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A Comparative Study on the Effect of Using Three Maternal Positions on Postpartum Bleeding, Perineum Status and Some of the Birth Outcomes During Lathent and Active phase of the Second Stage of Labor

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BACKGROUND/AIMS
This study aimed to determine the effect of three different positions of delivery on the postpartum bleeding, perineum status, and some birth outcomes.

MATERIALS and METHODS
This clinical trial study was performed on 96 primiparous pregnant women who had voluntarily entered the trial and were randomly assigned to one of the following three groups: lithotomy, sitting, and squatting group in the second stage of labor. Bleeding during the first hour after delivery, postpartum status of the perineum, as well as type and degree of tear were measured. The data were analyzed using Statistical Package for the Social Sciences 17 (SPSS Inc.; Chicago, IL, USA).

RESULTS and CONCLUSION
The mean volume of bleeding in the lithotomy group was significantly lower than those in the other two groups (p=0.016), and there was no significant difference between the sitting and squatting groups. There was no significant difference among the three groups in terms of the perineal status (tear and episiotomy), the height of the uterus, and the neonatal mean Apgar mean scores at 1 and 5 minutes (p>0.05). The use of different delivery positions based on the status of the mother can have different effects on the mother and infant outcomes; further studies are warranted on this subject.

Keywords: Childbirth position, episiotomy and laceration, post partum position

INTRODUCTION

The main goal of the third-millennium development program is to ensure the physical and mental health of mothers, and one of the items is safe pregnancy and childbirth. Childbirth or parturition is an event that has great psychological, social, and emotional impact on the mother and the family. Thus, management of the stages of labor, especially the third and fourth stages, play an important role in maintaining the health of women and children who constitute two-thirds of the population (1). One of the major causes of maternal morbidity and mortality, especially in developing countries, is postpartum hemorrhage, with a reported prevalence of around 1%–5%, as per different criteria. Most bleedings occur in the third and fourth stage of labor (2, 3). The third phase of labor includes the separation and dissection of the placenta. This phase begins with the baby's birth and ends with the extraction of the placenta. The placenta is generally extracted within the third or fourth postpartum contraction. After the birth, the uterus contracts with more intensity and strength, and because of this, the coupling site of the placenta becomes smaller than the size of the placenta itself. Then, the separation, descent, and extraction of the placenta and membranes occur. One hour after the delivery is considered as the fourth stage of labor owing to its importance in bleeding, and it should be carefully monitored. Some practitioners have increased this

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time to two hours on consensus. At this stage, rapid healing and restoration of homeostasis are re-established (4).

Typically, postpartum hemorrhage is defined as blood loss of 500 cc or more after the completion of the third stage of labor (5). In fact, about 5% of women who give birth vaginally lose more than 1000 mL of blood. Usually, the estimated blood loss is 50% of the actual blood loss. Therefore, if the bleeding is estimated to be >500 mL, it should be considered as moderate to severe bleeding. Increase in the normal blood volume during pregnancy (usually 30%–60% in women with moderate body mass) is about 1500–2000 mL. During the delivery, blood lossis approximately equivalent to the amount of blood added during pregnancy. At the end stage of the pregnancy, at least 600 mL of blood passes through the space between the villi per minute. Homeostasis at the placental implantation site is initiated via a contraction in the myometrium that causes compression of the arteries. As a result, the formation of a large clot in the uterine myometrium prevent effective myometrium contraction and can disrupt homeostasis in the placental implantation site. Therefore, it is clear that despite the natural coagulation, uterine atony may cause fatal hemorrhage after the delivery (6). Postpartum bleeding may be observed before or after the separation of the placenta. Sometimes, constant bleeding can be observed instead of sudden bulky bleeding. The bleeding may appear moderate, but may persist until signs of hypovolemic shock appear. Some women in the postpartum period may not bleed from the vagina, and the blood will accumulate in their uterus; therefore, a phenomenon could occur wherein 1000 mL or more of blood causes dilation in the uterus. In some cases, during the uterine massage, a sheet of abdominal fat may be massaged instead of the uterus. Thus, it is important care of the uterus in the postpartum period not be allocated to inexperienced practitioners or midwives (7). Multiple factors affect the bleeding and postpartum laceration, including underlying diseases, age, weight of the neonate, and the delivery position of the mother. Maternal position during labor can affect the amount of bleeding during the third and fourth stages and facilitate placenta removal by intervening in the process of uterine contractions (8). Until the mid-eighteenth century, women underwent active labor in the vertical position during childbirth. During the 17th century, a French physician developed the recumbent-in-bed position for the first time. However, in recent years, more attention is being paid to the tendency of many women who want to use more simple methods of labor, such as the vertical position (9). Labor in the sitting position affects the duration of placenta extraction and postpartum hemorrhage. In this position, intra-abdominal pressure and the gravity force facilitate placenta and membrane extraction and accelerate the third stage of the labor. It is believed that vertical position can likely increase the chances of postpartum hemorrhage. It seems that the gravitational force applied during the vertical position is one of the most important factors in the occurrence of excessive bleeding. In the recombinant or supine position, there is a higher chance of developing blood clots in the uterus therefore the real amount of bleeding remains hidden (10).

