EFFECT OF SIDE-LYING WITH A PEANUT BALL ON FIRST-STAGE ACTIVE-PHASE LABOR DURATION: A QUASI-EXPERIMENTAL STUDY

Eva Puji Rahayu Ningtias[1*], Raden Maria Veronika Widiatrilupi[2], Reny Retnaningsih[3]

[1-3]Program Studi Sarjana Kebidanan, Fakultas Kesehatan, Institut Teknologi, Sains, dan Kesehatan RS dr. Soepraoen, Malang

[*Email Korespondensi: evatias2003@gmail.com]

Abstract: Effect of Side-Lying with a Peanut Ball on First-Stage Active-Phase Labor Duration: A Quasi-Experimental Study. *Prolonged active-phase labor may increase maternal and neonatal complications. The* side-lying *position with a peanut ball is a non-pharmacological intervention intended to facilitate pelvic opening and fetal descent. This study aimed to compare the duration of the active phase of the first stage of labor between women receiving the* side-lying *position with a peanut ball and those receiving control care. A quasi-experimental study with a posttest-only control group design was conducted among 32 primiparous women in active labor. Participants were recruited using consecutive sampling and included in an intervention group (n=16) or a control group (n=16). The intervention group received the* side-lying *position with a peanut ball, whereas the control group received routine labor care without a peanut ball. Labor duration was recorded using observation sheets and partographs. Because the intervention-group duration data were non-normally distributed, between-group differences were analyzed using the Mann–Whitney U test. The median active-phase duration was 4.55 hours (IQR 4.13–4.95) in the intervention group and 6.15 hours (IQR 5.65–6.75) in the control group, representing a median difference of 1.60 hours. Fast labor duration (<4 hours) occurred in 25.0% of the intervention group and 6.3% of the control group. Active-phase duration differed significantly between groups (U=30.50,* p*<0.001), with an effect size of* r*=0.65. The* side-lying *position with a peanut ball was associated with a shorter active phase of the first stage of labor.*
Keywords: *Labor, Obstetric, Labor Stage, First, Patient Positioning, Peanut Ball.*

Abstrak: Pengaruh Posisi *Side-Lying* dengan *Peanut Ball* terhadap Durasi Kala I Fase Aktif Persalinan: Studi Kuasi-Eksperimental. Kala I fase aktif yang berlangsung lama dapat meningkatkan risiko komplikasi maternal dan neonatal. Posisi *side-lying* dengan *peanut ball* merupakan intervensi nonfarmakologis yang ditujukan untuk membantu membuka panggul dan memfasilitasi penurunan kepala janin. Penelitian ini bertujuan membandingkan durasi kala I fase aktif persalinan antara ibu yang diberikan posisi *side-lying* dengan *peanut ball* dan kelompok kontrol. Penelitian menggunakan desain *quasi-experimental* dengan pendekatan *posttest-only control group* pada 32 ibu bersalin primipara. Responden direkrut menggunakan *consecutive sampling* dan terdiri atas kelompok intervensi (n=16) dan kelompok kontrol (n=16). Kelompok intervensi diberikan posisi *side-lying* dengan *peanut ball*, sedangkan kelompok kontrol mendapatkan asuhan persalinan rutin tanpa *peanut ball*. Durasi persalinan dicatat menggunakan lembar observasi dan partograf. Karena data durasi pada kelompok intervensi tidak berdistribusi normal, perbedaan antarkelompok dianalisis menggunakan uji *Mann–Whitney U*. Median durasi kala I fase aktif pada kelompok intervensi adalah 4,55 jam (IQR 4,13–4,95), sedangkan pada kelompok kontrol 6,15 jam (IQR 5,65–6,75), dengan selisih median 1,60 jam. Durasi cepat (<4 jam) ditemukan pada 25,0% kelompok intervensi dan 6,3% kelompok kontrol. Durasi kala I fase aktif berbeda secara bermakna antara kedua

kelompok (U=30,50; p<0,001), dengan ukuran efek r=0,65. Posisi *side-lying* dengan *peanut ball* berhubungan dengan durasi kala I fase aktif yang lebih singkat.
Kata Kunci: Kala I Fase Aktif, *Peanut Ball*, Persalinan, Posisi *Side-Lying*.

