

Title: A Comparative Analysis of Maternal and Perinatal Outcomes in Supine Versus Upright Birthing Positions at a Tertiary Care Teaching Hospital in Maharashtra

Abstract

Background: The position a woman assumes during labor and delivery can significantly impact maternal and perinatal outcomes. This study aims to compare the effects of different birthing positions on these outcomes in low-risk multiparous mothers.

Methods: This cross-sectional study was conducted over 18 months at a tertiary care teaching hospital in Maharashtra. A total of 470 low-risk multiparous mothers who delivered vaginally were included. Participants were divided into two groups based on their birthing positions: 240 mothers in the supine position group and 230 mothers in the upright position group. Data was collected through personal interviews, focused group discussions, and document analysis. Primary outcomes measured included duration of labor, mode of delivery, maternal comfort and satisfaction, and neonatal outcomes.

Results: Upright positions, such as sitting, kneeling, squatting, and standing, were associated with shorter durations of labor, reduced rates of episiotomies, perineal tears, and postpartum hemorrhage, as well as lower incidences of instrumental deliveries and birth trauma. The need for NICU admission and infective morbidity were also lower in upright positions. Additionally, upright positions were associated with higher maternal satisfaction and comfort.

Conclusion: Upright birthing positions offer significant benefits in terms of shorter labor duration, reduced risk of caesarean birth, and decreased need for epidural analgesia, without increasing the risk of interventions or adverse outcomes for mothers and babies. Women in low-risk labor should be encouraged to assume positions that maximize their comfort and physiological advantage during labor and delivery. Further high-quality research is needed to confirm these findings and to better understand the optimal birthing positions for different populations of women.

Keywords: Birthing positions, Upright position, Supine position, Maternal outcomes, Perinatal outcomes, Labor duration, Episiotomy, Perineal tear, Postpartum haemorrhage, Instrumental delivery, Maternal satisfaction, Neonatal outcomes.

Introduction:

Birthing practices have evolved significantly over the centuries, yet the supine position remains the most commonly used in many parts of the world, including India. Historically, the supine position has been favoured for its convenience in clinical settings, allowing

healthcare providers easier access for interventions and continuous electronic foetal monitoring (EFM). However, this practice is not without its drawbacks. Continuous EFM, while intended to monitor foetal well-being, has been associated with increased rates of caesarean sections without a corresponding improvement in neonatal outcomes[1].

In contrast, upright birthing positions, such as sitting, kneeling, squatting, and standing, are more physiological and have been shown to facilitate the mechanism of labor. These positions leverage gravity to aid in the descent of the fetus, reduce the duration of labor, and decrease the need for instrumental deliveries[2]. Research has shown that upright positions can lead to more effective uterine contractions, shorter second stages of labor, and reduced back pain for the mother[3]. Additionally, these positions support better foetal oxygenation and reduce the incidence of abnormal foetal heart tones, thereby improving perinatal outcomes[4].

The World Health Organization (WHO) and the Ministry of Health and Family Welfare (MOHFW) of India recommend that women should be given the choice to adopt a birthing position in which they feel most comfortable[5]. This recommendation is based on evidence that allowing women to choose their birthing position can enhance their sense of control and satisfaction during childbirth, potentially leading to better overall experiences and outcomes[6].

Despite these recommendations, many women continue to give birth in supine positions, often due to the symbolic importance of hospital birthing beds and the perceived necessity of continuous monitoring[7]. This practice can leave women feeling vulnerable and powerless, impacting their psychological well-being during labor and delivery[8]. Moreover, continuous EFM, which is more feasible in the supine position, has not been shown to improve neonatal outcomes and is associated with higher caesarean section rates[9].

This study aims to compare maternal and perinatal outcomes between supine and upright birthing positions at a tertiary care teaching hospital in Maharashtra. By examining these outcomes, we hope to provide evidence that supports the adoption of more physiological birthing practices, ultimately improving the childbirth experience for women.

Background

Birthing positions have long been a subject of interest and research in obstetrics due to their significant impact on maternal and perinatal outcomes. Traditionally, the supine position has been the most commonly used in clinical settings, particularly in India, due to its convenience for healthcare providers and the ease of performing interventions and continuous electronic

foetal monitoring (EFM)[1]. However, this position is associated with several drawbacks, including increased rates of caesarean sections and instrumental deliveries, as well as prolonged labor[2].

