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RESEARCH ARTICLE

THE ANALYSIS OF MATERNAL CHARACTERISTICS AND REGULATION OF ANTENATAL CARE ON PREGNANCY RISK STATUS BASED ON THE INDEPENDENT FAMILY HEALTH EVALUATION

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ABSTRACT

BACKGROUND:

High-risk pregnancy is a serious problem and needs to be detected early. Pregnant women with risk categories have a direct impact on the fetus. This study aimed to analyze maternal characteristics and the consistency of antenatal care visits in relation to the pregnancy risk status of pregnant women using the Independent Family Health Evaluation (IFHE)

METHODS:

This study used a cross-sectional study with a correlational design. The sample was the third-trimester pregnant women who have a maternal and child health record booklet, with a total sample of 128 respondents in Indonesia. The instrument used was a questionnaire adopted from the identification of family health in the IFHE application system. Data analysis was carried out using multiple logistics regression.

RESULTS:

The results showed that age (p = 0.004), height (p = 0.027), number of pregnancies (p = 0.0001), history of pregnancy (p = 0.0001), history of childbirth (p = 0.001), having children under 2 years of age (p = 0.001), pregnancy complications (p = 0.0001), and history of regular antenatal care (p = 0.0001) had a significant effect on pregnancy risk status. While history of tetanus toxoid immunization showed no relationship with pregnancy risk (p = 0.332). The final modelling of multiple logistic regression showed that the influential variables were age, the number of pregnancies and consistency of antenatal care. The number of pregnancies was the variable that had the strongest influence on pregnancy risk status (OR= 40.192).

CONCLUSION:

This research contributes valuable insights into the factors influencing pregnancy risk, providing a foundation for more effective antenatal care and ultimately better health for expectant mothers and their infants. Healthcare providers can use this information to identify pregnant women at higher risk and implement targeted interventions, thereby improving maternal and fetal outcomes.

KEYWORDS

antenatal care, family, maternal characteristics, risk pregnancy

INTRODUCTION

Pregnancy is a physiological condition in accordance with the stages of individual development. During pregnancy, pregnant women need the support from their partner, family, and health workers [1]. The condition of the pregnant woman can be physiological or pathological. Pregnancy with complications, of course, requires more serious attention [2]. Various efforts have been made to prevent pregnancy complications, including identifying the risks of pregnancies by recognizing and identifying the risk factors existing in pregnant women [3]. Pregnancy screening in recognizing risk factors should be carried out during antenatal care (ANC). Therefore, routine ANC is crucial to identify the condition of the mother and the fetus [4].

Maternal characteristics are one of the factors related to maternal health during the perinatal period and pregnancy [5]. This maternal characteristic is crucial as it can provide an overview of possible risk factors and help to analyze whether this pregnant woman is included in the safe, low, moderate or high-risk pregnancy [6]. Based on that category, health workers and the pregnant woman's family worked together to reduce the existing risk factors. In addition, preventive efforts were carried out to reduce morbidity and mortality in mothers and babies [7].

The Maternal Mortality Rate (MMR) is one of the global Sustainable Development Goals (SDGs) targets to reduce the MMR to 70 per 100,000 live births by 2030 [8]. The maternal mortality rate is one indicator of the success of maternal health efforts. MMR is the ratio of maternal deaths during pregnancy, childbirth and the puerperium caused by pregnancy, childbirth and the postpartum period or its management but not due to other causes such as accidents or incidents in every 100,000 live births [9]. In addition to assessing maternal health programs, this indicator can also assess the rank of public health due to its sensitivity to improve health services quality in terms of accessibility and quality [10]. Based on 2018-2019 provincial report data, the number of maternal deaths in Indonesia has decreased from 4,226 to 4,221. In 2019, the most common causes of maternal death were bleeding (1,280 cases), hypertension (1,066 cases), and infection (207 cases) [11].

The MMR per Regency/City in East Java in 2019 is as follows: the highest MMR in 2019 was in Situbondo, which was 198 per 100,000 live births. Jember was in fourth place, with 133 MMR per 100,000 live births. The proportion of infant mortality is still large (3/4) occurring in the neonatal period (0 – 28 days), which happens every year from 2015 to 2019. Therefore, there is a tendency for a stagnant Infant Mortality Rate. In 2019, the Infant Mortality Rate in Indonesia was estimated at 23 per 1,000 live births, based on data from the Central Statistics Agency. Moreover, as of 2019, East Java's Infant Mortality Rate was already below the national target [12].

