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The association between maternal age and parity with prolonged labor: A literature review

Kiqueen Bintha Kinasih *

Department of Midwifery, Faculty of Medicine, University of Airlangga, Surabaya, Indonesia.

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Abstract

Introduction: Labor and childbirth are essential parts of the human life cycle. When labor extends longer than expected, it's referred to as prolonged labor, a complication that contributes to over 810 maternal deaths each year worldwide and accounts for over 69,000 cases annually. In fact, prolonged labor is the most frequently reported childbirth complication, occurring in 41% of cases. Past research has shown that a mother's age and the number of children she has (parity) can influence the risk of prolonged labor. More research is needed to understand better how these factors impact prolonged labor.

Method: This study is a literature review, drawing from sources in Google Scholar, PUBMED, and Science Direct, focusing on research published between 2019 and 2024. The study included only original research articles in English or Indonesian with all the required components.

Result and Discussion: From the literature search, 10 studies met the inclusion criteria. Among these, 7 studies found a strong correlation between maternal age and prolonged labor, while 2 found no correlation. Furthermore, 9 studies indicated a significant relationship between parity and prolonged labor, while 1 study described the characteristics of mothers who experienced prolonged labor.

Conclusion: In general, maternal age is related to the risk of prolonged labor, though a few studies showed no link. Parity is also significantly associated with prolonged labor.

Keywords: Maternal age; Parity; Delivery; Prolonged labor; Long parturition

1. Introduction

Labor and childbirth are integral to the human life cycle. Normal labor refers to the natural delivery of a fully developed fetus and placenta through the vagina without any assistance, with the fetus capable of survival outside the womb and positioned back-of-head first [20]. Labor begins with uterine contractions and the discharge of blood-tinged mucus from the mother's vagina. Sufficient uterine contractions then lead to cervical dilation, which signals the onset of Stage I of labor [21]. For first-time mothers (primigravida), Stage I typically lasts around 13–14 hours, while for mothers who have previously given birth (multigravida), it may be 5–6 hours shorter [20]. This stage is divided into a latent phase (1–3 cm dilation) and an active phase (4–10 cm dilation), after which the fetus is delivered in Stage II [6].

When labor takes longer than usual, it can lead to prolonged labor. Prolonged labor, or "dystocia," refers to active labor that includes regular contractions and progressive cervical dilation but lasts over 12 hours [10]. Dystocia can result from issues with contractions, the fetus, or the birth canal. Prolonged labor commonly results from a lack of progress in Stage I [13]. Generally, Stage I is considered extended if it lasts more than 24 hours for a first-time mother and over 18

* Corresponding author: Kiqueen Bintha Kinasih

hours for a multipara [8]. Prolonged labor is a major contributor to maternal complications, accounting for over 810 maternal deaths globally each year and over 69,000 reported cases annually [18]. The 2017 Indonesia Demographic and Health Survey found that prolonged labor is the most frequently reported labor complication, occurring in 41% of cases.

Savitri et al. [14] found that factors associated with prolonged labor include the mother's age at childbirth and parity. Women who are either younger or older than the ideal reproductive age are at greater risk of prolonged labor compared to those within the reproductive age range. The safest age for childbirth is between 20 and 35. Ideally, childbirth should be completed before 35. In mothers younger than 20, reproductive organs may not be fully developed, raising the risk of complications. In women older than 35, cellular regression, particularly in the endometrium, can make pregnancy and labor riskier [13].