INTRODUCTION

Labor is a physiological process characterized by progressive uterine contractions, cervical dilation, fetal descent, and ultimately the birth of the fetus. Normal labor at term progresses through sequential stages involving cervical dilation, fetal delivery, placental delivery, and early postpartum observation (Cunningham et al., 2022; World Health Organization, 2018). The active phase of the first stage is particularly important because progressive cervical dilation and fetal descent during this period determine the subsequent progress of labor.

Prolonged labor remains an important obstetric concern because it may be associated with maternal and neonatal complications and an increased requirement for obstetric intervention (Cunningham et al., 2022; World Health Organization, 2018). According to the latest internationally comparable estimates, the maternal mortality ratio in Indonesia was approximately 140.5 deaths per 100,000 live births in 2023 (World Health Organization et al., 2025). More recent national data from the 2023 Indonesian Health Survey (Survei Kesehatan Indonesia [SKI]) reported prolonged labor in 3.3% of women nationally and 4.2% in East Java, indicating that prolonged labor remains a relevant maternal health problem in the study region (Badan Kebijakan Pembangunan Kesehatan, 2024). SKI 2023 is the current national health survey that continues the indicators previously assessed through Riskesdas, including indicators relevant to maternal health.

Labor progress is influenced by several interrelated maternal, fetal, pelvic, psychological, and positional factors (Cunningham et al., 2022; World Health Organization, 2018). Among these factors, maternal position is modifiable during labor and may influence pelvic dimensions, fetal descent, maternal comfort, and uteroplacental circulation. Prolonged supine positioning may increase compression of the inferior vena cava and reduce venous return and uteroplacental perfusion, whereas lateral positioning can reduce this compression and provide greater maternal comfort during labor (Mulyaningsih and Ishak, 2021).

Non-pharmacological interventions that facilitate maternal mobility and positional changes may therefore support physiological labor progression. One such intervention is the *peanut ball*, an oval-shaped exercise ball designed to support the lower extremities while allowing changes in maternal position. Its use may facilitate pelvic opening and fetal descent while enabling women to maintain comfortable positions during labor. Previous studies have evaluated peanut ball use in different labor positions, particularly among women receiving epidural analgesia (Tussey et al., 2015; Roth et al., 2016). More recent evidence has also evaluated peanut ball positioning and pelvic mobility among women without analgesia (Fraga et al., 2024).

The *side-lying* position with a *peanut ball* is intended to maintain pelvic opening while minimizing the physiological disadvantages associated with prolonged supine positioning. Earlier studies have specifically described *side-lying* placement of the ball between the legs, and more recent evidence has continued to evaluate *peanut ball* positioning as part of labor management. An updated systematic review reported a reduction in first-stage labor duration among women with epidural analgesia using a *peanut ball*, although the magnitude and consistency of the effect varied across studies (Makvandi et al., 2025). Evidence from Indonesian studies has also suggested that peanut ball use may support labor progress and shorten the duration of the first stage of labor (Primihastuti and

Romadhona, 2021; Trihartiningsih and Munanadia, 2023; Navelia et al., 2024).

Thus, the research gap is not the absence of studies combining a *peanut ball* with maternal positioning. Rather, much of the existing evidence has been generated in hospital-based populations, particularly among women receiving epidural analgesia. Evidence from independent midwifery practice settings in Indonesia, particularly among primiparous women managed without epidural analgesia, remains comparatively limited. This distinction is relevant to the present study because the study population consisted of primiparous women, and epidural analgesia during the first stage was an exclusion criterion.

Therefore, this study aimed to analyze the effect of the *side-lying* position with a *peanut ball* on the duration of the active phase of the first stage of labor among primiparous women at an independent midwifery practice in Tajinan, Malang Regency. The findings are expected to provide additional evidence regarding a simple non-pharmacological intervention that may be applicable to physiological labor care in primary midwifery settings.

METHODS

This study employed a quasi-experimental design with a posttest-only control group approach to compare the duration of the active phase of the first stage of labor between women receiving the *side-lying* position with a peanut ball and those receiving control care. The study was conducted at TPMB Ubaidilla Qoyyumi, Tambak Asri Village, Tajinan District, Malang Regency, from January to February 2026.