In contrast, upright birthing positions, such as sitting, kneeling, squatting, and standing, are considered more physiological and beneficial for the mechanism of labor. These positions utilize gravity to aid in the descent of the fetus, potentially reducing the duration of labor and the need for medical interventions[3]. Research has shown that upright positions can lead to more effective uterine contractions, shorter second stages of labor, and reduced back pain for the mother[4]. Additionally, these positions support better foetal oxygenation and reduce the incidence of abnormal foetal heart tones, thereby improving perinatal outcomes[5].

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Objective: To compare maternal and perinatal outcomes in vaginal births between supine and upright positions in low-risk multigravida women.

Study Design

This study was designed as a cross-sectional analysis to compare maternal and perinatal outcomes between supine and upright birthing positions in low-risk multiparous mothers. The study was conducted over a period of 18 months at a tertiary care teaching hospital in Maharashtra. The PICO framework was utilized to structure the study: the population consisted of low-risk multiparous mothers who delivered vaginally; the intervention involved

the use of upright birthing positions; the comparison was made with supine birthing positions; and the outcomes measured were maternal and perinatal outcomes.

A total of 470 low-risk multiparous mothers who delivered vaginally were included in the study. The participants were divided into two groups based on their birthing positions: 240 mothers in the supine position group and 230 mothers in the upright position group. The intervention group consisted of mothers who delivered in an upright birthing position, which included sitting, kneeling, squatting, and standing. The comparison group consisted of mothers who delivered in a supine birthing position, which included dorsal, semi-recumbent, lithotomy, and side-lying positions.

Data was collected using a combination of methods to ensure comprehensive and accurate information. Personal interviews were conducted with the mothers to gather detailed information about their birthing experiences and outcomes. These interviews provided qualitative data on maternal comfort, satisfaction, and any complications experienced during labor and delivery. Focused group discussions were facilitated with groups of mothers to gain deeper insights into their preferences and perceptions regarding different birthing positions. These discussions helped to contextualize the quantitative data and provided a richer understanding of the mothers' experiences. Additionally, document analysis was performed by reviewing medical records and delivery notes to extract relevant clinical data. This method ensured that objective clinical outcomes were accurately recorded and analysed.

The primary outcomes measured were maternal and perinatal outcomes, including the duration of labor, mode of delivery (spontaneous vaginal delivery, instrumental delivery, caesarean section), maternal comfort and satisfaction, and neonatal outcomes (Apgar scores, neonatal intensive care unit admissions). The duration of labor was recorded in minutes for both the second and third stages of labor. The mode of delivery was categorized to assess the frequency of different delivery methods in each birthing position. Maternal comfort and satisfaction were evaluated using a 5-point Likert scale, where mothers rated their overall birthing experience. Neonatal outcomes were assessed based on Apgar scores at 1 and 5 minutes after birth and the need for neonatal intensive care unit (NICU) admissions.

The collected data was analysed using descriptive statistical methods, including percentages and ratios, to compare maternal and perinatal outcomes between the two birthing positions. Statistical analysis was performed to identify significant differences in outcomes between the supine and upright positions. The results were presented in the form of comparative graphs to visually illustrate the differences and trends observed across the various birthing positions.

This study design allows for a comprehensive comparison of the two birthing positions, providing valuable insights into their impact on maternal and perinatal outcomes. By utilizing a combination of qualitative and quantitative data collection methods, the study offers a holistic view of the birthing experience and highlights the potential benefits and drawbacks of each position. The findings from this study can inform clinical practice and guide recommendations for optimal birthing positions to enhance maternal and neonatal health outcomes.