Parity, which is the condition of having given birth to a baby (whether live or stillborn) without regard to the number of infants delivered, also affects labor outcomes. Multiple births count as a single parity event [15]. The lowest maternal mortality risk is seen with a parity of 2–3 births, while maternal mortality increases with higher parity. Higher parity is linked to greater maternal mortality [13]. First-time mothers are at higher risk of labor complications due to inexperience, and mothers with more than four children also face increased risks, especially if pregnancies are spaced less than two years apart. Frequent pregnancies, births, breastfeeding, and childcare can weaken the mother and lead to various health issues [13]. Parity affects labor duration, along with other factors like premature membrane rupture, excessive analgesia or anesthesia, and maternal anxiety. Prolonged active phases are less common in multiparous women than in first-time mothers [8]. Nulliparous mothers, in particular, often experience prolonged labor because they typically have tighter pelvic and perineal muscles, making it harder for the fetus to pass through the birth canal [2].

This study aims to further investigate the relationship between maternal age and parity and the risk of prolonged labor. The purpose of this review is to increase the knowledge of healthcare professionals, particularly midwives, mothers, and labor assistants, enabling them to anticipate and screen for risk factors for prolonged labor. By identifying these risk factors, more comprehensive care can be provided during pregnancy and childbirth to reduce the occurrence of prolonged labor and other complications.

2. Material and methods

This article is a literature review that examines 10 selected articles based on specific inclusion criteria. The selected articles present original research findings on the influence of maternal age and parity on the occurrence of prolonged labor, or on the characteristics of mothers who experience prolonged labor. The articles were published between 2019 and 2024 (within the last five years) and are in either English or Indonesian. Exclusion criteria applied to any articles discussing age and parity in relation to prolonged labor using methods other than original research. The articles were sourced from several databases, including Google Scholar, PUBMED, and Science Direct. Each selected article will be analyzed descriptively, covering author and publication year, research location, study methods, study subjects, and a summary of research findings.

3. Results

Ten articles—seven in English and three in Indonesian—have been reviewed and analyzed as follows.

Table 1 Results of Review of 10 Articles

No	Author	Research Title	Location	Method	Subject	Result
1	Savitri, A., *et al*. (2022).	Hubungan Antara Usia Dan Paritas Dengan Kejadian Partus Lama Pada Ibu Bersalin Di Rs Islam	Islam Jemursari Hospital, Surabaya, Indonesia	Analytical survey with cross-sectional design	72 mothers in labor on September – November 2021	Most respondents (75%) did not experience prolonged labor. There was no correlation found between age and prolonged labor in mothers. However, there was a relationship between parity and prolonged labor, with the majority of multiparous mothers

		Jemursari Surabaya				(85.4%) not experiencing prolonged labor.
2	Sui, M. Y., Lada, C. O., & Ruliati, L., P. (2021).	Analysis of Factors Affecting the Incidence of Prolonged Labor at Prof Dr Wz Johannes Hospital Kupang	Prof Dr Wz Johannes Hospital, Kupang, Indonesia	Observational analytic design with a case-control approach	150 mothers in labor on April – June 2020, consisting of 75 case groups and 75 control groups	No significant effect was found between age and prolonged labor (p = 0.468). In both the control and case groups, mothers aged 20–35 years (considered a safe age) were the majority. However, there was a significant effect of parity on prolonged labor (p = 0.015) with a negative trend. Mothers with a parity of 1 or more than 3 had a 1.9 times higher risk of prolonged labor compared to those with safer parity levels.
3	Kurniati, P. T. (2021).	Hubungan Usia Ibu Bersalin, Paritas Dan Berat Bayi Lahir Dengan Kejadian Partus Tak Maju	Ade Muhammad Djoen Hospital, Sintang, Indonesia	Quantitative analytics with cross-sectional design	346 mothers in labor on 2019	A correlation was found between maternal age and prolonged labor. Mothers in the high-risk age groups were 2.25 times more likely to experience prolonged labor compared to those in the safer age range. Parity was also strongly related to prolonged labor, with mothers in high-risk parity groups being 1.977 times more likely to experience it compared to those with safer parity.
4	Firdhauzy, A. R., *et al*. (2024).	Hubungan Usia dan Paritas dengan Kejadian Partus Lama pada Ibu Bersalin di Puskesmas Galis Bangkalan	Galis Health Center, Bangkalan, Indonesia	Analytical survey with cross sectional design	122 mothers in labor	There was a connection between age and prolonged labor in mothers. Most mothers who experienced prolonged labor were in high-risk reproductive age groups (younger than 20 or older than 35). Additionally, parity was related to prolonged labor, with most cases occurring in first-time or grand multiparous mothers.
5	Tilden, E. L., *et al*. (2022).	The duration of spontaneous active and pushing phases of labor among 75,243 US women when intervention is minimal: A prospective, observational cohort study	50 states in US	Observational cohort study using the Midwives Alliance of North America 4¢0 data (MANA Stats) with prospective approach	75.243 US women in labor between January 2012 and December 2018	Nulliparous mothers significantly experienced longer durations in the active phase of first stage and in second stage compared to multiparous mothers. Among nulliparous women, those older than 35 had longer first and second stage durations. In multiparous mothers, those over 35 experienced a slightly quicker active phase in first stage, but there was no significant difference in the duration of second stage.

