minute, nature of the escaped amniotic fluid (i.e., clear, bloody, or meconium-stained), molding of the sagittal suture which ranges from 0 to +3. The middle part is the labor progress which is described by the

changes in the rate of cervical dilatation in cm, fetal head descent in relation to the ischial spine, and uterine contractions intensity, duration, and interval in between. Lastly, the maternal condition gives an idea about the given medicines and Intravenous fluids, the vital signs, and the findings of urine investigation for protein and acetone, and the urine output is included in the same section.

Validity and reliability of the tools

The content validity of the developed measure; the structured interview questionnaire, was confirmed by a panel of three experts in the maternity nursing specialty before introducing it to the parturient mothers. Validation was done to ensure that the questions were consistently conveyed and carried the anticipated meaning they were prepared for. Their opinions elicited regarding the consistency, accuracy, and relevancy of the tools. No modifications were suggested. Reliability for internal consistency of the measure was assessed statistically through Cronbach's alpha coefficient of 86.7.

Pilot study

A pilot study carried out on 9 parturient mothers who represent 10% of the calculated sample size. The pilot aimed to test the applicability of intervention, the clarity of the developed tool, and to estimate the time needed to complete the study tools. Based on the pilot results, some items were omitted from the Opinionnaire to be two-questions only. Thus, the pilot sample was excluded from the study sample.

Ethical considerations

Before implementing the intervention, official approval was taken from the research ethics committee of the Faculty of Nursing, Mansoura University to perform the current research. Each eligible parturient mother signed an informed written consent after clarification of the aim and approach of the study. Adequate privacy for the participants was maintained during the study and for the collected data after. The parturient mother had a right to withdraw from the study at any time without change on the provided care. In case of any emergency, the intervention could be stopped.

Research process

The current research was carried out through three phases. Baseline data collection, implementation and observation of the intervention, and evaluation of the outcomes.

Baseline data collection

Once eligibility for participation was confirmed, the research aim and method were clarified to each potential participant. Informed written consent was taken from each eligible parturient. Thereafter, the general characteristics and obstetric profile were collected, as well as baseline data were recorded in the Partograph sheet. One by one met the inclusion criteria was assigned for the assigned group; taking into consideration collecting the control group data first then that of the ambulation group.

Implementation and observation

The control group

Each one in this group received the usual care of the first stage of labor while were adopting the usual semi-sitting position according to the following description: 1) The parturient mother was positioned on her back in a bed with head-end elevated to 30°-45° angle for 20

minutes; starting from 4 cm cervical dilation, 2) followed by a 10 minutes rest period in the left lateral position. This was repeated until the participant woman reached a full cervical dilatation.

The ambulation group

Besides the usual care of the first stage of labor, the participants of this group were instructed to ambulate in the long corridor of the Labor and Delivery unit. Each one was taught to ambulate according to the following 2 steps protocol: 1) the parturient was encouraged to walk for 20 minutes; starting from 4cm cervical dilation, 2) followed by a rest period of 10 minutes in the left lateral position. This cycle was repeated until full cervical dilatation. The parturient mother was instructed to return to bed in case of care or assessment was needed. Compliance with the ambulation practice was recorded by repeating the ambulation cycle for at least 6 times.

The parturient mothers of the control group and ambulation group were observed during the labor process for the occurrence of any adverse events which need urgent intervention. Each parturient mother in the ambulation group was instructed to discontinue the practice of ambulation in case of the following events: 1) abnormal fetal heart rate, 2) sudden rupture of the fetal membranes at a high head station (i.e., above 0 station) to prevent umbilical cord prolapse, or 3) unexplained vaginal bleeding. In these cases, the parturient mother withdrawn from the research work.

Evaluation of the outcomes

At the end of the labor process, the Partograph sheets were reviewed for the following outcomes: 1) progress of the cervical dilatation, 2) progress of the fetal head descent, 3) characteristics of the uterine contractions, 4) duration of the labor stages, and 5) need for augmentation or instrumental deliveries. The cervical dilatation was recorded in cm every 2 hours. The fetal head descent was determined by identifying its relation to the ischial spine; it is 0 station at the level of ischial spine, from -3 to -1 above, and from +1 to +3 below the spine. It is recorded simultaneously with the cervical dilatation.