It is crucial to know the maternal characteristics of pregnant women so that the risk of pregnancy can be detected early [13]. This is also an important factor for health workers to determine preventive measures in reducing pregnancy risk, which can impact the mother's and her fetus's health [14]. Independent Family Health Evaluation (IFHE) is a media where the family is expected to check the pregnant woman's health status independently. Using an online-based family health identification formula, the maternal characteristics of pregnant women can be identified. Several literatures confirmed that multi factors influence the health status of pregnant women. Despite efforts to reduce maternal mortality and improve maternal and child health, there remains a need to examine the role of maternal characteristics and ANC regularity in the context of pregnancy risk assessment, specifically utilizing IFHE. This study seeks to address this research gap by investigating these interconnections and their implications for maternal and fetal health. Thus, this study aimed to analyze the relationship between maternal characteristics and ANC regularity with pregnancy risk status based on IFHE.

METHODS

This study used a cross-sectional quantitative study with a correlational design. The population 188 pregnant women with criteria was the third-trimester pregnant women in Jember Regency, Indonesia, who had a maternal and child health record booklet, taken from January-September 2021. In our study, we used the Slovin formula to determine the sample size, obtained 128 samples. Given the constraints in resources and time, the Slovin formula provided a practical method for estimating an appropriate sample size from the population of third-trimester pregnant women in Jember Regency, Indonesia. Simple random sampling technique was used, with maternal characteristics including age, height, number of

pregnancies, history of pregnancy, history of childbirth, having children under two years of age, history of tetanus toxoid (TT) immunization, pregnancy complications, and regularity of ANC as the independent variables.

"Pregnancy Complications" in this study refer to medical conditions or issues that occur during pregnancy, potentially posing risks to the mother or fetus. Pregnant women are categorized as "Yes" if they experience these complications, and "No" if they do not encounter any of these issues [15], [16]. "Regular Antenatal Care" in this context signifies pregnant women attending scheduled medical check-ups consistently and as per healthcare provider recommendations, typically in alignment with WHO's suggestion of at least four ANC visits during pregnancy. Conversely, "Irregular Antenatal Care" denotes infrequent or inconsistent attendance at these appointments [17]. "Healthy Pregnancy Risk Status" is a comprehensive assessment of a pregnant woman's overall health during her pregnancy journey. The classification of a pregnancy as "Non-Risk" or "Risk" depends on a combination of factors and is determined by healthcare providers. Healthcare providers use their expertise and these criteria to assess and classify the risk status of each pregnancy [18].

The dependent variable was pregnancy risk status. To assess these variables, the researchers employed a questionnaire adapted from the IFHE application system. The IFHE application system was originally developed to enhance the health status of the community in Tutul Village. It serves as a comprehensive tool for collecting family health data, including information on pregnant women, which is reported continuously. Besides its capacity to identify pregnant women's health status, the IFHE system offers additional features, such as a health discussion forum. To ensure its suitability for the specific study context, a pilot testing process was conducted.

The study was conducted in Tutul Village, Jember, East Java in April-September 2021. Prior to data collection, ethical approval was obtained from the Faculty of Health Science, Universitas Muhammadiyah Jember (Reference number: 057/KEPK/FIKES/IV/2021). The data collection process adhered to ethical guidelines, ensuring the privacy and rights of the participants. Participants were provided with clear and understandable information about the research, their rights, and the voluntary nature of their participation. Participants who agreed to participate provided written informed consent. After obtaining informed consent, participants completed the questionnaire, which was adapted from the Independent Family Health Evaluation (IFHE) application system. This questionnaire included questions related to maternal characteristics, ANC, and pregnancy risk status. The collected data were kept confidential, with personal identifiers removed to ensure anonymity.

Data analysis included univariate, bivariate and multivariate. Univariate analysis using frequency distribution. Bivariate analysis used the "Enter" method in logistic regression for age, the number of pregnancies, history of childbirth, number of children, administration of TT immunization, complications of pregnancy with health status. While history of pregnancy with health status using Chi Square. Variables height, history of ANC using Fisher Exact Test. Multivariate analysis using Multiple Regression Logistic, with an alpha value of 5% (0.05).