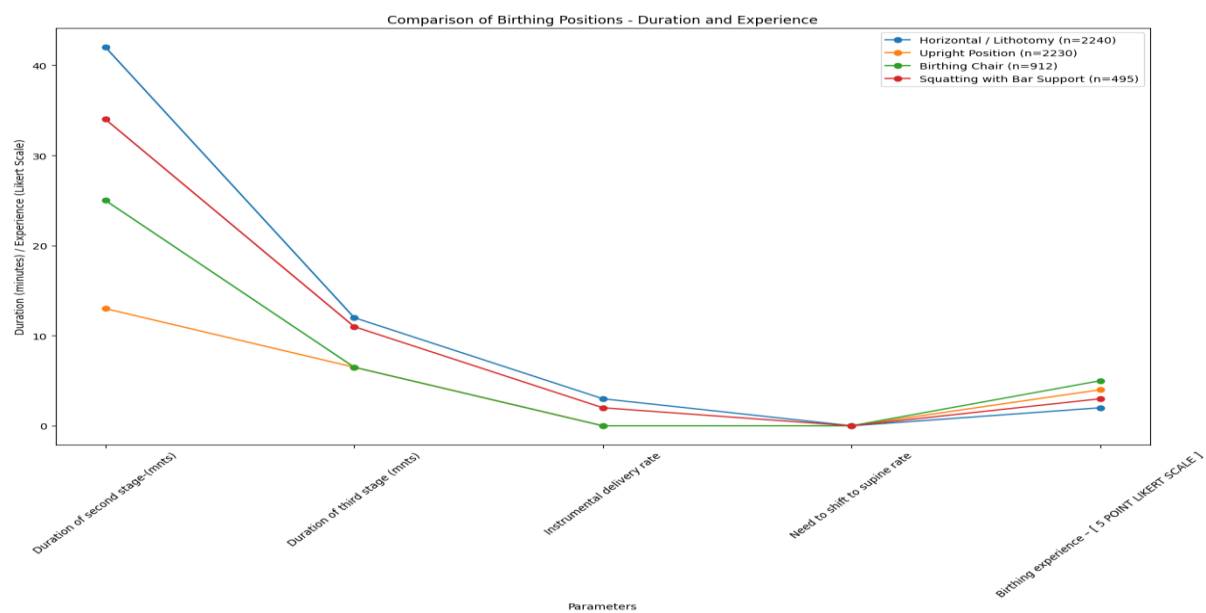
Results and Observations

The following sections present a detailed analysis of key maternal parameters, including episiotomy rates, perineal tear rates, cervical and paraurethral tear rates, postpartum hemorrhage (PPH) rates, duration of labor stages, instrumental delivery rates, the need to shift to a supine position, and overall birthing experience. Each parameter is illustrated through comparative graphs to highlight the differences and trends observed across the horizontal/lithotomy, upright, birthing chair, squatting with bar support, and semi-recumbent positions.

Table 1 : Objective maternal parameters documented in various birthing positions

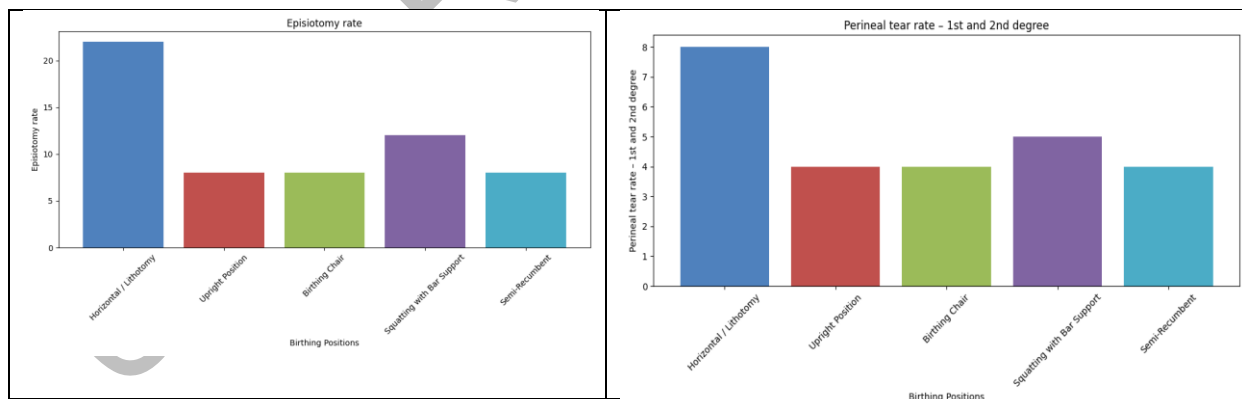
Parameter	Horizontal / Lithotomy (n=240)	Upright Position (n=230)	Birthing Chair (n=96)	Squatting with Bar Support (n=52)	Semi-Recumbent (n=82)
Episiotomy rate	22%	8%	8%	12%	8%
Perineal tear rate – 1st and 2nd degree	8%	4%	4%	5%	4%
Cervical tear rate	1-2%	0	0	1%	0
Paraurethral tear rate	0.2%	0	0	0.1%	0
PPH rate	2-3%	<1%	<1%	1-2%	<1%
Duration of second stage (minutes)	42 minutes	13 minutes	25 minutes	34 minutes	25 minutes
Duration of third stage (minutes)	12 minutes	5-8 minutes	5-8 minutes	10-12 minutes	5-8 minutes
Instrumental delivery rate	3%	0%	0%	2%	0%
Need to shift to supine rate	-	0	0	0	0
Birthing experience – [5 POINT LIKERT SCALE]	2	4	5	3	5