6	Doussot, M., *et al*. (2021).	Factors Associated with Prolonged Duration of Labor in Medical Termination of Pregnancy in the 2nd and 3rd Trimesters	Port-Royal Maternity Hospital, Paris, France	Retrospective study	227 women who have a normal delivery	The sample was divided into two groups based on labor duration: labor <12h (n=173) and labor ≥12h (n=54). The average maternal age was 33.7 years, with 44% of the patients being nulliparous. Both age and parity correlated with prolonged labor, with older mothers and nulliparous mothers being more at risk for prolonged labor.
7	Wulansari, I., Yusuf, N. A. R., & Jafar, C. P. S. H. (2022).	Prolonged Labor Characteristics: A Study in Gorontalo	Three hospitals in Gorontalo Province, Indonesia	Descriptive research with retrospective approach	58 mothers with prolonged labor	Of the 31 (53.4%) mothers who experienced prolonged labor, the majority were first-time mothers, while 27 were multiparous. Although there was a higher number of first-time mothers experiencing prolonged labor, multiparous mothers were also at risk. Among all mothers, 43 (74.1%) were aged 20–35 years, while the remaining 15 were younger than 20 or older than 35, indicating that mothers within the "safe" reproductive age group can still experience prolonged labor.
8	Almeida, N. S., & Pinto, J., G. (2023).	Factor Analysis of Age and Gravidity with Prolonged Parturition in the Obstetrics Room of the District Hospital, Viqueque City, Timor Leste	District Hospital, Viqueque City, Timor Leste, Indonesia	Analytical research with cross-sectional design	30 mothers maternity with prolonged parturition	In this study, 12 mothers (40%) experienced prolonged labor. Among them, 8 (66.66%) were younger than 20, and 11 (91.66%) were first-time mothers. There was a significant correlation between maternal age and prolonged labor at Viqueque District Hospital (p value = 0.002), as well as a significant correlation between parity and prolonged labor at the same hospital (p value = 0.000).
9	Pardosi, M. (2023).	Factors Associated with Prolonged Parturition	Martha Friska Hospital, Medan, Indonesia	Analytical research with cross-sectional design	72 mothers in the labor phase	A total of 41 mothers (56.9%) experienced prolonged labor, with 22 (53.65%) being younger than 20 or older than 35, and 35 (85.36%) being nulliparous. There was a significant correlation between maternal age and prolonged labor at Marta Friska Hospital (p value = 0.018), as well as a significant correlation between parity and prolonged labor at the same hospital (p value = 0.001).
10	Hanis, I., Chairuna,	Relationship of Parity, Maternal Age,	Karya Mukti Health	Analytical survey method with	30 mothers in	Among 21 mothers with safe parity (2 or 3 births), 20 (95.23%) did not experience

	Handayani, S. (2023).	and Birth Weight With The Duration of The Second Stage of Labor	Center, Indonesia	cross-sectional approach	the labor phase	abnormal duration in second stage. Likewise, among 22 mothers within the safe age range (20–35 years), 21 (95.45%) did not experience prolonged second stage. There was a correlation between parity (p value = 0.019) and age (p value = 0.011) with prolonged labor due to an extended second stage. Mothers with high-risk parity and age had a higher likelihood of abnormal duration in second stage.