If the bleeding continues despite a rigid and completely constricted uterus, it is likely to be the consequence of a tear. Presence of bright red blood also indicates the presence of arterial blood resulting from a rupture in the genital duct (11). Perineal tearing may occur following vaginal delivery. The underlying causes of laceration include being in labor for the first time, interruption of the second stage of labor, consistent posterior occipital posture, use of local anesthetic, and median episiotomy (12).

Routine episiotomy is performed to prevent perineal rupture, irregular tears, prevent damage to the fetus, and avoid complications of the pelvic floor; however, its routine use has been questioned (13). One of the disadvantages of episiotomy is the increased incidence of anal and rectal sphincter ruptures that can contribute to the incontinence of the anal sphincter. The incidence of severe rupture is related to the type of episiotomy. Total 20%–50% of women who are repaired due to rupture of sphincter have symptoms of urinary incontinence (14). Problems with the sphincter sometimes manifest 20 years later. Several clinical trials have shown that the limitation of episiotomy is associated with desirable outcomes, such as reduced damage to the posterior perineum, repair complications, stitches, and blood loss. This also leads to faster return to daily activities (15, 16).

Most studies have estimated the amount of postpartum bleeding subjectively. This would increase the error in the estimation of the bleeding amount; thus, contradictory results have been concluded in this regard. Several studies have also been conducted on the status of the perineum and its damages; as per the study methods, different results have been obtained. Thus, conducting a variety of research trials in this field can help understand the application of some of these techniques during delivery. Therefore, this study was planned to perform a comparative evaluation of the effects of three delivery positions on bleeding, perineum status, and some birth outcomes.

Main Points:

- One of the positive points of the present study was that postpartum bleeding was measured objectively. Also, in order to ensure the accuracy of the measurement, bleeding volume was measured in three ways.
- In this study, the volume of bleeding in all three delivery positions was within normal range.
- Postpartum bleeding and perineal tear are likely to be controlled if the delivery goes through its natural and physiological process and using positions according to the mother's circumstances.
- Because of the difficulty of increasing the sample size one limitation of the study was the low sample size.

MATERIAL and METHODS

This research was a clinical trial (Ethics committee approval: 389292) performed on primiparous women in 2010–2011.

Women who were undergoing labor for the first time with a singleton pregnancy between 37 and 42 weeks, had head presentation, and were completing the first phase of delivery via the physiological method without any problems were entered in the trial at 8-cm dilatation.

Mothers who had fetal distress in the first stage of labor, those who gave birth to neonates weighing >4000 g (based on the

Johnson formula) (17), those diagnosed with asynclitism, those with special diseases, and those who took oxytocin were excluded from the study.

The subjects were provided a detailed description of the study design and procedures; thereafter, the willing subjects provided written consent for study participation. The patients were provided individual rooms for their comfort, convenience, and privacy. During all study stages, each patient was provided similar emotional, verbal and non-verbal support.

Based on the mentioned entry and prohibition criteria, 96 eligible women were randomly selected . into the three groups of lithotomy, squatting, and sitting positions. (each group included 32 women). Each subject was immediately placed in the respective position at 10 cm dilatation of the uterus and 100% effacement; they remained in the same position until complete extraction of the placenta.