154 Figure 1 Graphical representation of maternal outcomes in different birthing positions



155
156 Maternal outcomes **are** compared for various maternal outcomes across different birthing
157 positions Viz Horizontal/Lithotomy, Upright Position, Birthing Chair, and Squatting with
158 Bar Support. in Figure 1: Each outcome is discussed below
159 Genital tract birthing trauma is an important maternal outcome and rate of need of episiotomy
160 is more in the supine position which is commonly practised during birth and this is a
161 significant maternal outcome contributing to a negative birthing experience.

163 Figure 2 Episiotomy and perineal tear rates associated with birthing position



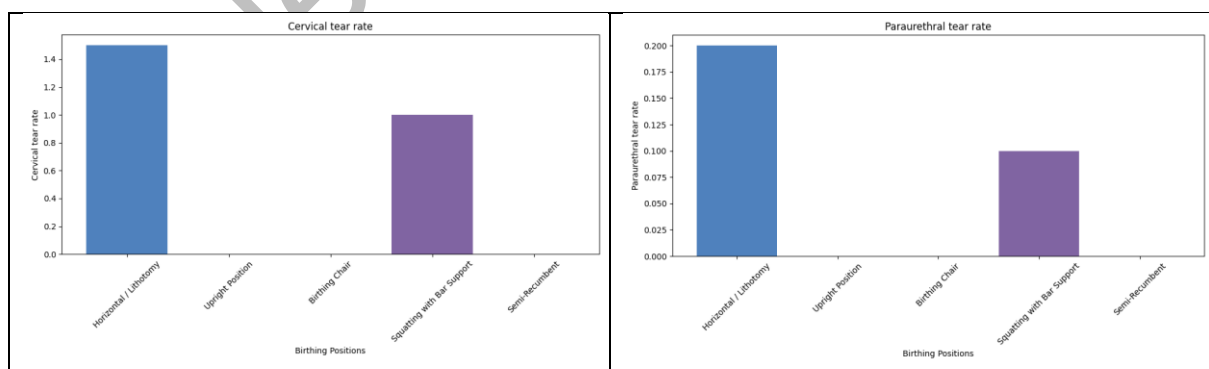
164
165 The graph (Figure 2) illustrates the percentage of episiotomies performed across different
166 birthing positions. Notably, the horizontal/lithotomy position exhibits the highest episiotomy
167 rate at 22%, whereas the upright position, birthing chair, and semi-recumbent positions all
168 share the lowest rate at 8%. This data indicates a significant disparity in episiotomy rates
169 between the horizontal/lithotomy position and the other positions. The elevated rate in the

horizontal/lithotomy position may be attributed to the restricted movement and increased pressure on the perineum, which can necessitate an episiotomy to facilitate delivery. In contrast, the lower rates observed in the upright, birthing chair, and semi-recumbent positions suggest that these positions may allow for better perineal support and flexibility, thereby reducing the need for episiotomies. This finding underscores the potential benefits of adopting alternative birthing positions to minimize the incidence of episiotomies and enhance maternal outcomes.

The graph in Figure 2 also compares the rates of 1st and 2nd degree perineal tears across different birthing positions. It is evident that the horizontal/lithotomy position has the highest rate of perineal tears at 8%, whereas the upright position, birthing chair, and semi-recumbent positions all have the lowest rate at 4%. This data suggests that the horizontal/lithotomy position may be associated with a higher risk of perineal trauma during childbirth. In contrast, the lower rates observed in the upright, birthing chair, and semi-recumbent positions indicate that these positions may offer protective benefits against perineal tears. This could be due to better anatomical alignment and reduced pressure on the perineum in these positions, which may facilitate a more controlled and less traumatic delivery process. Consequently, adopting these alternative birthing positions could potentially minimize the incidence of perineal tears and improve maternal outcomes.