The uterine contractions were described by its duration, interval, and intensity. The duration described in seconds (i.e., it is timed from the moment the uterus begins to tighten until it relaxes again). The interval was described in minutes (i.e., the time period from the beginning of one contraction to the beginning of the next one). Meanwhile, the intensity is described by placing the fingertips gently on the uterine fundus at the beginning of a uterine contraction. It is described as 1) mild when the uterine fundus is felt somewhat tense; like the tip of the nose, 2) moderate when the uterine fundus is felt moderately tense like chin, or 3) strong when the uterine fundus is felt almost hard like forehead.

The need for labor augmentation was recorded by the need for artificial rupture of the membranes or by the Oxytocin infusion. The duration of labor was also determined. Since the parturient mother enrolled in the early active phase; such a phase was determined from admission to full cervical dilation. The duration of the second stage of labor was timed from full cervical dilation to delivery of the fetal head. Meanwhile, the third stage of labor was from the delivery of the fetus to the placenta delivery.

Limitations and strengths

Selecting a quasi-experimental research design in the absence of randomization, implementing the research work in one hospital, and only include the primi parturients may limit the generalize ability of the results and account as limitations in this research. Meanwhile, adequate sample size and repeated measures of cervical dilation and uterine contractions are considered strengths of the current study.

Statistical analysis

All statistical analyses were performed using SPSS for windows version 20.0 (SPSS, Chicago, IL). All continuous data were normally distributed and were expressed in mean ± standard deviation (SD). Categorical data were expressed in number and percentage. The comparisons between the ambulation group and control group were determined by Student's t-test for variables with continuous data and by Chi-square test for variables with categorical data. The mean difference, as well as a 95% confidence interval (CI) of the mean difference, were calculated. Statistical significance was set at $p<0.05$.

Results

Table 1. Basic characteristics of the participants in the control and ambulation groups **(n=86)**

	Control group (n=43)	**Ambulation group (n=43)**	**Significance test**	
Characteristics	Mean ±SD	Mean ±SD	t	P
Age (years)	24.3 ±3.3	25.2 ±3.9	1.128	0.263
Body Mass Index (BMI)	21.6 ±2.0	21.8 ±1.8	0.417	0.678
Gestation age (weeks)	38.2 ±1.2	38.0 ±0.8	0.742	0.460
Bishop score on admission	9.6 ±1.1	9.7 ±1.3	0.352	0.726

Table (1) shows the basic characteristics of the participants in the control and ambulation groups. It is clear from this table that the two groups are matched regarding the age, BMI, gestational age, and the Bishop Score on admission.

Table 2. Changes of the cervical dilatation in the control and ambulation groups

	Control group	**Ambulation group**		**Significance test**	
Time from admission	Mean ±SD	Mean ±SD	**Mean difference** [95% CI]	t	P
On admission (cm)	4.6 ±0.5	4.5 ±0.5	0.1 [-0.17, 0.26,]	0.428	0.670
After 2 hours (cm)	5.5 ±0.5	6.6 ±0.5	-1.1 [-1.31, -0.88]	10.131	<0.001**
After 4 hours (cm)	5.8 ±0.4	7.1 ±0.9	-1.3 [-1.61, -1.04]	9.195	<0.001**
After 6 hours (cm)	7.0 ±0.8	8.9 ±0.9	-1.9 [-2.32, -1.59]	9.018	<0.001**

** **≤ 0.001** highly significant

Table (2) presents the progress of cervical dilatation and fetal head descent in the control and ambulation groups. On admission, the cervical dilatation showed no significant difference between the two groups, however, the parturient mothers in the ambulation group had significantly wider cervical dilatation than those in the control group thereafter. Two-hours post admission, the cervical dilatation was 5.5 ± 0.5 cm vs. 6.6 ± 0.5 cm in the control group and ambulation group respectively, with a mean difference of 1.1 cm ($p<0.001$). Moreover, the cervical dilatation mean differences were larger in favor of the ambulation group participants, reaching 1.3 cm at 4-hours post-admission and reaching 1.9 cm at a 6-hours post admission evaluation points ($p<0.001$). The cervical dilatation at the 6-hours post admission evaluation was assessed for 25 (58.1%) parturients in the ambulation group because 18 (41.9%) had delivered**.**

Table 3. Changes in the fetal head station in the control and ambulation groups **(n=86)**