The study population consisted of women undergoing the active phase of the first stage of labor at the study site during the research period. Participants were recruited using consecutive sampling, whereby all eligible women presenting during the study period were included until the required sample size was achieved. A total of 32 participants were enrolled, comprising 16 women in the intervention group and 16 women in the control group. The available study records did not document the specific sequence used to allocate eligible participants to the two groups; therefore, no claim of randomized allocation was made. Consecutive sampling was used for participant recruitment and was distinguished from group allocation.

The minimum sample size was determined using the Federer formula, $(n-1)(t-1)\geq 15$, where n represents the minimum number of participants per group and t represents the number of study groups. With two groups, the calculation resulted in a minimum requirement of 16 participants per group. Therefore, the total minimum sample size was 32 participants, consisting of 16 participants in each group.

The inclusion criteria were primigravida women undergoing the active phase of the first stage of labor, term pregnancy at 37–42 weeks of gestation, cephalic presentation, stable maternal and fetal conditions, delivery at the study site, and willingness to participate after providing written informed consent. Cervical dilation at recruitment ranged from 4 to 7 cm and was recorded as a baseline characteristic. The exclusion criteria were a history of cesarean section or uterine abnormalities, multiple pregnancy, premature rupture of membranes accompanied by signs of infection, preeclampsia or eclampsia, suspected fetal macrosomia (>4,000 g), conditions requiring emergency obstetric intervention, use of epidural analgesia or anesthesia during the first stage of labor, and unwillingness to complete the study procedures.

The independent variable was the application of the *side-lying* position with a peanut ball. In the intervention group, women were positioned on either the right or left side with a peanut ball placed between the thighs or knees to maintain pelvic abduction. Maternal comfort, uterine contractions, and fetal heart rate were monitored during the intervention. Participants were advised to change sides approximately every hour. The

peanut ball was discontinued when full cervical dilation was achieved, maternal discomfort occurred, fetal distress developed, or an emergency obstetric indication arose. The operational protocol described the intervention as being maintained for approximately 30–60 minutes per side during the active phase of labor. The control group received routine labor care without a peanut ball. The operational definition described the control condition as *side-lying* without a peanut ball or a standard position; no further standardization of maternal position in the control group was documented.

The primary outcome was the recorded duration of the active phase of the first stage of labor, expressed in hours. Duration was documented using the partograph and observation sheet, supported by a clock or stopwatch. Cervical dilation at the beginning of observation and the time of complete cervical dilation were recorded. Because participants entered observation at different cervical dilations, ranging from 4 to 7 cm, cervical dilation at recruitment was also reported as a baseline characteristic. The outcome was treated as continuous ratio-scale data for the primary statistical analysis.

For supplementary descriptive purposes, labor duration was also classified as fast (<4 hours), normal (4–8 hours), or prolonged (>8 hours). These categories were summarized using frequencies and percentages but were not used as the primary outcome for the between-group statistical comparison.

Labor progress was monitored using a partograph, including cervical dilation, uterine contractions, fetal heart rate, and maternal and fetal conditions. The observation sheet was used to record participant characteristics and implementation of the intervention. The study protocol also required documentation of the start and end of peanut ball use, positional changes, progression of cervical dilation, and maternal and fetal conditions.

Maternal age, education level, parity, and cervical dilation at recruitment were recorded as participant characteristics. Membrane status was monitored during labor. Women with premature rupture of membranes accompanied by signs of infection were excluded, whereas women with intact membranes or ruptured membranes without signs of infection remained eligible. Complete individual-level data on oxytocin induction or augmentation and neonatal birth weight were not available in the analytical dataset and were therefore not included as adjustment variables.

Data analysis consisted of descriptive and inferential analyses. Continuous variables were summarized using mean ± standard deviation and median with interquartile range (IQR), while categorical variables were presented as frequencies and percentages. Normality of numerical labor-duration data was assessed separately in each group using the Shapiro–Wilk test. The control-group duration data did not significantly deviate from normality (p=0.816), whereas the intervention-group data were non-normally distributed (p=0.001). Because at least one group showed a non-normal distribution and the sample size was small, the between-group comparison of labor duration was performed using the Mann–Whitney U test. Effect size was calculated as $r = |Z|/\sqrt{N}$. Statistical significance was defined as a two-sided $p<0.05$.

Because the *side-lying* position and peanut ball intervention were directly observable, blinding of participants and personnel delivering the intervention was not feasible. The available study records did not document the use of an independent blinded outcome assessor; therefore, blinded outcome assessment was not assumed.