RESULTS

Based on a sample of 128 pregnant women, the following describes the research results obtained. From table 1, the majority of respondents were 20-35 years old (109 people or 85.2%), the majority of respondents' height was more than 145 cm (121 people or 94.5%), and the highest number of respondents' pregnancies was a second pregnancy (61 people or 47.7%). The majority of respondents' pregnancy history was normal (98 people or 76.6%), and most of their birth history was also normal (105 people or 82%). The majority of pregnant women did not have children aged under two years of age (107 people or 83.6%), the majority of the history of tetanus toxoid immunization was taken twice with a total of 103 people or 80.5%, and during this pregnancy, most of the respondents (97 people or 75.8%) did not have any complications. Most respondents have a history of regular antenatal care (108 people or 84.4%). The table above shows that the health status of pregnant women (80 people or 62.5%) in Tutul Village is mostly not at risk.

TABLE 1: MATERNAL CHARACTERISTICS AND RELATIONSHIP BETWEEN REGULARITY OF ANTENATAL CARE AND PREGNANCY RISK STATUS (N=128)

Variables	Pregnancy Risk Status						p-value
	No-risk pregnancy		Risky Pregnancy		Total		
	n	%	n	%	n	%	
Age							0.004*
20-35 years old	74	67.9	35	32.1	109	100	
< 20 or > 35 years old	6	31.6	13	68.4	19	100	
Height							0.027***
≤ 145 cm	79	65.3	42	34.7	121	100	
>145 cm	1	14.3	6	85.7	7	100	
Number of Pregnancy							0.0001*
First	53	100	0	0	53	100	
Second	23	37.7	38	62.3	61	100	
Third or more	4	28.6	10	71.4	14	100	
History of Pregnancy							0.0001**
Normal	73	74.5	25	25.5	98	100	
Abnormal (pathological)	7	23.3	23	76.7	30	100	
History of Childbirth							0.0001*
Normal	76	72,4	29	27.6	105	100	
Abnormal (pathological)	4	17.4	19	82.6	23	100	
Having Children < 2 Years Old							0.001*
No	74	69.2	33	30.8	107	100	
Yes	6	28.6	15	71.4	21	100	
Tetanus Toxoid Immunization History							0.332*
Never	66	64.1	37	35.9	103	100	
Once	13	59.1	9	40.9	22	100	
Twice	1	33.3	2	66.7	3	100	
Pregnancy Complications							0.0001*
No	73	75.3	24	24.7	97	100	
Yes	7	22.6	24	77.4	31	100	
The Regularity of ANC							0.0001***
Regular	78	72,2	30	27,8	108	100	
Irregular	2	10	18	90	20	100	

Note:

*The statistical test used Logistic Regression;** The statistical test used Chi Square;*** The statistical test used Fisher Exact; Significant level set 0.05

Table 1 also showed the relationship between maternal characteristics: age, height, number of pregnancies, history of pregnancy, history of childbirth, regularity of antenatal care, having children under two years old, and pregnancy complications have a significant relationship with the health status of pregnant women based on IFHE, with p < 0.05. So, it can be said that maternal characteristics: age, height, number of pregnancies, history of pregnancy, history of childbirth, having children under two years of age and pregnancy complications are associated with the risk of pregnancy. There was no relationship between maternal characteristics of a history of tetanus toxoid immunization with the risk of pregnancy (p=0.136). However, based on table 2, it can be said that there is a significant relationship between the regularity of antenatal care and the risk of pregnancy (p = 0.0001).

IDENTIFICATION OF SIGNIFICANT VARIABLES RELATED TO PREGNANCY RISK STATUS

To identify the variables significantly related to pregnancy risk status, a stepwise multiple logistic regression analysis was conducted. This process involved systematically removing non-significant variables to arrive at a final model. The final model, presented in Table 2, reveals the variables that exhibited significant associations with pregnancy risk status, along with their coefficients, p-values, and odds ratios.