4. Discussion

4.1. Correlation Between Maternal Age and Prolonged Labor

Based on a review of 10 articles, 7 indicate a significant correlation between maternal age and prolonged labor. These articles highlight that high-risk reproductive ages (under 20 or over 35) are associated with a greater likelihood of experiencing prolonged labor compared to mothers within the safe reproductive age range of 20 to 35 years. One article examined the characteristics of mothers who experienced prolonged labor in relation to age and parity, while 2 other articles reported no significant correlation between age and prolonged labor.

A descriptive analysis of 58 mothers with prolonged labor in Gorontalo revealed that 43 (74.1%) were aged between 20 and 35, while the remaining 15 were either under 20 or over 35. This suggests that, while prolonged labor is theoretically more common among high-risk age groups, it can still occur in mothers who are considered to be in a healthy reproductive age range. In other words, even mothers within this range can be at risk for prolonged labor. Age is not the sole factor influencing prolonged labor; other determinants, such as inadequate contractions, fetal malposition, pelvic muscle conditions, and lack of physical activity during pregnancy, also play significant roles [13, 22].

Research by Savitri et al. [14] found no significant association between maternal age and prolonged labor. The majority of mothers studied at RS Islam Jemursari were in the safe age range of 20 to 35. This trend is likely due to increased awareness among mothers about the benefits of giving birth during their productive years, which can reduce labor risks, as well as effective communication from healthcare providers regarding pregnancy and labor risk prevention. The lack of age-related effects in this study may stem from the variability in the ages of the mothers, which resulted in less significant correlations when related to labor outcomes. Savitri et al.'s findings align with a case-control study involving 150 mothers at Prof Dr Wz Johannes Hospital, which also found no association between age and prolonged labor. Both the case and control groups were primarily composed of mothers within the safe age range, leading to the absence of a statistical correlation between age and prolonged labor.

Conversely, a study by Kurniati [7] found a correlation between maternal age and labor complications (p = 0.008). Mothers in high-risk age groups were 2.25 times more likely to experience prolonged labor compared to those in the safe range. Not all mothers under 20 or over 35 will experience labor difficulties; however, younger women often have immature reproductive organs and hormonal functions, which can be compounded by psychological and emotional factors that may hinder uterine contractions, leading to prolonged labor. For mothers over 35, weakened reproductive functions and reduced physical stamina can make it more challenging to push effectively during labor, which can result in complications.

A study conducted at Galis Health Center involving 122 mothers supported these findings, showing a correlation between age and prolonged labor (p = 0.000). The majority of mothers experiencing prolonged labor fell within the high-risk age range of under 20 or over 35. Younger mothers, particularly those under 20, are vulnerable to prolonged labor due to the incomplete development of their reproductive systems, making it difficult for the uterus to handle the demands of pregnancy [4]. Similar results were found in a study at Port-Royal Maternity Hospital involving 227 mothers, where participants were divided into two groups based on labor duration: less than 12 hours (n=173) and 12 hours or more (n=54), with an average maternal age of 33.7 years, which is within the healthy reproductive range. This study indicated a correlation between age and prolonged labor [3].

Almeida and Pinto [1] found a significant correlation between maternal age and prolonged labor at Viqueque District Hospital (p = 0.002). However, it is important to recognize that other factors also contribute to prolonged labor. In this study, 8 out of the 12 mothers with prolonged labor were under 20, which may statistically support the link between age and prolonged labor. Research by Pardosi [9] found similar results, confirming that age correlates significantly with prolonged labor, as 22 out of 41 mothers with prolonged labor were in the high-risk age category. Age is an important variable related to individual health, and it is hoped that mothers in a healthy reproductive age group will be better equipped to handle the emotional aspects of pregnancy and childbirth.