The cervical tear rate (Figure 3) is 1-2% in the horizontal/lithotomy position, while the upright position, birthing chair, and semi-recumbent positions have a rate of 0%. This absence of cervical tears in the latter positions suggests they may be safer for the cervix, potentially due to less mechanical stress and better support during delivery

Figure 3.Rates of cervical and perineal tears experienced in various birthing positions

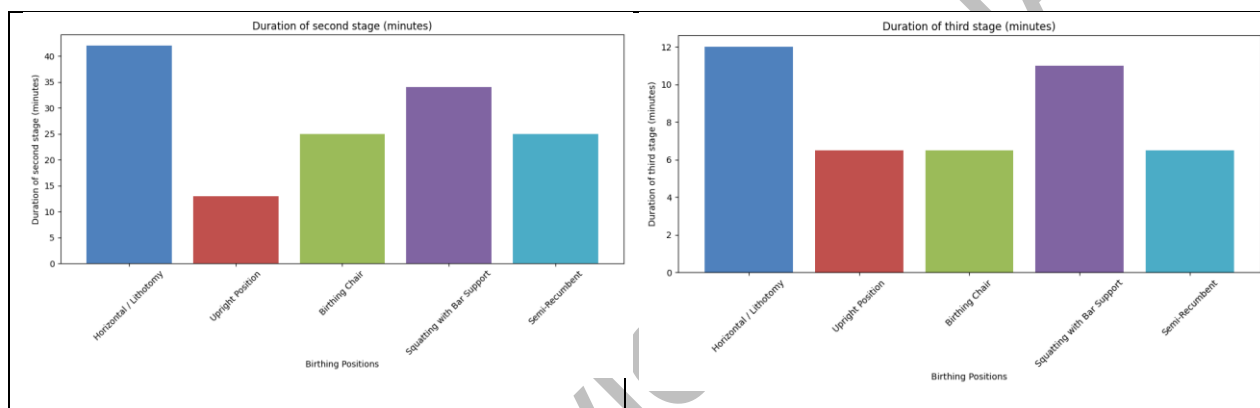


The paraurethral tear(Figure 3) rate is 0.2% in the horizontal/lithotomy position, compared to 0% in the upright position, birthing chair, and semi-recumbent positions. This data implies that the upright, birthing chair, and semi-recumbent positions may reduce the risk of

paraurethral tears, likely due to better anatomical alignment and less strain on the urethral area. Overall, these findings highlight the potential benefits of adopting alternative birthing positions to minimize various types of trauma and enhance maternal outcomes.

The duration of the second and third stages of labor varies significantly across different birthing positions. The horizontal/lithotomy position has the longest duration of the second stage at 42 minutes, while the upright position has the shortest duration at 13 minutes. This shorter duration in the upright position suggests that it may facilitate more efficient labor, possibly due to gravity aiding in the descent of the baby and better maternal effort.

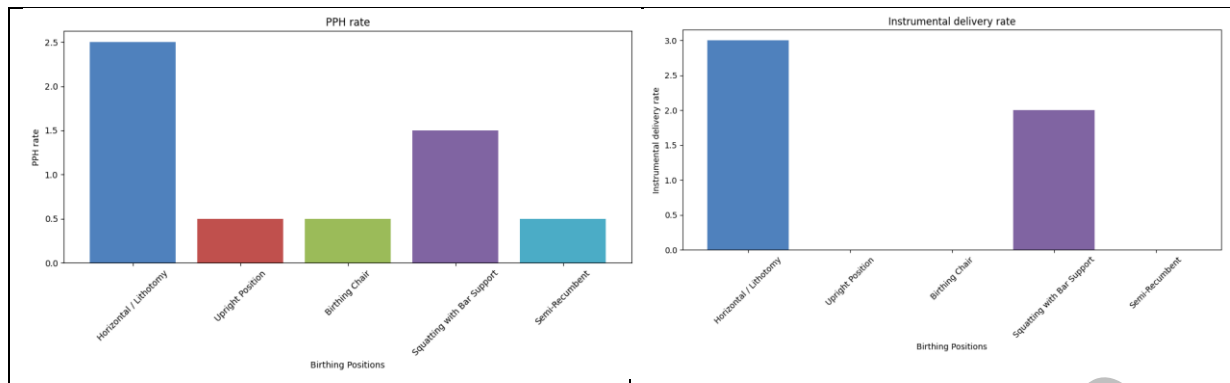
Figure 4 : Durations of second and third stage of labour for various birthing positions