TABLE 2: FINAL MODELING OF MULTIPLE LOGISTIC REGRESSION MATERNAL CHARACTERISTICS AND REGULARITY OF ANTENATAL CARE ON PREGNANCY RISK STATUS (N=128)

Model Variables	Unstandardized Coefficient		Wald	Sig.	Exp (B)	CI 95%
	B	S.E				
Age	2.380	1.041	5.229	0.022	0.093	0.012-0.712
Number of Pregnancy	3.694	0.799	21.394	0.0001	40.192	8.402-192.257
Regularity of ANC	3.309	1.040	10.120	0.001	27.359	3.562-210.154
Constant	8.364	1.771	22.297	0.000	0.000	

Table 2 have shown the variables that were significantly related to the risk of pregnancy: the age of the pregnant women (p= 0.022), number of pregnancy (p= 0.0001) and the regularity of Antenatal Care (p= 0.001). The results of the analysis showed that the Odds Ratio of the variable number of pregnancies was 40.192, meaning that pregnant women with an increasing number of pregnancy (multigravida and grand multigravida) had a risk of 40.192 times to experience the risk of pregnancy compared to mothers in their first pregnancy (primigravida). Therefore, it leads to the conclusion that the variable number of pregnancies was the variable that had the greatest influence on the risk of pregnancy. Variables that did not demonstrate significant associations with pregnancy risk status in the multivariate analysis were excluded from the final model. These non-significant variables included height, history of pregnancy, history of childbirth, complications of pregnancy, complications of childbirth, and having children under 2 years old were confounding variables. While these variables were considered, they did not contribute significantly to the prediction of pregnancy risk in this study. they did not independently contribute to explaining pregnancy risk status but had the potential to introduce bias or distortion in the interpretation of the significant variables.

Furthermore, variables not included in the final modeling in the multivariate test, namely height, history of pregnancy, history of childbirth, complication of pregnancy, complications of childbirth and having children < 2 years old were confounding variables.

DISCUSSION

Pregnancy is a crucial period for families, especially if the presence of children is a long-awaited hope. During pregnancy, various conditions are very likely to occur. Therefore, optimal support for the pregnant woman, both physically and emotionally, is needed. The lower family socioeconomic status is associated with a higher risk of depression in pregnant women [19]. On the other hand, pregnant women who receive informational, instrumental, and emotional support have a positive attitude towards pregnancy [20]. Families need consistent health information from health workers to support pregnancy conditions [21]. There are significant things about fathers' involvement in supporting pregnant women from pregnancy to delivery [22].

During pregnancy, it is essential to identify the well-being of the mother and the fetus through antenatal care examinations [23]. Health workers may support antenatal care and increase competence by providing antenatal care services through training and improving the support system [24]. Barriers to using ANC services are not solely rooted in individuals but are multifactorial: barriers related to health care providers, culture and religion. Therefore, a multisectoral approach to increase the utilization of regular antenatal care services is highly recommended [25]. Pregnancy complications, the education status of the parents-to-be, the family residence, economic status, and media exposure related to the use of antenatal care. During the antenatal care examination, health workers also

educate pregnant women about the perinatal period: pregnancy, delivery and postpartum [26]. Birth preparation classes are also enacted to improve antenatal and postnatal services, adherence to micronutrient supplementation, and awareness of risks in pregnancy [27]. Training for health workers, strengthening counselling, and increasing women's economic empowerment to increase the use of quality antenatal services are highly recommended. Based on antenatal care activities, health workers also conduct assessments based on anamnesis, physical examination, and diagnostic examinations. Through the results of this study, it will also be possible to identify the risk factors in pregnancy.

Maternal characteristics are the characteristics of factors related to maternal health during pregnancy. Several maternal characteristics identified during antenatal care examinations include age, height, number of pregnancies, pregnancy history, delivery history, antenatal care compliance, history of tetanus toxoid immunization, and current pregnancy conditions or pregnancy complications. Maternal age is associated with a high risk of pregnancy. Based on several related studies, it was found that women under 20 or over 35 years old had a higher risk of pregnancy as the reproductive system of women under 20 is not yet optimal, while those over 35 will begin to experience a decreasing reproductive function. This study's results indicate that most pregnant women (85.2% of them) are between 20-35 years old. According to [28], women under 20 and over 35 have a higher risk of pregnancy and delivery.