Prolonged labor can also be identified through extended durations of Stage II. Among 30 mothers, 22 were in the safe reproductive age range, with 21 (95.5%) not experiencing prolonged Stage II. This indicates a correlation between age and extended Stage II duration. Age is linked to the duration of the second stage of labor due to maternal readiness and the quality of the pregnancy. Labor risks increase for those under 20 or over 35, as age influences both pregnancy quality and maternal preparedness [5]. In nulliparous mothers, those over 35 were associated with longer durations in both Stage I and Stage II, while multiparous mothers over 35 experienced slightly quicker active phases in Stage I, with no significant differences in Stage II duration [17]. This indicates that age is not the only factor affecting labor duration.

After analyzing the 10 articles, it was found that most suggest that maternal age affects the duration of labor during both Stage I and Stage II. This aligns with Saifuddin's theory [13], which states that age is a maternal factor influencing the labor process, as physiological changes in the body can impact outcomes. For mothers under 20, their reproductive organs are often not fully developed, leading to a higher risk of labor complications. Meanwhile, mothers over 35 may experience regression in their body cells, particularly in the endometrium, increasing risks during pregnancy and labor [13]. Two articles did not find a link between age and labor duration, likely due to weaknesses in the data variability that could affect statistical results, even though, theoretically, age does influence maternal physiological conditions during pregnancy and childbirth. However, other factors such as parity, contractions, fetal position, and maternal physical activity also contribute to labor duration. One article highlighted the importance of considering parity to illustrate that age is not the sole influencing factor, underscoring the need for further research that accounts for other potential factors that could interfere with or moderate findings in similar studies.

4.2. Correlation Between Parity and Prolonged Labor

After reviewing 10 articles, it was found that 9 of them established a strong connection between parity and the incidence of prolonged labor. These studies indicate that high-risk parity (nulliparous, primiparous, and those with more than three births) significantly increases the likelihood of prolonged labor when compared to safe parity (two to three births). This extension in labor duration is observed in both the first and second stages. Additionally, one article categorized mothers with prolonged labor based on their age and parity.

A descriptive study involving 58 mothers with prolonged labor in Gorontalo revealed that 31 (53.4%) were primiparous, while the remaining 27 were multiparous. This finding suggests that while theory suggests prolonged labor is more common among first-time mothers, it can also occur in multiparous mothers, indicating that they too are at risk.

Research by Savitri et al. [14] demonstrated a link between parity and prolonged labor in mothers, with a majority (85.4%) being multiparous. This is likely because many mothers who give birth in hospitals have prior cesarean section histories, and it's generally recommended that subsequent births occur in a hospital. All forms of parity carry a risk for prolonged labor, supporting theories that suggest parity is one of several factors influencing this outcome. The findings from Savitri et al. (2022) align with a case-control study of 150 mothers at Prof Dr Wz Johannes Hospital, which also found a significant relationship between parity and prolonged labor (p = 0.015) in a negative direction (Exp B = -0.66). Mothers with a parity of 1 or more than 3 are 1.9 times more likely to experience prolonged labor compared to those with safe parity (2-3 births). As a result, preventive measures such as regular monitoring and adequate antenatal care (ANC) visits are crucial for mothers with high-risk parity.

Similarly, study by Kurniati [7] indicated a correlation between parity and the occurrence of stalled labor (p value = 0.026). Mothers with high-risk parity are nearly twice as likely to experience prolonged labor compared to those with safe parity. Primiparous mothers, lacking prior birthing experience, face a higher risk of complications. Conversely, mothers with four or more births may face health challenges and weakened uterine walls, increasing their risk for fetal positioning issues, transverse births, uterine rupture, stalled labor, and postpartum bleeding.

