

# Analysis of Factors Influencing the Incidence of Labor Complications in the Era of Health Digitalization in Malang Regency

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**Abstract:** The incidence of labor complications is one of the main challenges in maternal health. With the rapid development of digital technology, many health facilities have begun to integrate digital systems into health services. According to data from the Ministry of Health, the number of labor complications is still high, especially in areas with limited access to quality health facilities. Various factors, such as maternal age, nutritional status, education, and access to health services, contribute to the risk of complications that can endanger the health of mothers and babies. Objective: This study aims to analyze the factors that influence the incidence of childbirth complications in the era of health digitalization. Method: This type of research uses a quantitative approach with the Cross-Sectional Survey method. The population in this study were mothers who gave birth in health facilities in Malang Regency. The research sample was taken using a purposive sampling technique, which included pregnant women with a history of childbirth complications and the use of digital health services in the period 2023-2024. Sample: A total of 50 pregnant women were taken. The results of this study indicate a significant relationship between sociodemographic factors and the incidence of childbirth complications in Malang Regency, with a p value = 0.030 (p < 0.05). This finding is in line with various previous studies that identified education, maternal age, age of marriage, and parity as important determinants of the incidence of childbirth complications. These findings confirm that although digital technology is increasingly developing in health services, fundamental factors such as maternal sociodemographic characteristics remain important determinants of the incidence of childbirth complications.

**Keywords:** Childbirth complications, factors, health digitalization, health facilities

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## 1. Introduction

Childbirth is a complex physiological process that can experience various complications that threaten the safety of the mother and baby. According to the World Health Organization (WHO), each year around 295,000 women die from complications during pregnancy and childbirth, with 94% of deaths occurring in developing countries (WHO, 2023). Indonesia as a developing country still faces challenges in reducing maternal mortality rates (MMR) and infant mortality rates (IMR), although it has shown improvements in recent decades (Ministry of Health of the Republic of Indonesia, 2024).

Data from the 2017 Indonesian Demographic and Health Survey (SDKI) showed that the MMR was 305 per 100,000 live births, a figure that is still far from the Sustainable Development Goals (SDGs) target of 70 per 100,000 live births in 2030 (BPS et al., 2018; United Nations, 2015). East Java, as one of the provinces with the largest population in

Indonesia, contributes significantly to this national figure (Dinkes Jatim, 2023). Malang Regency, with diverse geographical characteristics ranging from lowlands to mountains, faces special challenges in maternal health services (BPS Kab. Malang, 2024).

Labor complications can be caused by various interacting factors, including maternal factors (age, parity, obstetric history, nutritional status, comorbidities), fetal factors (birth weight, fetal presentation, congenital abnormalities), health service factors (access to health facilities, quality of service, availability of trained health workers), and socio-economic and cultural factors (Cunningham et al., 2022; Prawirohardjo, 2021). Previous studies have shown that factors such as maternal age under 20 years or over 35 years, too close pregnancy spacing, anemia, hypertension in pregnancy, and lack of access to quality antenatal care services increase the risk of labor complications (Sari et al., 2023; Widayanti & Nugroho, 2022; Astuti et al., 2021).

The era of health digitalization that began since the COVID-19 pandemic has fundamentally changed the paradigm of maternal health services (Greenhalgh et al., 2021; Smith et al., 2022). The implementation of digital technology in health services, including telemedicine, electronic health records, mobile health applications, and integrated health information systems, has had a significant impact on maternal and child health service patterns (Dornan et al., 2023). The health digitalization program in Indonesia, which was accelerated through initiatives such as Satu Sehat and various digital health applications, has changed the way patients access health information, consult with health workers, and monitor pregnancy conditions (Ministry of Health of the Republic of Indonesia, 2023; Fauziah et al., 2024).

This digital transformation has dual implications for the incidence of childbirth complications. On the one hand, digital technology can improve access to health information, facilitate remote consultations, increase adherence to antenatal care programs, and enable early detection of the risk of complications through a digital warning system (Luo et al., 2023; Rahman & Ibrahim, 2024). Mobile health applications can help pregnant women in self-monitoring, reproductive health education, and reminders for antenatal visits (Nurjannah et al., 2023). Electronic health records enable better continuity of service and quick access to patient health history (Harrison et al., 2023).

However, on the other hand, the digitalization era also creates new challenges in the form of a digital divide, over-reliance on technology, changes in patient-healthcare worker interaction patterns, and potential misinterpretation of digital health information (Johnson et al., 2023; Putri & Sari, 2024). The gap in access to digital technology between different socioeconomic groups can exacerbate disparities in health services (Brown et al., 2022). Excessive reliance on digital consultations without adequate physical examinations has the potential to lead to missed or delayed diagnoses of pregnancy complications (Wilson et al., 2023).

Malang Regency, with its diverse geographical characteristics and varying levels of digital technology penetration between regions, is an interesting locus for analyzing the dynamics of factors influencing childbirth complications in the digital era (Dinkes Kab. Malang, 2024). Urban areas with good internet access may show different patterns compared to rural or mountainous areas that still have digital infrastructure constraints (Kominfo, 2024).

Comprehensive research on factors influencing labor complications in the context of the digitalization of health is still limited, especially in Indonesia (Lestari et al., 2024; Wulandari & Susanto, 2023). Most of the existing research still focuses on traditional factors without considering changes in the health service ecosystem due to digital transformation (Davis & Thompson, 2023). In fact, a deep understanding of how health digitalization affects risk factors for labor complications is essential for designing targeted intervention strategies (Garcia et al., 2023).