In order to determine the amount of bleeding in the first hour after childbirth in all the three groups, immediately after the baby was extracted, one basin was placed under the mother's hips. In the lithotomy position, after complete extraction of the placenta and its blood, the basin was removed and immediately thereafter, the pad that was weighed was placed in the perineal and vulva area. If necessary, the pads were replaced. In the sitting and squatting positions, a basin was placed under the hips of the mother. Immediately after the third stage ended and the placenta and its blood were completely extracted, the basin was removed, and the pad was placed in the perineal and vulva area. The mother was moved to a bed near the delivery site, and the pads were replaced if needed. It is noteworthy that for collecting blood in each of the three groups, a draw sheet was weighted and placed under the mother immediately after the basin was removed in the lithotomy position and immediately before moving the mother to the bed (after the third stage ended) in the sitting and the squatting positions. In case of excessive bleeding, uterine massage was applied. If the bleeding was not controlled, syntocinon was injected (30 units of syntocinon per 1000 cc of ringer serum). In the next step, the blood inside the basin was transferred to a container; thereafter, it was measured and recorded. The blood stuck to the basin was placed within the gauzes that were previously weighed in a container. At the end of the first hour after delivery, the pads and gauzes that were weighed before by using a digital scale were weighed again and deducted from the previous weight, and the amount of blood was measured in grams. According to the blood weight (per grams) formula, they were divided by the total blood concentration (total blood concentration is 1.06) (10), resulting in a blood volume per cc, and it was accumulated with the volume of blood measured in the scaled container. The volume of bleeding in the first hour after delivery was obtained and recorded in the questionnaire (in cc). To prevent the error of collecting the lost blood volume, the bleeding volume was calculated using three methods. In method I, as noted, the volume of blood in the scaled container and the volume of blood in the pads were measured. In the second method, the graduated cylinder was weighed with the containing blood; thereafter, the result was weighed out of the cylinder alone and then added to the amount of blood in the pads. Finally, the whole blood volume was measured. In the third method, the clot that had developed in the scaled container was weighed during the next hour after delivery and converted to cc; thereafter, it was added to the rest of the blood in the container and the blood volume in the pads; the final bleeding volume was measured.

In the lithotomy position, the mother rested on her back on a bed at a 30° angle from the horizons with her knees bent.

The sitting posture was a condition in which the mother sat on the delivery chair, with the vertebrae completely flat and the joints of the knee and hip on one level. The squatting condition was a situation wherein the mother sat in the sitting position on the leg so that the palm of the foot was completely on the ground and the knee joint was lower than the hip joint.

The labor stages were controlled by the researcher. Throughout the study, psychological support was continuously provided, and the mother was never left alone.

Perineal tear could occur due to the force applied to the perineum in the middle of the perineal area between the vaginal opening and the anus (median rupture) or the vaginal lateral wall or by a rupture in the median line, extending to the left or right perineal area (medio lateral rupture). The perineal tear was considered to be of first degree if there was tear of the hymen, perineum skin, and mucous membrane of the vagina; it was considered a second-degree laceration if there was laceration of the hymen, perineum skin, and mucosal membrane of the vagina with fascia and muscles. The tear was considered a grade-3 tear if there was tearing of the hymen, perineal skin, mucosal vagina, fascia, muscle, and rectal sphincter. A grade-4 rupture was that which included the rupture of the hymen, perineal skin, vaginal mucosal membrane, fascia, muscle, sphincter, and rectal mucosa (7).

In order to control the condition of the perineum and determine the degree and type of the rupture, immediately after placing the baby on the mother's abdomen for skin-to-skin contact and after completing the extraction of placenta, the presence of rupture and the type and degree of rupture was determined by the researcher. In cases wherein repair was needed, an episiotomy was performed on the area, and the tear was repaired. The status of the uterus contraction was examined by examination of the abdomen and the detection of normal or abnormal contractions of the uterus during the first hour after delivery (when the mother was lying on the bed). In this study, uterine contraction was defined by examining the abdomen and pressing the fingers on the uterus fundus during the first hour after delivery; if the finger did not enter the uterus, it was defined as natural and if the finger entered the uterus area, it was defined as abnormal. Control of the contractile condition of the uterus was investigated by the researcher during the first hour after delivery and then every 15 minutes (four times). The height of the uterus vertex was controlled and recorded by the researcher's assistant by touching the uterus at the umbilical cavity and at the bottom (as normal) and above the umbilicus (as abnormal) at the end of the fourth stage.