A study conducted at Galis Health Center with 122 mothers found a significant association between parity and prolonged labor (p value = 0.000). Most mothers experiencing prolonged labor were either primiparous or grand

multiparous, highlighting their higher risk compared to those with safe parity. It was noted that parities of 2-3 are generally considered safe, while lower parity mothers face greater risks due to inexperience. Conversely, mothers who have had multiple births risk complications in subsequent pregnancies if they neglect their nutritional needs and other factors, alongside potential declines in uterine physiological conditions [4]. Likewise, a study at Port-Royal Maternity Hospital involving 227 mothers yielded similar results. The sample was divided into two groups: 173 mothers with labor durations of less than 12 hours and 54 with durations of 12 hours or more, with 44% being nulliparous. This study also indicated a correlation between age and prolonged labor.

Almeida and Pinto [1] reported a significant correlation between parity and prolonged labor at Viqueque District Hospital (p value = 0.000). In their study, 11 out of 12 mothers with prolonged labor were nulliparous. This suggests a statistical relationship between parity and prolonged labor, further supported by relevant theories. Multiparous mothers experiencing prolonged labor are suspected to have uterine inertia issues. Research by Pardosi [9] supported this view, finding a significant relationship between parity and prolonged labor. Among 72 mothers studied, 41 experienced prolonged labor, 35 of whom were nulliparous. Young nulliparous mothers face even greater risks for prolonged labor due to their underdeveloped reproductive organs, leading to various complications.

Prolonged labor can also be identified by an extended second stage. In a study of 30 mothers, 21 were from safe parity (2 or 3 births), and 20 (95.23%) of them did not experience abnormal durations in the second stage. This indicates a correlation between parity and the lengthening of the second stage of labor. Mothers with at-risk parity often experience longer durations due to a decrease in elasticity in the uterine muscles. High parity may lead to prolonged second-stage labor due to looseness in the uterine wall. However, not all at-risk parities result in prolonged labor, as various other factors, such as malpresentation, can significantly influence labor duration.

In a study involving 75,243 women in the U.S., it was found that nulliparous mothers significantly experienced longer durations in both the active first stage and the second stage of labor compared to multiparous mothers. Further analysis based on age characteristics revealed varying results across different parity categories, indicating that parity is not the sole factor related to labor duration.

In conclusion, the review of these 10 articles indicates that all analytical studies (as opposed to descriptive ones) suggest that parity influences labor duration in both stages. This aligns with the theory proposed by Oxorn and Forte [8], which indicates that primiparous mothers often experience longer durations in the first stage, particularly during the active phase, compared to multiparous mothers. Young primiparous mothers may face challenges in psychological readiness for labor, as they lack sufficient birthing experience. Additionally, those under 20 years old may experience heightened anxiety and fear due to their physical immaturity, compared to mothers aged 20 to 35. Grand multiparas may experience reduced uterine function, increasing their risk for uterine inertia and prolonged labor. Nevertheless, while research indicates that parity plays a significant role in the labor process, other factors, such as age and uterine contractions, also contribute to labor duration.

5. Conclusion

The review of ten journal articles reveals that most indicate a relationship between a mother's age and the duration of labor, especially regarding prolonged labor. Mothers who are younger than 20 or older than 35 years have a higher likelihood of experiencing prolonged labor. Moreover, all the articles point to a significant connection between parity and prolonged labor, with first-time mothers being more susceptible compared to those who have had two to three births, as well as those with more than three. Nonetheless, it's essential to recognize that age and parity are not the only factors affecting labor duration. Thorough screening during prenatal appointments is vital to identify risk factors and to take preventive actions to reduce complications. Healthcare professionals play a critical role in this context. In addition to screening, they can provide education and counseling before conception and throughout the pregnancy.

Compliance with ethical standards

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