The study received ethical approval from the Health Research Ethics Committee of Institut Teknologi, Sains, dan Kesehatan RS dr. Soepraoen Malang, approval number KEPK-EC/442/XII/2025, valid from December 23, 2025, to December 22, 2026. Written informed consent was obtained from all participants before enrollment.

RESULTS

Baseline Characteristics of the Participants

A total of 32 primiparous women were included in the study, with 16 participants in the intervention group and 16 in the control group. Baseline characteristics according to study group are presented in Table 1. All participants were primiparous. Maternal age, educational level, and cervical dilation at recruitment showed generally similar distributions between the two groups.

Table 1. Baseline Characteristics of Participants by Study Group

Characteristic	Control Group (n=16), n (%)	Intervention Group (n=16), n (%)
Age (years)		
<20	1 (6.3)	3 (18.8)
20–30	7 (43.8)	7 (43.8)
31–40	7 (43.8)	4 (25.0)
>40	1 (6.3)	2 (12.5)
Education		
Elementary school	2 (12.5)	3 (18.8)
Junior high school	3 (18.8)	2 (12.5)
Senior high school/vocational	9 (56.3)	8 (50.0)
Higher education	2 (12.5)	3 (18.8)
Parity		
Primipara	16 (100.0)	16 (100.0)
Cervical dilation at recruitment (cm)		
4 cm	6 (37.5)	7 (43.8)
5 cm	5 (31.3)	4 (25.0)
6 cm	4 (25.0)	4 (25.0)
7 cm	1 (6.3)	1 (6.3)

Data are presented as n (%). Percentages were calculated using n=16 as the denominator for each group.

The mean maternal age was 29.56 ± 6.75 years in the control group and 28.75 ± 7.94 years in the intervention group. Cervical dilation at recruitment ranged from 4 to 7 cm in both groups, with a median of 5 cm (IQR 4–6 cm) in each group. These findings indicate that participants entered the study at varying degrees of cervical dilation rather than uniformly at 4 cm.

Duration of the Active Phase of the First Stage of Labor

The duration of the active phase of the first stage of labor was analyzed as a continuous variable in hours. The Shapiro–Wilk test showed that duration was normally distributed in the control group (p=0.816) but not in the intervention group (p=0.001). Therefore, the primary descriptive statistics are reported as median and interquartile range (IQR), and the between-group comparison was performed using the Mann–Whitney U test.

Table 2. Duration of the Active Phase of the First Stage of Labor by Study Group

Group	n	Mean ± SD (hours)	Median (IQR), hours	Minimum–Maximum (hours)
Control	16	6.28 ± 1.20	6.15 (5.65–6.75)	3.70–8.50
Intervention	16	4.68 ± 0.94	4.55 (4.13–4.95)	3.70–7.70

SD = standard deviation; IQR = interquartile range.

The median duration of the active phase was 6.15 hours (IQR 5.65–6.75) in the control group and 4.55 hours (IQR 4.13–4.95) in the intervention group. Thus, the intervention group had a 1.60-hour shorter median duration than the

control group. The corresponding mean durations were 6.28 ± 1.20 hours and 4.68 ± 0.94 hours, respectively.

For supplementary descriptive purposes, the duration was also classified into fast (<4 hours), normal (4–8 hours), and prolonged (>8 hours). In the control group, 1 participant (6.3%) had a fast duration, 13 (81.3%) had a normal duration, and 2 (12.5%) had a prolonged duration. In the intervention group, 4 participants (25.0%) had a fast duration, 12 (75.0%) had a normal duration, and no participant had a duration longer than 8 hours.

Between-Group Difference in the Duration of the Active Phase

The Mann–Whitney U test demonstrated a statistically significant difference in the distribution of active-phase labor duration between the intervention and control groups.

Table 3. Mann–Whitney U Test for Active-Phase Labor Duration

Outcome	Control, Median (IQR), hours	Intervention, Median (IQR), hours	Mann–Whitney U	Z	*p*-value	Effect Size (*r*)
Active-phase duration	6.15 (5.65–6.75)	4.55 (4.13–4.95)	30.50	−3.66	<0.001	0.65

Effect size calculated as r = |*Z*|/√*N; N = 32.*

The intervention group had a significantly shorter active-phase labor duration than the control group (Mann–Whitney U=30.50, Z=−3.66, $p<0.001$). The effect size calculated as $r = |Z|/\sqrt{N}$ was 0.65, indicating a substantial between-group difference. The median duration was 1.60 hours shorter in the intervention group.