Time from admission	Control group n (%)	Ambulation group n (%)	Significance test X2	Significance test P
On admission (4-5 cm)				
Above the ischial spine (-3 to -1)	40 (93.0%)	41 (95.3%)		
At the ischial spine level (0)	3 (7.0%)	2 (4.7%)	0.212	0.645
At 2 hours from admission				
Above the ischial spine (-3 to -1)	37 (86.0%)	29 (67.4%)		
At the ischial spine level (0)	6 (14.0%)	14 (32.6%)	4.170	0.041*
At 4 hours from admission				
Above the ischial spine (-3 to -1)	32 (74.4%)	21 (48.8%)		
At the ischial spine level (0)	8 (18.6%)	9 (20.9%)		
Below the ischial spine (+1 to +3)	3 (7.0%)	13 (30.2%)	8.592	0.014*
At 6 hours from admission				
Above the ischial spine (-3 to -1)	26 (60.5%)	0 (0%)		
At the ischial spine level (0)	12 (27.9%)	6 (14.0%)		
Below the ischial spine (+1 to +3)	5 (11.6%)	19 (44.2%)		
Delivered	0 (0%)	18 (41.9%)	54.167	<0.001**
At 8 hours from admission				
Delivered	15 (34.9%)	25 (100.0%)	27.674	<0.001**

*** ≤ 0.05** significant **** ≤ 0.001** highly significant

Table (3) compares the changes in the fetal head stations in the control and ambulation groups. On admission, the fetal head was above the ischial spine level in most parturient mothers in the control and ambulation groups (93.0% vs. 95.3% respectively; p=0.645). At 2-hours post admission, the fetal head was at ischial spine level more frequently in the ambulation group than the control group (32.6% and 14.0% respectively; p= 0.041). Despite, there was no fetal head below the ischial spine level at 2-hours post admission, 30.2% vs. 7% respectively; p =0.014 in the ambulation and control group were passed the level of the ischial spine at 4-hours post admission; indicating greater head descent. A greater descent achieved at the 6-hours evaluation point, the fetal head was below ischial spine level in 44.2% vs. 11.6% respectively in ambulation and control groups. Interestingly, while none of the women in the

control group had delivered at 6-hour post admission, 18 (41.9%) in the ambulation group had delivered. These differences were significant (p<0.001). At the 8-hours post admission, all women in the ambulation group had delivered, while only 34.9% in the control group had delivered. These differences were significant (p<0.001).

Table 4a. Uterine contraction interval and duration in the control and ambulation groups in the active phase **(n= 86)**

Characteristics	Control group Mean±SD	Ambulation group Mean ±SD	Mean difference [95% CI]	Significance test t	P-value
Interval between the uterine contractions(minutes)					
During active acceleration	12.3 ±1.9	3.9 ±0.8	8.4 [7.79, 9.04]	27.007	<0.001**
During active deceleration	7.1 ±1.6	2.4 ±0.5	4.7 [4.19, 5.21]	18.396	<0.001**
Duration of the uterine contractions (seconds)					
During active acceleration	34.5 ±3.1	52.2 ±5.3	-17.7 [-19.55, -15.80]	18.747	<0.001**
During active deceleration	53.3 ±4.6	75.2 ±7.8	-21.9 [-24.67, -19.14]	15.763	<0.001**

Note. ** ≤ 0.001** highly significant
Active acceleration phase (4-7cm) and active deceleration phase (8-10cm)

Table (4a) shows the Progress of uterine contractions in the control and ambulation groups. It clarifies that the interval between the uterine contractions was significantly shorter in the ambulation group than in the control group during the active acceleration phase and during the active deceleration phase by a mean difference of 8.4 and 4.7 minutes respectively. The duration of uterine contractions was significantly longer in the ambulation group than in the control group during the active acceleration phase and during the active deceleration phases by a mean difference of 17.7 and 21.9 seconds respectively. These differences were significant for uterine contractions intervals and duration (p<0.001).