For the third stage of labor, the horizontal/lithotomy position has a duration of 12 minutes, whereas the upright position, birthing chair, and semi-recumbent positions have a duration of 5-8 minutes. The shorter duration of the third stage in these positions indicates that they may promote faster placental delivery, potentially due to better uterine contractions and less interference with natural processes. These findings highlight the potential benefits of upright, birthing chair, and semi-recumbent positions in reducing the duration of both the second and third stages of labor, thereby enhancing the overall efficiency and safety of the birthing process.

The rates of postpartum hemorrhage (PPH) and instrumental deliveries vary across different birthing positions. (Figure 5) The horizontal/lithotomy position has a PPH rate of 2-3%, while the upright position, birthing chair, and semi-recumbent positions have a rate of less than 1%. This suggests that the upright, birthing chair, and semi-recumbent positions may be associated with reduced blood loss during childbirth, potentially due to better uterine contraction and less vascular compromise.

Figure 5: Association of PPH and instrumental delivery



In terms of instrumental deliveries, the horizontal/lithotomy position has a rate of 3%, whereas the upright position, birthing chair, and semi-recumbent positions have a rate of 0%. The absence of instrumental deliveries in these positions indicates that they may reduce the need for interventions, possibly due to better maternal effort and more effective pushing. These findings highlight the potential benefits of adopting alternative birthing positions to minimize the risk of PPH and the need for instrumental deliveries, thereby enhancing maternal and neonatal outcomes.

The need to shift to a supine position during labor varies across different birthing positions. The horizontal/lithotomy position is not applicable for this measure, while the upright position, birthing chair, and semi-recumbent positions all have a rate of 0%. This data suggests that these positions are stable and do not require shifting to a supine position, indicating their feasibility and safety during labor.

The birthing experience ratings, measured on a 5-point Likert scale, also vary across different birthing positions(Table 2). The horizontal/lithotomy position has the lowest rating at 2, while the birthing chair and semi-recumbent positions have the highest rating at 5. The higher ratings for birthing experience in the birthing chair and semi-recumbent positions suggest that these positions are perceived as more comfortable and satisfactory by mothers, possibly due to better support, less pain, and a more natural birthing process.

The Likert scale [11] used for birthing experience ranges from 1 to 5, with 1 indicating a very poor experience and 5 indicating an excellent experience. This scale helps quantify subjective experiences and provides a standardized way to compare different birthing positions.

Table 2 : Likert score results:

Birthing Positions	Likert Score
Horizontal / Lithotomy	2
Upright Position	4

Birthing Chair	5
Squatting with Bar Support	3
Semi-Recumbent	5

The satisfaction index, as indicated by the Likert scale, highlights that mothers in the birthing chair and semi-recumbent positions reported the highest levels of satisfaction, reflecting a more positive overall birthing experience.

Table 1 : Perinatal outcomes observed in different birthing positions

Parameter	Horizontal / Supine Position (n=240)	Upright Position (n=230)	Birthing Chair (n=96)	Squatting with Bar Support (n=52)	Semi- Recumbent (n=82)
Low APGAR score	1-2%	1-2%	1-2%	1-2%	2%
Meconium aspiration	< 1%	< 1%	< 1%	< 1%	< 1%
Birth Trauma	0.2	Nil	Nil	Nil	Nil
Need for NICU admission	< 1%	< 1%	< 1%	< 1%	< 1%
Infective morbidity	3-4%	1-2%	1-2%	1-2%	1-2%
Shoulder dystocia	0.4	0	0	0.3	0.3
Fresh still birth	0.15	0.12	0.10	0.12	0.12
Average birth weight (grams)	2760	2850	2790	2650	2650
Early initiation of breast feeding among eligible babies	100%	100%	100%	100%	100%
Average hospital stay	3-4 days	2 days	2 days	2-3 days	2-3 days

The perinatal outcomes present a comprehensive comparison across different birthing positions, highlighting key parameters such as low APGAR scores, meconium aspiration, birth trauma, need for NICU admission, infective morbidity, shoulder dystocia, fresh stillbirth, average birth weight, early initiation of breastfeeding, and average hospital stay.