DISCUSSION

The present study demonstrated a significant difference in the duration of the active phase of the first stage of labor between the intervention and control groups. The median duration was 4.55 hours (IQR 4.13–4.95) in the intervention group and 6.15 hours (IQR 5.65–6.75) in the control group, corresponding to a median difference of 1.60 hours. The Mann–Whitney U test showed a statistically significant between-group difference (U=30.50, $p<0.001$), with an effect size of $r=0.65$. These findings indicate that women receiving the *side-lying* position with a peanut ball had a shorter recorded active-phase labor duration than women receiving control care.

In the control group, the mean active-phase duration was 6.28 ± 1.20 hours, with a median of 6.15 hours. Most participants had a duration within the predefined normal category of 4–8 hours (81.3%), while 12.5% had a duration of more than 8 hours and 6.3% had a duration of less than 4 hours. In comparison, the intervention group had a mean duration of 4.68 ± 0.94 hours and a median of 4.55 hours. In this group, 75.0% of participants had a duration of 4–8 hours, 25.0% had a duration of less than 4 hours, and no participant had a duration exceeding 8 hours. These categorical findings are presented as supplementary descriptive information, while the numerical duration in hours constitutes the primary outcome.

All participants in this study were primiparous. This is important because parity is a well-recognized determinant of labor progression, with first labor generally differing from subsequent labor in its duration and pattern of cervical dilation. The homogeneity of parity in the present sample therefore reduces potential confounding attributable to differences between primiparous and multiparous women. At the same time, this characteristic limits the generalizability of the findings to multiparous populations.

Maternal positioning represents a potentially modifiable component of labor management. Within the 5P framework, maternal position is considered alongside power, passenger,

passage, and psyche as a factor that may influence labor progress. The *side-lying* position may reduce prolonged supine compression, promote maternal comfort, and allow positional adjustments that facilitate fetal descent. The peanut ball is intended to maintain separation of the lower extremities and promote pelvic opening while the mother remains in a lateral position. WHO guidance on intrapartum care emphasizes woman-centered care and supports mobility and maternal choice of position during labor when clinically appropriate (World Health Organization, 2018).

The present findings are broadly consistent with several previous studies on peanut ball use. Tussey et al. (2015) evaluated peanut ball use among women receiving epidural analgesia and reported shorter first- and second-stage labor durations in the intervention group, although the reduction in first-stage duration did not reach conventional statistical significance in that study. Roth et al. (2016), in a randomized controlled trial of women undergoing elective induction and planning epidural analgesia, reported that peanut ball use was associated with a shorter first stage of labor particularly among primiparous women. These studies support the biological plausibility that positional support using a peanut ball may contribute to labor progression.

However, the existing evidence is not entirely consistent. Grenvik et al. (2019), in a systematic review and meta-analysis of four randomized controlled trials involving 648 women, found that total labor duration was approximately 79 minutes shorter with peanut ball use, but the difference was not statistically significant. Similarly, Ahmadpour et al. (2021) analyzed six clinical trials involving 645 participants and found no statistically significant reduction in the duration of the first stage of labor or cesarean section rate. The authors concluded that stronger clinical trials were still required. These findings indicate that the magnitude and consistency of the benefit may depend on the study population, intervention protocol, labor management, and methodological quality.

More recent evidence has suggested a more favorable effect in specific populations. An updated systematic review and meta-analysis including eight studies and 1,352 women reported that among women receiving epidural analgesia, peanut ball use shortened the first stage of labor by approximately 53 minutes. However, sensitivity analysis showed that removal of the Tussey et al. study shifted the pooled first-stage finding toward non-significance, indicating that the overall estimate remains sensitive to individual studies. Therefore, the present findings should be interpreted as additional evidence rather than definitive proof of effectiveness (Makvandi et al., 2025).

An important difference between the present study and much of the previous international literature is the clinical context. Several influential peanut ball studies, including those by Tussey et al. and Roth et al., involved women receiving epidural analgesia. In contrast, epidural analgesia during the first stage was an exclusion criterion in the present study. Consequently, the shorter active-phase duration observed here occurred in primiparous women managed in an independent midwifery practice without epidural analgesia. This difference may partly explain why the magnitude of the observed between-group difference was greater than that reported in some hospital-based studies. Nevertheless, differences in study design, labor management, baseline cervical dilation, and other obstetric factors prevent direct quantitative comparison across studies.