Table 4b. Intensity of the uterine contractions in the control and ambulation groups during the active phase **(n= 86)**

Characteristics	Control group (n,%)	Ambulation group (n,%)	Significance test X^2	P
Intensity of the uterine contractions				
During the active acceleration phase				
Mild	19 (44.2%)	0 (0%)		
Moderate	18 (41.9%)	15 (34.9%)		
Strong	6 (14.0%)	28 (65.1%)	33.508*	<0.001**
During the active deceleration phase				
Moderate	18 (41.9%)	0 (0%)		
Strong	25 (58.1%)	43 (100.0%)	22.765*	<0.001**

Note. ** ≤ 0.001** highly significant
Active acceleration phase (4-7cm) and active deceleration phase (8-10cm)

Table (4b) also shows the intensity of the uterine contractions. This table clarifies that 65.1% in the ambulation group had strong uterine contractions during the active acceleration phase compared to 14.0% only in the control group. During the active deceleration phase, all of the ambulation group had strong uterine contractions compared to 58.1% in the control group. These differences regarding the intensity of the uterine contractions between the two groups during the active acceleration and active deceleration phases were significant ($p<0.001$).

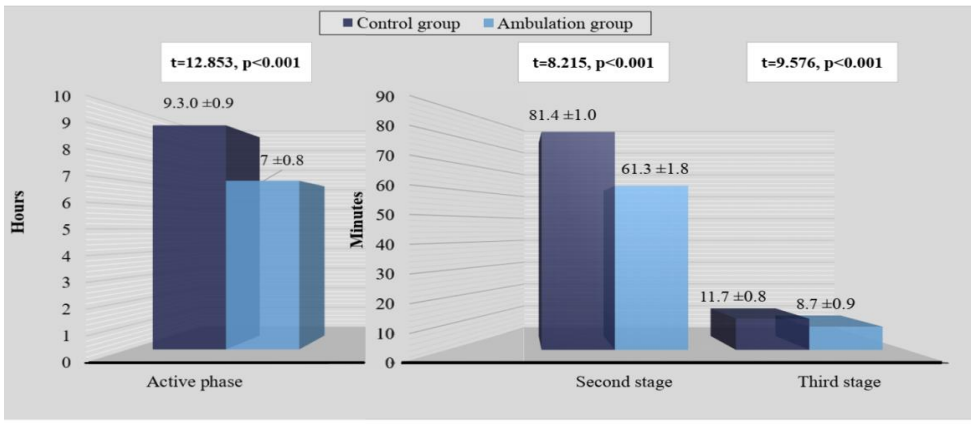

Figure 2. Duration of the labor stages in the control and ambulation groups **(n=86)**

Figure (2) illustrates a comparison of the duration of the labor stages in the control and ambulation groups. It reveals that parturient mothers in the ambulation group had a shorter duration of the active phase of labor and shorter 2nd stage and 3rd stage of labor compared to the control group by 2.3 hours, 20.1 minutes, and 3.0 minutes respectively. These differences in the duration of labor stages between the two groups were statistically significant ($p<0.001$).

Table 5. Mode of rupture of the fetal membranes and oxytocin augmentation in the control and ambulation groups **(n=86)**

Items	Control group (n=43)	Ambulation group (n=43)	Significance test	
	n (%)	n (%)	X^2	P
Mode of rupture of the fetal membranes				
Spontaneous (SROM)	15 (34.9%)	32 (74.4%)		
Artificial (AROM)	28 (65.1%)	11 (25.6%)	13.559	<0.001**
Oxytocin augmentation	33 (76.7%)	9 (20.9%)	26.805	<0.001**

** ≤ **0.001** highly significant

Table (5) describes the state of the fetal membranes and mode of delivery in the control and ambulation groups. It shows that the fetal membranes had ruptured spontaneously in 74.4% of the ambulation group compared to 34.9% among the control group. This difference was significant ($p<0.001$). In addition, while 76.7% of the women in the control group needed

augmentation by oxytocin infusion, only 20.9% in the ambulation group needed augmentation. This difference was significant (p<0.001).

Table 6. Mode of delivery in the control and ambulation groups **(n=86)**

Items	Control group (n=43) n (%)	Ambulation group (n=43) n (%)	Significance test X^2	P
Spontaneous vaginal delivery	25 (58.1%)	38 (88.4%)		
Emergency Cesarean section	18 (41.9%)	5 (11.6%)	10.030	<0.002*

***<0.05** significant

Table (6) clarifies that the mode of delivery differed significantly between the two groups; where 41.9% of the women in the control group needed emergency CS, only 11.6% in the ambulation group needed emergency CS (p=0.002).