For low APGAR scores, the rates are consistent across most positions, ranging from 1-2%, with the semi-recumbent position slightly higher at 2%. Meconium aspiration rates are uniformly low across all positions, at less than 1%. Birth trauma is notably absent in the upright, birthing chair, and squatting with bar support positions, while the horizontal/supine position has a minimal rate of 0.2%.

The need for NICU admission is similarly low across all positions, at less than 1%. Infective morbidity shows a higher rate in the horizontal/supine position (3-4%) compared to 1-2% in the other positions. Shoulder dystocia is present in the horizontal/supine position (0.4%) and squatting with bar support (0.3%), but absent in the upright and birthing chair positions.

Fresh stillbirth rates are slightly higher in the horizontal/supine position (0.15%) compared to the upright (0.12%), birthing chair (0.10%), and squatting with bar support (0.12%) positions.

Average birth weights are highest in the upright position (2850 grams) and lowest in the squatting with bar support and semi-recumbent positions (2650 grams).

Early initiation of breastfeeding among eligible babies is consistently high at 100% across all positions. Average hospital stay is longest in the horizontal/supine position (3-4 days) and shortest in the upright and birthing chair positions (2 days), with the squatting with bar support and semi-recumbent positions averaging 2-3 days.

These findings suggest that upright, birthing chair, and semi-recumbent positions may offer several advantages, including lower rates of infective morbidity, shoulder dystocia, and fresh stillbirth, as well as shorter hospital stays and higher average birth weights. This data underscores the potential benefits of adopting alternative birthing positions to improve perinatal outcomes.

Discussion

The findings from this study underscore the significant impact of birthing positions on maternal and perinatal outcomes. The data indicates that upright positions, such as sitting, kneeling, squatting, and standing, offer several advantages over the traditional horizontal/supine positions. These benefits include shorter durations of labor, reduced rates of episiotomies, perineal tears, and postpartum hemorrhage, as well as lower incidences of instrumental deliveries and birth trauma.

The J-shape[12] of the birth canal in upright positions allows for a wider range of motion at the sacroiliac (SI) joint, facilitating pelvic expansion and reducing the need for surgical assistance. In contrast, supine positions tend to fix the sacrum, potentially limiting pelvic mobility and increasing the likelihood of interventions.

Despite the clear benefits observed, it is important to acknowledge the heterogeneity and potential performance bias in the study situations. Therefore, higher quality trials are necessary to confirm the true risks and benefits of upright and mobile positions compared to recumbent positions for all women. Based on the current findings, it is advisable to inform women in low-risk labor about the advantages of upright positions and to support and assist them in adopting the positions they find most comfortable.

The Cochrane review by Lawrence et al. (2013) provides robust evidence supporting the use of upright positions during the first stage of labour[13]. The review included 25 trials with 5218 participants and found that the duration of the first stage of labor was more than one hour shorter in women randomly assigned to upright positions compared to those assigned to recumbent positions or bed care (mean difference -1.36 hours, 95% CI -2.22 to -0.51 hours). Additionally, upright positions were associated with a modest reduction in the risk of caesarean birth (risk ratio [RR] 0.71, 95% CI 0.54-0.94), reduced need for epidural analgesia, and no increase in interventions or negative effects on maternal and neonatal wellbeing.

Historically, the most common birthing position has been some form of the upright position. However, the mid-seventeenth century saw a shift towards the recumbent position, primarily for the convenience of forceps deliveries. By the nineteenth century, the use of ether as an anaesthetic further entrenched the recumbent position, as it facilitated labor and delivery under anaesthesia. Despite these historical practices, evidence has long supported the physiological advantages of upright positions during labor and delivery. Principles of physics and studies using topographical and radiographic methods have demonstrated the positive influence of upright positions on the childbirth process.

Conclusion

In conclusion, the study provides compelling evidence that upright birthing positions offer significant benefits in terms of shorter labor duration, reduced risk of caesarean birth, and decreased need for epidural analgesia, without increasing the risk of interventions or adverse outcomes for mothers and babies. Given the physiological advantages and historical precedence of upright positions, it is recommended that women in low-risk labor be encouraged to follow their instincts and assume positions that maximize their comfort and physiological advantage during labor and delivery. Further high-quality research is needed to confirm these findings and to better understand the optimal birthing positions for different populations of women.

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