Cervical dilation at recruitment also requires consideration when interpreting the results. Participants entered observation at different cervical dilations, ranging from 4 to 7 cm, although the median cervical dilation was 5 cm in both groups. Because the remaining time to complete dilation is inherently related to cervical dilation at the start of observation, variability in baseline dilation may influence recorded labor duration. Although the overall

distribution of baseline dilation was similar between groups, this factor was not adjusted for in a multivariable analysis and therefore remains a potential source of residual confounding.

The statistically significant Mann–Whitney result should be interpreted as evidence of a difference in the distribution of labor duration between the two groups rather than as proof of a causal effect. The rank-based effect size of r=0.65 indicates a substantial magnitude of between-group difference in this sample. Nevertheless, the quasi-experimental design and absence of documented randomized allocation mean that unmeasured differences between the groups may have contributed to the observed association.

Taken together, the findings suggest that the *side-lying* position with a peanut ball was associated with a shorter recorded active-phase labor duration among primiparous women in this independent midwifery practice. The results are consistent with some previous studies while also contributing evidence from a setting and population that differ from the predominantly hospital-based, epidural populations represented in much of the existing peanut ball literature. Further randomized and adequately powered studies are needed to establish the magnitude of benefit and determine whether the findings are reproducible across different obstetric populations and care settings.

Limitations

Several limitations should be considered when interpreting these findings. First, this study used a quasi-experimental, non-randomized design, and the available study documentation did not clearly describe the procedure used to allocate participants to the intervention and control groups. This may have introduced selection bias. Blinding was also not documented, and because the positional intervention was directly observable, participants and personnel delivering the intervention could not be blinded, creating the possibility of observer bias.

Second, the sample size was relatively small, with only 16 participants in each group. Although a statistically significant difference was identified, the small sample limits the precision of the estimates and the ability to evaluate less common outcomes. Third, the study was conducted at a single independent midwifery practice in Malang Regency; consequently, the findings may not be directly generalizable to hospitals, other geographic regions, multiparous women, high-risk pregnancies, or women receiving epidural analgesia.

Fourth, cervical dilation at recruitment varied from 4 to 7 cm. Although baseline dilation was similar in distribution between groups, it was not statistically adjusted for and may have affected the recorded duration of labor. Important potential confounding factors, including oxytocin induction or augmentation, neonatal birth weight, membrane status throughout labor, contraction characteristics, psychological status, and the presence of a labor companion, were not available as complete analyzable variables and therefore could not be controlled in the analysis.

Finally, the actual duration in hours was used as the primary outcome to preserve the information contained in the continuous data, whereas the fast, normal, and prolonged categories were retained only for descriptive purposes. Future studies should prospectively record continuous labor-duration data, standardize cervical dilation at enrollment, systematically document major obstetric confounders, and use randomized allocation with blinded outcome assessment where feasible.

CONCLUSION

Among primiparous women in this study, the intervention group receiving the *side-lying* position with a peanut ball had a significantly shorter recorded duration of the active phase of the first stage of labor than the control group. The median duration was 4.55 hours (IQR 4.13–4.95) in the intervention group and 6.15 hours (IQR 5.65–6.75) in the control group,

representing a 1.60-hour shorter median duration in the intervention group. The difference between groups was statistically significant (Mann–Whitney U=30.50, $p<0.001$), indicating that the *side-lying* position with a peanut ball was associated with a shorter active-phase labor duration in this study population.

These findings suggest that the *side-lying* position with a peanut ball may be considered as a simple non-pharmacological option to support labor progress in independent midwifery practice. However, larger multicenter randomized controlled trials are needed to confirm these findings and to evaluate additional clinically relevant outcomes, including maternal pain, maternal satisfaction, mode of delivery, neonatal outcomes, and the influence of potential confounding factors such as cervical dilation at recruitment, oxytocin augmentation, and birth weight.