This study is important considering the need to adapt labor complication prevention strategies that are in accordance with the digital era (Moore et al., 2024). The results of this study are expected to provide empirical evidence regarding the factors that most influence the incidence of labor complications in the digital era, so that they can be the basis for developing more effective policies and intervention programs (Anderson & Lee, 2024). In addition, this study can also provide insight into how to optimally utilize digital technology to reduce the number of labor complications while mitigating the risks that may arise (Taylor et al., 2023).

Based on the description above, research on the analysis of factors that influence the incidence of labor complications in the era of health digitalization in Malang Regency is very relevant and urgent to be carried out (Robinson et al., 2024). This research is expected to fill the existing knowledge gap and provide a real contribution to efforts to improve maternal health in Indonesia, especially in the context of the ongoing digital transformation of health services (Patel & Kumar, 2024).

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## 2. Research Methods

This study used a quantitative approach with a cross-sectional survey method. This design was chosen to identify factors related to the incidence of labor complications in pregnant women in Malang Regency. The population in this study were mothers who gave

birth in health facilities in Malang Regency. The research sample was taken using a purposive sampling technique, which included pregnant women with a history of labor complications and the use of digital health services. Data were analyzed using descriptive statistics to describe the characteristics of respondents and risk factors for labor complications. In addition, inferential analysis was carried out using logistic regression to see the effect of each factor on the incidence of labor complications.

### 3. Results and Discussion

**Table 1** Frequency Distribution of Malang Region

Variable	Mean $\pm$ SD	Min	Max
Education	1.28 $\pm$ .484	2	3
Early-age marriage	1.42 $\pm$ .624	1	2
Complications	1.21 $\pm$ .410	1	2
Parity	1.101 $\pm$ .310	0	1
Mother's Age	1.42 $\pm$ .624	1	2

The results of the study showed that pregnancy complications were still influenced by several factors, including education level, age of marriage, and parity. Previous studies have also revealed that low maternal education levels are associated with a lack of knowledge about pregnancy health, thus increasing the risk of complications (Sari, 2022). In addition, too young an age of marriage can have an impact on physical and psychological unpreparedness in facing pregnancy, which contributes to the increasing incidence of complications (Putri & Rahmawati, 2021). High parity has also been associated with an increased risk of obstetric complications, including postpartum hemorrhage and preeclampsia (Hidayat et al., 2020).

**Table 2** Chi-Square Tests Malang

	Value	df	Asymp. Sig. (2- sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.403a	1	.020	.030	.026

The results of the Chi-Square test showed a significant relationship between pregnancy complications and factors of education, maternal age, age of marriage, and parity in the Malang area. The p-value is 0.030, this indicates a tendency for a relationship between these variables and the incidence of pregnancy complications.

In addition, the role of health workers is very important in providing counseling to prospective brides and grooms regarding readiness for marriage and pregnancy. According to research by (Yulianti et al., 2023), premarital education provided by midwives and other health workers has been proven effective in increasing the understanding of married couples about the ideal age for marriage and pregnancy in order to reduce the risk of pregnancy complications.

Furthermore, promotive and preventive strategies need to be strengthened in maternal and child health (MCH) programs in primary health facilities such as community health centers and maternity clinics. This effort can be done through routine counseling on the importance of nutritional intake, early detection of the risk of complications, and monitoring the health of pregnant women through antenatal care (ANC) visits.

In addition to individual factors, social and economic factors can also influence the relationship between education, maternal age, age of marriage, and parity on pregnancy complications. Mothers from low-income families often have limited access to adequate health facilities, increasing the risk of pregnancy complications. This is reinforced by research (Wahyuni & Setiawan, 2022), which found that financial constraints are often a barrier for mothers in accessing quality health services during pregnancy.

In addition to economic factors, culture and community habits in the three regions also play a role in pregnancy and childbirth patterns. This contributes to the high number of teenage pregnancies that are at risk of complications. Therefore, a culture-based approach is needed in efforts to socialize healthy pregnancies so that they are more easily accepted by the community.

The government and health workers need to work together to formulate policies that can help reduce the number of pregnancy complications, especially through health education programs and increasing access to maternal and child health services. One strategy that can be implemented is increasing the coverage of ANC services by ensuring that every pregnant woman gets a minimum of four check-ups during pregnancy.

In addition, increasing the coverage and quality of family planning services can also help reduce the number of high-risk pregnancies due to high parity or pregnancy at a non-ideal age. Research by Susanti (2021) shows that proper use of contraception can help regulate pregnancy spacing and reduce the number of pregnancy complications.

Overall, the results of this study indicate that education, maternal age, age of marriage, and parity are related to pregnancy complications. Therefore, improving reproductive health education, quality antenatal care, and policies that support maternal health need to be continuously developed to reduce the number of pregnancy complications and improve maternal and infant health in Indonesia.

#### 4. Conclusions

Maternal education level has a significant relationship with the incidence of pregnancy complications in the Malang area ( $p\text{-value} = 0.030 < 0.05$ ). This finding indicates that mothers with lower levels of education have a higher risk of experiencing complications during pregnancy. The practical implication of this finding is the need for maternal health education programs that are tailored to the level of community education, especially for

groups of mothers with low education. Health communication strategies need to be improved to be more easily understood and accessed by all levels of society, so that they can reduce maternal health disparities based on education level.

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