After the full explusion of the baby, five signs of heart rate, respiratory effort, muscle tone, reflexive stimulation, and baby's color were assessed according to the table of Apgar score (each items

with a score of zero, one or two). A total score of 10 indicated that the baby was in optimal health (18). The Apgar score of the infant was determined by the researcher at the first minute and the fifth minute, and it was recorded by the researcher's colleague.

Statistical analysis

In order to analyze the data, Statistical Package for the Social Sciences were used (version 17, IBM, manufacturer is SPSS Inc., 233 South Wacker Drive, Chicago, IL 60606-6412. Patent No. 7,023,453, USA). Significance level was set at $p<0.05$.

RESULTS

The three groups were not significantly different in terms of maternal age and the gestational age based on the first day of menstruation and ultrasonography of the first trimester (Table 1).

Table 2 shows the average bleeding volume during the first hour after delivery (by 3 types of measurement) in the three groups. The mean bleeding volume in the lithotomy group was significantly lower than that in the other two groups; there was no significant difference between the two sitting and squatting groups (p=0.98). The mean volume of postpartum bleeding in the lithotomy group (lying back) was approximately 200 cc less than that in the other two groups.

As shown in Table 2, the mean volume of bleeding in all the groups in the non-rupture and non-episiotomy samples was 589.600±46.377, in episiotomy samples 785.846±235.091 and in tear samples were 770.836±350.131 which were not significantly different (p>0.05).

Table 3 shows that the tear types were not significantly different among the three groups (p>0.05). The frequency distribution of perineal tear degree was not significantly different among the three groups (p>0.05). Perineal status (in terms of rupture and episiotomy) after delivery was not significantly different among the three groups (p>0.05).

Table 4 shows that the contraction status of the uterus in the 1st, 2nd, 3rd, and 4th 15-minute periods after delivery was not significantly different among the three groups (p>0.05). There was no significant difference in the height of the uterus fundus during the first hour after the delivery among the three groups (p>0.05).

The results also indicated that the average Apgar score in the first minute after the birth in the lithotomy group was 8.69±0.59, that in the sitting group was 8.56±1.39, and that in the squatting group was 8.59±0.87. The mean Apgar score in the fifth minute after birth in the lithotomy group was 9.84±0.51, that in the sit-

TABLE 1. Mean age and gestational age in the three groups of lithotomy, sitting, and squatting

Group	Lithotomy		Sitting		Squatting		Test result	
Variable	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	F	P-value
Age	22.31	2.97	23.75	3.90	22.56	4.11	1.38	0.26
Gestational age based on the first day of menstruation	39.22	1.10	38.92	1.26	39.02	0.82	0.57	0.57
Gestational age based on the ultrasonography of the first trimester	38.98	./99	38.95	1.11	38.74	1.20	0.42	0.66

TABLE 2. Comparison of the bleeding volume in the first hour after delivery in the three groups of lithotomy, sitting, and squatting

Group								
Variable	Lithotomy		Sitting		Squatting		Test result	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	F	P-value
Bleeding volume (measured volume + volume of blood in the pad)	578.91	371.10	796.19	332.84	798.16	321.68	4.33	0.016
Bleeding volume (graded weight of the vessel + volume of blood in the pad)	548.31	360.45	761/.6	334.77	759.31	291.73	4.37	0.015
Clean substance in the container + Container volume + Pad volume	561.9	374.68	779.84	334.77	798.03	333.96	4.56	0.013
Bleeding volume in cases without episiotomy and rupture	461.286	432.420	852.666	679.930	611.400	389.995	1.96	0.35
Volume of bleeding in cases of episiotomy	776	342.471	796.333	105.078	792.750	133.662	0.023	0.98
Bleeding volume in cases of tear	591.625	374.667	812.042	317.639	860.286	332.135	1.184	0.32
Comparing the frequency distribution of bleeding in the three groups of lithotomy, sitting and squatting								
Groups								
Bleeding volume	**Lithotomy**		**Sitting**		**Squatting**		**Test result**	
	number	**percentage**	**number**	**percentage**	**number**	**percentage**	**Chi-square**	**p**
≤ 500 cc	18	56.20	4	12.50	7	21.90	10.51	0.005
501–1000 cc	9	28.10	20	62.50	17	53.10		
> 1000 cc	5	15.60	8	25	8	25		