In addition, height is also one of the crucial factors since it is directly related to the mother's pelvic area as one of the factors for normal vaginal delivery. This study's results indicated that most pregnant women's height is more than 145 cm (94.5%). This indicates that the height is considered normal. Lower risk of cesarean section in women of higher height [29]. However, this effect persisted due to other risk factors for a caesarean section, such as maternal age, BMI, gestational age, parity, and birth weight. BMI and maternal age are the risk factors in clinical assessment related to delivery. In addition, height is a positive indicator of successful vaginal delivery and increases pregnant women's confidence in a normal delivery, with a possible positive impact on reducing caesarean section rates.

The number of pregnancies was also closely related to the risk status of pregnancy. Number of pregnancy (multigravida and grand multigravida) had a risk of 40.192 times to experience the risk of pregnancy compared to mothers in their first pregnancy (primigravida). The number of births affects the stress level of pregnant woman, especially number of live children [30]. The more often mothers give birth, the health status of pregnant women will be more at risk [31], [32]. Grand multiparity, which is defined as having given birth five or more times, is associated with an increased prevalence of maternal and neonatal complications. Some of the complications associated with grand multiparity include abnormal placentation, abruption placenta, gestational diabetes, anemia, placenta previa, malpresentation, low birth weight, and macrosomia [32], [33]. However, it is important to note that some studies have associated high parity with an elevated risk to the pregnancy without adjusting for age in the analysis [34]. Therefore, maternal age must be examined as a confounder while interpreting the risk of maternal and neonatal complications in multiparous women.

Other maternal characteristics that are also important are pregnancy history, delivery history and current pregnancy conditions. This history provides an overview of the risk for complications so that it might become preventive efforts against the pregnancy risk for the mother and the fetus. The results showed that most pregnant women had a history of normal pregnancy (76.6%) and normal delivery (82%). Complications in pregnancy are a risk for both the mother and the fetus. For example, pregnant women with complications of pulmonary tuberculosis increase the risks of both mother and fetus to perinatal death, premature birth, and low birth weight babies [35]. Therefore, detecting and managing antenatal risk factors is critical for quality care [36]. Most of the pregnant women (96%) feel that they should be asked and informed about risk factors at least once (i.e. at the first visit), and screening for asymptomatic antenatal bacteriuria and treatment in the detected group resulted in a reduction in prematurity and low birth weight [37].

Pregnancy complications are factors that also contribute to pregnancy risk status. Pregnant women who have pregnancy complications have a higher risk compared to pregnant women who do not have pregnancy complications [38]. Pregnancy complications will pose health risks to pregnant women and baby. Healthy pregnant women have a healthy body, so that it has an impact on the health status of the mother and baby.

As for compliance with antenatal care in pregnant women, 84.4% of the research subjects regularly performed

the ANC. ANC allows pregnant women to undergo prenatal care to identify the well-being of the mother and fetus. Regular antenatal care will make it easier for health workers to detect the risk factors early. Various factors cause pregnant women to undergo antenatal care regularly/irregularly. The acceptance of pregnancy, education, parity and barriers during contact with health workers are related to the first antenatal care visit [1]. Pregnant women's capacity to utilize antenatal care varies significantly based on their socioeconomic status, level of autonomy and partner support [39]. In addition, health care providers should develop strong relationships with patients through attitudes, behaviours, and fair treatment.

The history of tetanus toxoid immunization is also important to identify. Tetanus toxoid immunization is a preventive measure for the incidence of neonatal tetanus. Considering the importance of immunization and the positive impact on pregnant women who have done a complete tetanus toxoid immunization (which is twice), the data on maternal characteristics is essential to fulfilling the immunization coverage. Previous research implied that tetanus-diphtheria toxoid and acellular pertussis (Tdap) vaccination during pregnancy can reduce the incidence of ARI in infants until the first two months of their life [40]. The response of the vaccine tetanus-diphtheria toxoid antigen and Tdap is strong [41]. immunization against tetanus-diphtheria toxoid and Tdap in the third trimester of pregnant women results in high levels of infant antibodies [42]. Immunization is the best strategy for increasing maternal and infant antibodies. Therefore, tetanus toxoid vaccination is essential, although almost half of postpartum mothers are not vaccinated against tetanus during pregnancy. The authorities still face challenges in expanding vaccine coverage and strengthening the national immunization program to help increase tetanus vaccination rates in pregnant women [43]. The previous study showed that vaccines recommended during pregnancy are influenza, pertussis, COVID-19, tetanus toxoid, and meningococcal [44].