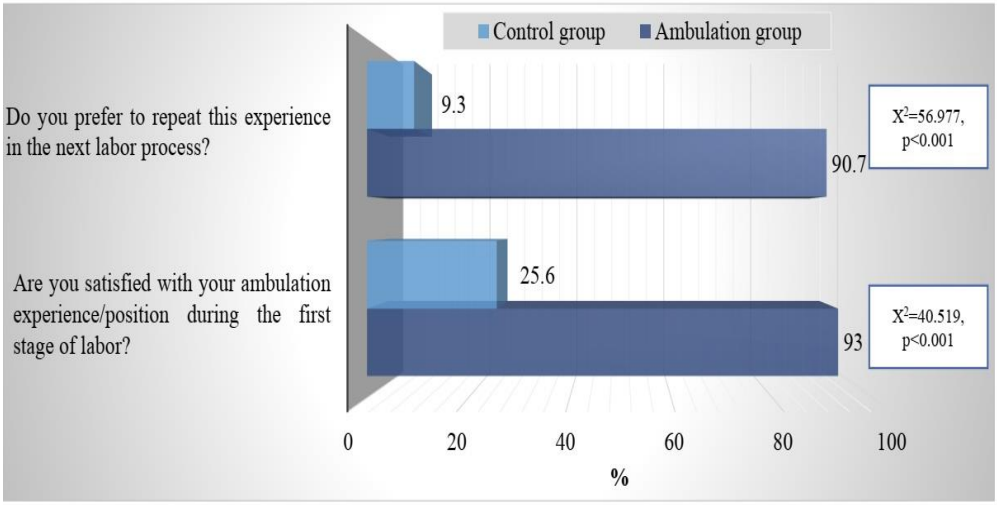

Figure 3. Mother's perception on their experience of the adopted position or ambulation in the control and ambulation groups **(n=86)**

Figure (3) demonstrates the mother's perception of the practice of ambulation or the adopted position in the ambulation and control groups. A significant difference was observed between the two groups. The Figure illustrates that 93.0% of mothers in the ambulation group were satisfied with the practice of ambulation compared to only 25.6% in the control group were satisfied with the adopted semi-sitting position during the first stage of labor. Moreover, 90.7% of mothers in the ambulation group compared to only 9.3% in the control group prefer to repeat this experience in the next labor process. These differences were significant (p<0.001).

Discussion

The current study aimed to assess the influence of ambulation during the first stage of labor on labor progress of primi parturients. This aim was achieved through the current study findings which revealed faster progress of labor among the ambulated parturient mothers compared to those in the control group. Thus, the first study hypothesis "The primi parturients who ambulate during the active phase of the first stage of labor go through faster labor progress compared to those in the control group" was accepted.

In the current study, labor progress was determined by the changes in cervical dilatation, fetal head descent, and uterine contraction characteristics during the first stage of labor. Concerning the cervical dilatation and fetal head descend, both showed faster progression among subjects of the ambulation group compared to those in the control group. Consistently with the current study findings, an earlier randomized controlled trial conducted at Mangalore to assess the effect of ambulation and birthing ball versus usual care in the first stage of labor on the maternal – neonatal outcomes of 60 parturient mothers **(Mathew, Nayak, & Vandana 2012)**. The Mangalore study revealed a higher rate of cervical dilatation among the ambulated parturient mothers in comparison to their mates in the control group. Similarly, a recent quasi-experimental study involved 60 Indian primi parturient mothers received either usual care or were ambulated in between uterine contractions with periods of rest if tired. Such an Indian study revealed that the rate of cervical dilation and head descent were statistically significantly higher among the ambulated parturient mothers compared to those in the control group **(Nishikumari & Chinchpure 2019)**. Authors of the present study attributed the faster progress in the descent of the fetal head to the evidenced effective uterine contractions which contribute to pressing the fetal head down toward the pelvis. Simultaneously, the progress in fetal head descent stimulates the cervical tissue to naturally release the prostaglandin which results in cervical ripening and cervical dilatation.