ting group was 9.81±0.54, and that in the squatting group was 9.88±0.42. The mean Apgar score in the 1st and 5th minutes after birth was not significantly different among the three groups (p>0.05).

DISCUSSION

In the present study, the mean bleeding volume in the first hour after delivery in the lithotomy group was less than that in the other two groups.

A study titled "childbirth in the squatting position" was conducted in 2007 by Aisha Nasir and Korejo (19) in Karachi to examine the advantages and disadvantages of labor in the squatting position in the second stage of labor and compare it with those in the recumbence position. The case-control study was conducted on randomly selected 200 individuals. Both groups were positioned recumbently in the third stage of labor. Nasir (19) reported that in the squatting group, bleeding was <500 cc. However, no significant difference was found between the two groups (p>0.05). These results are not consistent with our findings.

In a review article on 18 clinical trials, Gupta (20) reported that the standing, squatting, and lateral recumbent positions result in >500 cc of blood loss than that in the recumbent position. His study results are consistent with the results of our study.

Bonder et al. (21) reported that the amount of severe bleeding in the two squatting and supine groups was not significantly different (p>0.05).

In a study conducted by Altman et al. (22) in Sweden, the difference in the postpartum hemorrhage between the squatting

TABLE 3. Comparison of the perineum status, type and degree of laceration, and episiotomy in the three groups of lithotomy, sitting, and squatting

	Lithotomy		Sitting		Squatting	
Condition of the perineum after delivery	**Number**	**Percentage**	**Number**	**Percentage**	**Number**	**Percentage**
Without episiotomy and laceration	7	21.86	3	9.40	6	18.75
Episiotomy	6	18.75	3	9.40	3	9.38
Laceration	16	50	24	75	21	65.63
Cyanosis tissue and dead without tear	1	3.13	2	6.30	0	0
Episiotomy + Laceration	2	6.30	0	0	2	6.30
Total	32	100	32	100	32	100
Test result			Chi-square=8.28			
			p=0.41			
Degree of perineal tear						
Degree I	12	37.50	17	53.12	19	59.37
Degree 2	6	18.70	7	21.88	4	12.50
Degree 3	0	0	0	0	0	0
Degree 4	0	0	0	0	0	0
Total	18	100	24	100	23	100
Test result			Chi-square=2.74			
			p=0.25			
Type of laceration						
Median	7	38.90	12	50	11	47.83
Mediolateral	3	16.70	6	25	3	13.04
Lateral	6	33.30	3	12.50	6	26.09
Irregular tear in several areas	2	11.10	3	12.50	3	13.04
Total	18	100	24	100	23	100
Test result			Chi – square=4.88			
			p=0.56			
Condition of type of episiotomy						
Median	0	0	0	0	1	20
Mediolateral	2	25	2	66.7	3	60
Lateral	6	75	1	33.3	1	20
Total	8	100	3	100	5	100
Test result			Chi-square=5.57			
			p=0.23			