After identifying the data using the IFHE application system on the independent variable of maternal characteristics and the dependent variable of pregnancy risk status, it was found that most of the pregnancy risk showed no risk (62.5%), and the rest showed risk (37.5%). Through the identification of data on the health status of pregnant women, preventive measures can be carried out to reduce or prevent further risks. The final result is expected to reduce the risk in pregnancy to prevent the incidence of illness and death of the mother and the fetus. Lower blood pressure achieved during pregnancy in pregnant women with chronic non-severe hypertension could improve fetal/neonatal and maternal outcomes compared to mothers with higher blood pressure [45]. In addition, pregnancy is one of the important stages for women [46]. Since some complications arise during pregnancy, it can pose a high risk to both the mother and the fetus. One of them is the incidence of hypertension associated with pregnancy which causes an increase in maternal and fetal mortality during pregnancy and childbirth.

Based on the screening for risk factors in pregnancy, these maternal characteristics have the possibility of determining whether pregnant women have a risk of pregnancy or not. As for maternal characteristics: a history of tetanus toxoid immunization did not have a significant relationship with pregnancy risk status. The administration of tetanus toxoid immunization may prevent the occurrence of neonatal tetanus at the time of delivery so that the immune factor formed will enter the uteroplacental circulation to the fetus so that the fetus is expected to have immunity against tetanus. The results of multivariate data analysis showed that three variables significantly affected pregnancy risk status: age, number of pregnancies and antenatal care regularity. The number of pregnancies is the variable that has the most dominant influence on pregnancy risk status. Based on previous research, parity status is related to the final pregnancy outcome, but it is not only because of parity status [47]. If the primigravida mother is over 35 years of age, this also becomes a risk in the outcome of pregnancy. In an independent relationship between nullipara and spontaneous preterm birth at <37, <32 and <28 weeks, the increased risk of spontaneous preterm birth in women who were pregnant with their fifth pregnancy was higher than in those who were pregnant for the first time [48]. The number of pregnancies impacts the risk of pregnancy that needs to be considered.

These findings carry significant practical implications. Healthcare providers should tailor their care to the specific needs of pregnant women based on their maternal characteristics. For instance, younger or older pregnant women may require more focused attention and monitoring. Additionally, healthcare systems should prioritize accessibility and affordability, addressing the barriers that pregnant women may face in accessing antenatal care. Policymakers can use these insights to inform healthcare policies and allocate resources effectively. By understanding the relationship between

maternal characteristics and pregnancy risk, policymakers can develop targeted interventions to reduce maternal and fetal risks. These interventions may include improved education programs, support systems for pregnant women, and initiatives to increase immunization coverage.

The study has several limitations that need to be acknowledged, including the relatively small sample size. The small sample size may have contributed to the limited number of variables that emerged as statistically significant in the regression analysis, potentially overlooking the significance of other variables, such as the history of pregnancy, history of childbirth, and pregnancy complications. Therefore, these findings should be interpreted with caution, recognizing the constraints imposed by the sample size. Future research with larger and more diverse samples is warranted to further explore the relationships between maternal characteristics and pregnancy risk comprehensively.

CONCLUSION

Our study highlights maternal characteristics such as age, height, number of pregnancies, pregnancy history, childbirth history, having young children, and pregnancy complications as factors influencing pregnancy risk. Antenatal care regularity is also a significant determinant of pregnancy risk, with the number of pregnancies having the greatest impact. Maternal age and antenatal care regularity play crucial roles in assessing pregnancy risk. These findings offer valuable insights for healthcare providers and policymakers. Tailored antenatal care and targeted interventions can address specific risk factors, ultimately improving maternal and fetal health outcomes. Future research should delve into the mechanisms of these characteristics and assess the long-term consequences, while evaluating interventions to mitigate risks. Understanding these maternal factors empowers us to enhance the well-being of pregnant women and promote healthier outcomes for both mothers and infants.