As regards the uterine contractions, it was evidenced in the current study that the uterine contractions characterized by being more frequent, longer, and stronger among the ambulation group in comparison to the control group. These findings support that of **Martin and Martin (2013)**, noted an improvement in uterine contractions among the ambulated parturient mothers in a study examined the relationship of ambulation during labor and operative delivery. Furthermore, an Egyptian quasi-experimental study conducted at Benha University hospital by **Emam and Al-Zahrani (2018)** on 100 parturient mothers to compare the labor outcomes of the parturient mothers adopted some upright positions; including ambulation, versus a recumbent position during the first stage of labor. That Egyptian study found frequent, longer, and stronger uterine contractions among the parturient mothers adopted upright positions or ambulated compared to those adopted a recumbent position. The authors of the present study endorsed the effective uterine contractions in the ambulation group to the notion that with ambulation there is an increase in the maternal-fetal circulation and increase in the blood supply to the uterus; which in turn causes effective uterine contractions.

Regarding the duration of the labor, the faster progress of labor among the ambulation group subjects resulted in a shorter duration of the different labor stages compared to those in the control group. This current study finding supports that of **Lawrence and coauthors (2013)**,

in a large meta-analysis study involved 3706 parturient mothers evidenced that the ambulation and upright positions reduced the length of labor in comparison to adopting recumbent positions. Similarly, a previous quasi-experimental study conducted at Kerala revealed a shorter first stage by 41.93 minutes in the parturients who were ambulated for 60 to 90 minutes based on their tolerance; with rest periods in between, compared to their mates in the control group **(Prabhakar, George, & Karkada 2015)**. The rapid progress of cervical dilation, the proper fetal head descent, and the effective uterine contractions evidenced among the current study ambulation group may explain the shorter duration of the first and second stages of labor.

The current study findings revealed a significant increase in the rate of spontaneous rupture of the fetal membranes, with reduced need for labor augmentation using oxytocin infusion, and lower CS rate among the ambulation group compared to that in the control group. Accordingly, the second hypothesis: "The primi parturients who ambulate during the active phase of the first stage of labor have a lower rate of CS deliveries compared to those in the control group" was confirmed. Likewise, a meta-analysis study by **Deliktaş and Kabukçuoğlu (2018)** assessed the effect of ambulation and upright positions during the first stage of labor on the mode of childbirth among 2441 parturient mothers and found a lower rate of the cesarean deliveries in the upright position groups. Additionally, these findings support that of **Nishikumari and Chinchpure (2019)** found higher rates of the spontaneous rupture of the fetal membranes and vaginal deliveries and lower need for Oxytocin infusion among the ambulated group compared to the non-ambulated group. This finding can be explained by that the ambulation during labor carries many physiological benefits. For example, it raises the force of gravity which increases the intrauterine pressure on the uterine contents; including the amniotic fluid and membranes. This pressure leads to the spontaneous rupture of the membranes. There is a notion that the ruptured fetal membranes give a better chance for the fetal head descent; where the intrauterine pressure is now directed on the fetus and stimulates the cervical dilatation. Thus, reduce the need for Oxytocin infusion, expedite the labor process, and increase the rate of vaginal deliveries and decrease that of the CS.

After childbirth, the participants' perceptions about the practice of ambulation or the adopted position during the first stage of labor were assessed. Most of the ambulation group was satisfied with this experience and willing to ambulate in the future labor compared to the little among the control group was satisfied with the adopted position. Similarly, an earlier experimental study conducted at Mangalore to assess the effect of ambulation during the first stage of labor on labor outcomes of 40 primi parturients. The study revealed that 60% of the mothers strongly agreed with the ambulation practice and 40% have agreed to it **(Savitha, Nayak, & Paul 2013)**. Lately, **Al-Seady and coauthors (2017)** in a quasi-experimental Egyptian study; involved 134 primi parturients, found higher satisfaction among those of the ambulation and upright positions compared to their mates in recumbent positions. The positive opinion about the ambulation practice may be attributed to the faster progress of labor; thus shorter duration of labor and reduced level and duration of labor pain perception. From the findings of the current study, ambulation seems to be a cost-effective intervention that can be implemented by the nurse independently. It would be a useful intervention for nurses and doctors working in the Labor and Delivery units.

Conclusion

Based on the present study results, the tested hypotheses were accepted. Where the ambulation was an effective intervention for enhancing the labor progress with a lower rate of CS among the ambulation group compared to the control group.

Recommendations

In light of the findings of the current study, the following are recommended:

1. Encourage the primi parturient mothers to ambulate at the early active labor.
2. Targeting multi centers and evaluating the effect of ambulation on reducing the labor pain level and the state of anxiety can be advised as a future research trial.

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Conflicts of interest disclosure

The authors declare they have no conflicts of interest.

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