and sitting positions was not statistically significant (p=0.7). The mean volume of bleeding in the squatting (kneeling) group was 420±320 mL and that in the sitting group was 480±406 mL. Moreover, there was no significant difference in the prevalence of severe bleeding (bleeding volume>1000 mL) between the two groups (p=0.5). In this study, bleeding volume >500 mLwas considered to be associated with risk factor, such as age of the mother, weight gain of the embryo, prolongation of the second stage of labor, and the use of oxytocin. In the present study, maternal age (range: 20–25 years) and newborn weight (average 3200 g) were not significantly different in the 3 groups. Oxytocin was not used for any subject in any group; however, the duration of the second stage of labor was higher in the sitting group. This may be attributable to an increase in the amount of bleeding in the sitting group because of the prolonged latent phase of the second stage of labor and the active phase of the second stage of labor. Nasir (19) concluded that the cause of increased bleeding in the standing (squatting) position was the increased pressure on the perineum that causes further damage to the perineum. However, collecting lost blood volume in standing position is easier than supine position. Thus, the estimated amount of bleeding may be higher. Possibly, in the sitting and squatting positions, the bleeding volume is overestimated because of the effects of gravity. Collecting, controlling, and calculating the bleeding in the lithotomy position is more challenging; this confirms the reduction in the bleeding volume in this position.

Terry (23) reported a bleeding volume of 295 cc in the standing group and 358 cc in the recumbent group. These research results are not consistent with our findings. In Richard and Terry's study, the bleeding was measured subjectively, while in our study, it was calculated objectively using a graded container and collection on pads.

TABLE 4. The uterine contraction status during the first hour after delivery, every 15 minutes, and the height of the uterus fundus in the three groups of lithotomy, sitting, and squatting positions

Groups / Variable	Lithotomy		Sitting		Squatting	
	Number	Percentage	Number	Percentage	Number	Percentage
Condition of contraction of the uterus during the first 15 minutes after delivery						
Normal	29	90.60	25	78.10	29	90.60
Abnormal	3	9.40	7	21.90	3	9.40
Total	32	100	32	100	32	100
Test result	Chi-square=2.85 p=0.24					
Condition of uterus contraction during the second 15 minutes after delivery						
Normal	30	93.80	31	96.90	31	96.90
Abnormal	2	6.30	1	3.10	1	3.10
Total	32	100	32	100	32	100
Test result	Chi-square=0.52 p=0.77					
Condition of contraction of the uterus during the third 15 minutes after delivery						
Normal	31	96.90	32	100	30	93.80
Abnormal	1	3.10	0	0	2	6.30
Total	32	100	32	100	32	100
Test result	Chi-square=2.07 p=0.36					
Condition of the uterus contraction during the fourth 15 minutes after delivery						
Normal	32	100	32	100	32	100
Abnormal	0	0	0	0	0	0
Total	32	100	32	100	32	100
Height of the uterus in the first hour after delivery						
In the umbilicus and under the umbilicus	32	100	32	100	31	96.90
Above the umbilicus	0	0	0	0	1	3.10
Total	32	100	32	100	32	100
Test result	Chi-square=2.02 p=0.36					

The results of Bamfim's (24) research showed no significant difference in the amount of bleeding in both, the sitting and recumbent groups. The mean weight of the hemorrhage in the recumbent group was 516.5±339.5 gr and that in the sitting group was 334.4±331.6 gr (p=0.52). The results of Bomfim's study are not in line with the present findings.

Reynolds (25) did not report a significant difference in the bleeding volume in the standing (squatting) and recumbent groups in Canada. Postpartum hemorrhage in the recumbent group was 2.3% and that in the standing group was 1.5%. Renolds stated that due to the effects of gravity, a slight increase in the bleeding volume was observed in the standing group; however, the results were not statistically significant (p>0.05).

The mean bleeding volume in cases without episiotomy and tear was significantly less than that in those with an episiotomy or tear (p=0.049). It is obvious that the bleeding volume would increase owing to the bleeding in the episiotomy or tear site. In a study titled, "The relationship between reduced sphincter rupture and restrictions in episiotomy," Jeffrey (14) found that hemorrhage is slightly reduced by limiting episiotomy. There was no significant difference among the three groups in the first, second, third, and fourth 15-minute periods from the aspect of uterus contraction. During the first 45 min postpartum, 6 cases had abnormal contractions of the uterus in the lithotomy and squatting group, and 8 had abnormal uterine contractions in the sitting group. We believe that the prolonged latent phase of the second stage of labor is associated with the abnormal uterus contraction in the sitting position.