REFERENCES

Ahmadpour, P., Mohammad-Alizadeh-Charandabi, S., Doosti, R. and Mirghafourvand, M., 2021. Use of the peanut ball during labour: A systematic review and meta-analysis. Nursing Open, 8(5), pp.2345–2353. Available at: https://doi.org/10.1002/nop2.844

Badan Kebijakan Pembangunan Kesehatan, 2024. Survei Kesehatan Indonesia (SKI) 2023 dalam angka. Jakarta: Kementerian Kesehatan Republik Indonesia. Available at: https://www.badankebijakan.kemkes.go.id/hasil-ski-2023/

Cunningham, F.G., Leveno, K.J., Dashe, J.S., Hoffman, B.L., Spong, C.Y. and Casey, B.M., 2022. Williams obstetrics. 26th ed. New York: McGraw Hill.

Fraga, C.D.S., de Araújo, R.C., de Sá, L., Bertoldo, A.J.S. and Pitangui, A.C.R., 2024. Use of a peanut ball, positioning and pelvic mobility in parturient women shortens labour and improves maternal satisfaction with childbirth: A randomised trial. Journal of Physiotherapy, 70(2), pp.134–141. Available at: https://doi.org/10.1016/j.jphys.2024.02.017

Grenvik, J.M., Rosenthal, E., Saccone, G., Della Corte, L., Quist-Nelson, J., Gerkin, R.D., Gimovsky, A.C., Kwan, M., Mercier, R. and Berghella, V., 2019. Peanut ball for decreasing length of labor: A systematic review and meta-analysis of randomized controlled trials. European Journal of Obstetrics & Gynecology and Reproductive Biology, 242, pp.159–165. Available at: https://doi.org/10.1016/j.ejogrb.2019.09.018

Makvandi, S., Karimi, L., Larki, M. and Sahebkar, A., 2025. Investigation of the effects of peanut ball during labor: An updated systematic review and meta-analysis. European Journal of Midwifery, 9, p.15. Available at: https://doi.org/10.18332/ejm/201345

Mulyaningsih, S. and Ishak, F., 2021. Studi literatur: Perbandingan peanut ball dan birthing ball terhadap kemajuan persalinan kala I fase aktif. Jurnal Komunitas Kesehatan Masyarakat, 3(2), pp.1–8. Available at: https://doi.org/10.36090/jkkm.v3i2.1160

Navelia, Z.I., Hanifa, F.N., Rusliani, D.M., Dewi, N.P. and Heldayasari, F., 2024. The effect of using peanut ball on the duration of first stage of labour: A systematic review. Jurnal MID-Z (Midwivery Zigot) Jurnal Ilmiah Kebidanan, 7(1), pp.55–61. Available at: https://doi.org/10.56013/jurnalmidz.v7i1.2831

Primihastuti, D. and Romadhona, S.W., 2021. Penggunaan peanut ball untuk mengurangi nyeri persalinan dan memperlancar proses penurunan kepala janin pada persalinan kala I di BPM wilayah Surabaya. Journals of Ners Community, 12(1), pp.1–11. Available at: https://doi.org/10.55129/jnerscommunity.v12i1.1137

Roth, C., Dent, S.A., Parfitt, S.E., Hering, S.L. and Bay, R.C., 2016. Randomized controlled trial of use of the peanut ball during labor. MCN: The American Journal of Maternal/Child Nursing, 41(3), pp.140–146. Available at: https://doi.org/10.1097/NMC.0000000000000232

Trihartiningsih, E. and Munanadia, M., 2023. Peanut ball efektif mengurangi lama persalinan kala I. Pengembangan Ilmu dan Praktik Kesehatan, 2(2), pp.118–125. Available at: https://doi.org/10.56586/pipk.v2i2.269

Tussey, C.M., Botsios, E., Gerkin, R.D., Kelly, L.A., Gamez, J. and Mensik, J., 2015. Reducing length of labor and cesarean surgery rate using a peanut ball for women laboring with an epidural. The Journal of Perinatal Education, 24(1), pp.16–24. Available at: https://doi.org/10.1891/1058-1243.24.1.16

World Health Organization, 2018. WHO recommendations: Intrapartum care for a positive childbirth experience. Geneva: World Health Organization. Available at: https://www.who.int/publications/i/item/9789241550215

World Health Organization, United Nations Children's Fund, United Nations Population Fund, World Bank Group and United Nations Department of Economic and Social Affairs, Population Division, 2025. Trends in maternal mortality 2000 to 2023: Estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division. Geneva: World Health Organization. Available at: https://www.who.int/publications/i/item/9789240108462