There was no significant difference in the height of the uterus fundus during the first hour after delivery in the three groups. As shown in Table 2, only one individual (in the squatting group) has a fundus above the umbilicus. Considering the condition of the uterine contraction and the height of the uterus fundus during the first hour after delivery which are related to the amount of postpartum hemorrhage (if there is a bleeding, contraction of the uterus is disturbed and the height of the uterus fundus will be placed higher than the umbilicus) discussing about these goals was conducted in the form of postpartum hemorrhage. As shown in Table 3, there was no significant difference in the tear type, tear degree, and perineal status of the 3 groups. Nasir (19) did not find any significant difference in the number of episiotomies between the squatting and recumbent groups. However, episiotomy had extended in 7% of the cases from the recumbent group. Grade-2 and grade-3 tears were not observed in the squat group, while 9% of those in the recumbence position had grade-2 and grade-3 tears. A grade-2 tear was reported in 5 cases and grade-3 tear was observed in 4 cases, of which 2 out of 4 children were born with forceps because of their inability to strain.

In our study, 6% of those in the recumbent group and 6% of those in the squatting group had tears after episiotomy. In the sitting group, there was no tear. In the study of Nasir, widespread episiotomy was reported as a rupture, but in our study, first-degree tears and lacerations in other areas of the vulva were considered as a rupture with episiotomy. This study (19) reported no significant difference between grade-2 and grade-3 rupture. In this study, no subject of any group had grade-3 rupture. The results of the study by Nasir showed that given the high rate of episiotomy, the recumbence position should not be used routinely.

Ragnar (26) reported no significant difference in the occurrence of grade-3 tears between the groups with the sitting and crawling positions. The sitting and crawling positions are types of standing positions. In the present study, two groups out of the three compared groups are a subset of standing positions, which they are in agreement with Ragner's study, and there was also no case of grade 3 rupture in either of the three groups.

Hakan (27) concluded that there is a relationship between episiotomy and severe perineal tears. Jeffrey indicated that the risk of rupture of the sphincter is greater with episiotomy. Moreover, restricting the episiotomy will result in reduced perineal damage. In the present study, due to the physiologic process of childbirth and no intervention done during the study , the mother was given the chance to push spontaneously . If there was a possibility of severe tear or prolonged placement of the fetus head on the perineum, episiotomy was conducted. This might be the reason for the absence of grade-3 and grade-4 ruptures.

In the present study, 7 individuals in the group of lithotomy, 3 in the sitting group, and 4 in the squatting group had healthy perineum. Van (28) indicated that more pressure on the perineum in the standing position causes more damage to the perineum.

A study conducted in 2003 by Bonder et al. (21) in Australia reported more perineal tears in the standing group; however, the difference in the prevalence of perineal tears was not significant between the standing and recumbent groups. Furthermore, the number of episiotomies performed for those in the standing group was significantly lower, confirming our findings. Also Bonder et al. (21) reported that grade-3 tears occurred more frequently among patients with the standing positions; however, the difference was not significant. Bonder et al. (21) concluded that not performing the episiotomy in the standing position increased the chances of rupture.

Altman (22) compared the degree of perineal tears that occurred in the sitting group and crawling group (22). There was no significant difference between the two groups regarding the type of rupture; however, in the sitting group, 4 cases of grade-4 ruptures were reported. Richard et al. (23) reported that the level of the perineal tear in the standing positions was significantly lower than that in the recumbent group, and the chances of an intact perineum in the standing group was three times more than that in the recumbent group. The ruptures in the standing group were limited to grade-I; and no grade-3 or grade-4 ruptures were observed, consistent with our findings.

Terry (23) indicated that non-recumbent positions have an intrinsic protective effect on the perineum; this also affects risk factors, such as first birth and neonate weight.

Bamfim (24) conducted a study titled, "Influence of the position of the mother at delivery over some maternal and neonatal outcomes" in Brazil wherein there was no significant difference in the perineal tear and degree of laceration of the sitting and recumbent groups. In women with a history episiotomy, grade-2 rupture was significantly more common (twice as frequent) in

the recumbent group than in the standing group (p=0.02). Bamfim (24) indicated that the open status of thighs in the standing position causes perineal relaxation and reduces damage to the perineum. In the recumbent position, more pressure of the presentation part is applied to the posterior part of vagina due to the inappropriate position of the perineum and leaning it forward, and before the head reaches the vaginal opening, there is a great deal of pressure on the perineum and there may be a rupture due to the excessive stretching. He also believed that the lower prevalence of perineal tears in the standing group was attributable to the lower rate of episiotomy in this group. In our study, episiotomy indications were fully considered in all 3 groups. Further, the study included only primiparous women who had no history of episiotomy or a scar on the perineum.

Renolds (25) reported that the rate of episiotomy was significantly lower in the squatting group than in the recumbent group. Soong (29) in Queensland did not find any significant correlation between perineal rupture and trauma in the sitting, squatting, lithotomy, and crawling positions. Soong stated that the risk of tear and perineal trauma is related to the mother's body position, habits, infant weight, and history of perineal rupture. Eason's study (30) concluded that the mother's position in the second stage of labor does not affect the chances of perineal injury and tear. In addition, the position of the mother and the perineum injuries are not associated with being primiparous; however, a relationship was observed between the risk of perineum injuries and multiparous status.

Sekhavat (31) showed a significant difference between the sitting and recumbent groups in terms of ruptures. During the study, the back of the bed was placed in a vertical position, and the mother was seated in the lithotomy position with her legs placed in the childbirth rack. In this situation, pressure and elasticity on the perineum increases, increasing the rupture rate. In our study, the mother slept on the labor bed, and the top of the bed was raised to 30°; her legs were not bent over the abdomen; further, her buttocks and feet were resting on the bed, so the knees were not too far apart and opened in coordination with the footpads. Perhaps in this situation, too much stretch was not applied to the perineum and vagina; therefore, the tear rate in this situation was comparable to that in the sitting group.

As indicated, there was no significant difference in the Apgar score at 1 and 5 min in the three groups. Sekhavat (31) reported no differences in the Apgar score at 5 min in the sitting and sleeping groups. Delaram and Forozandeh (32) also showed that the maternal position during labor had no effect on the Apgar score of the baby. Ragnar and Altman (22, 26) reported no difference between the Apgar score at 1 and 5 min in the standing and recumbent groups. Terry (23) reported no significant difference in the Apgar scores at 1 and 5 min in the recumbent and non-recumbent positions (sitting and squatting). Nasir (19) indicated no significant difference in the Apgar score at 1 and 5 min. The results of all these studies are in line with our findings. Nasir found no significant difference in the Apgar score of the 2 groups (p>0.05).

Motamedi (33) reported that the Apgar score at 1 min in the combined group (sitting, lateral recumbence, standing, and crawling) was significantly higher than that in the recumbent group.

The Apgar score at 1 min in the standing group was significantly higher than that in the recumbence group in the study by Khavandizadeh (34); moreover, the score at 5 min showed no significant difference.

Reyhani (35) found no difference in the Apgar score at 1 min of the 4 groups (sitting, recumbent, moving, and free groups). However, the score at 5 min in the recumbent group was significantly lower than that in the other 3 groups (including the sitting group). She concluded that the active positions of mothers during labor can improve the Apgar score at 5 min. Bloom (36) indicated that due to uterine pressure on the lower inferior vein and the reduced blood flow to the heart in the recumbent position, the cardiac output would decrease and blood flow to the fetus would be impaired; this may affect the Apgar scores at 1 and 5 min.

One of the positive points of the present study was that postpartum bleeding was measured objectively. Also, in order to ensure the accuracy of the measurement, bleeding volume was measured in three ways. In this study, the volume of bleeding in all three delivery positions was within normal range. Postpartum bleeding and perineal tear are likely to be controlled if the delivery goes through its natural and physiological process and using positions according to the mother's circumstances. Because of the difficulty of increasing the sample size one limitation of the study was the low sample size

CONCLUSION

The use of these three positions can have effects on the postpartum bleeding in normal range. It is noteworthy that each birth position should be selected based on the situation of the mother. Finally, more studies should be conducted to identify the postpartum bleeding of these positions.

Ethics Committee Approval: Ethics committee approval was received for this study from Isfahan University of Medical Sciences Code of Ethics Committee:389292**.**

Informed Consent: Written informed consent was obtained from patients' parents who participated in this study.

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