References

1. P. Mkandawire, O. Atari, J. Kangmennaang, G. Arku, I. Luginaah, and J. Etowa, "Pregnancy intention and gestational age at first antenatal care (ANC) visit in Rwanda," Midwifery, vol. 68, pp. 30–38, Jan. 2019, doi: 10.1016/j.midw.2018.08.017.
2. L. C. Poon, H. D. Mcintyre, J. A. Hyett, and E. Borges, "The first-trimester of pregnancy - a window of opportunity for prediction and prevention of pregnancy complications and future life," Diabetes Res. Clin. Pract., 2018, doi: 10.1016/j.diabres.2018.05.002.
3. A. Islam, R. Kabir, and A. Talukder, "Triggering factors associated with the utilization of antenatal care visits in Bangladesh: An application of negative binomial regression model," Clin. Epidemiol. Glob. Heal., no. April, pp. 0–1, 2020, doi: 10.1016/j.cegh.2020.04.030.
4. T. Liabsuetrakul, N. Oumudee, M. Armeeroh, N. Nima, and N. Duerahing, "Improvement of Early Antenatal Care Initiation: The Effects of Training Local Health Volunteers in the Community," vol. 5, pp. 1–5, 2018, doi: 10.1177/2333392818761483.
5. M. Kangalgil, A. Sahinler, I. B. Kırkbir, and A. O. Ozcelik, "Associations of maternal characteristics and dietary factors with anemia and iron-deficiency in pregnancy," J. Gynecol. Obstet. Hum. Reprod., vol. 50, no. 8, p. 102137, Oct. 2021, doi: 10.1016/j.jogoh.2021.102137.
6. N. De Groot, H. H. Bijma, G. J. Bonsel, and M. P. L. Den, "The role of structured Antenatal Risk Management (sARM) on experiences with antenatal care by vulnerable clients," vol. 67, pp. 39–45, 2018.
7. A. M. Ramseyer, J. R. Whittington, E. F. Magann, J. A. Pates, and S. T. Ounpraseuth, "Can maternal characteristics on admission for preterm prelabor rupture of membranes predict pregnancy latency?" Am. J. Obstet. Gynecol. MFM, vol. 2, no. 4, p. 100194, Nov. 2020, doi: 10.1016/j.ajogmf.2020.100194.
8. WHO, "SDG Target 3.1 Reduce the global maternal mortality ratio to less than 70 per 100 000 live births," SDG Target 3.1 Maternal mortality, 2023. https://www.who.int/data/gho/data/themes/topics/sdg-target-3-1-maternal-mortality (accessed Sep. 25, 2023).
9. WHO, "Maternal Mortality in 2030," Human Reproduction Programme, 2023. https://srhr.org/mmr2030/?year=2015?mmr=219?arr=6.1 (accessed Sep. 25, 2023).
10. UN Women, "SDG 3: Ensure healthy lives and promote well-being for all at all ages," Women and the Sustainable Development Goals (SDGs), 2023. https://www.unwomen.org/en/news/in-focus/women-and-the-sdgs/sdg-3-good-health-well-being (accessed Sep. 25, 2023).
11. Kementerian Kesehatan Republik Indonesia, Pedoman Pelayanan Antenatal, Persalinan, Nifas, Dan Bayi Baru Lahir Di Era Adaptasi Kebiasaan Baru. Kementerian

Kesehatan Republik Indonesia Dirjen Kesehatan Masyarakat, 2020.
12. Dinas Kesehatan Jawa Timur, "Buku data menurut provinsi dan kabupaten," Profil Kesehat. Provinsi Jawa Timur, pp. 25–26, 2019.
13. H. and E. Huang, T., Rashid, S., Mak-Tam, A.D.E., Priston, M., Bedford, C.G.M., Meschino, W., Mei-Dan, "Early pregnancy screening for preeclampsia and preterm birth using maternal characteristics and biomarkers," Am. J. Obstet. Gynecol., 2022.
14. R. Rao et al., "Pregnancy in women with osteogenesis imperfecta: pregnancy characteristics, maternal, and neonatal outcomes," Am. J. Obstet. Gynecol. MFM, vol. 3, no. 4, p. 100362, Jul. 2021, doi: 10.1016/j.ajogmf.2021.100362.
15. CDC, "Pregnancy Complications," Reproductive Health, 2023. https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-complications.html (accessed Sep. 25, 2023).
16. BMJ Best Practice, "Overview of pregnancy complications," BMJ Best Practice. https://bestpractice.bmj.com/topics/en-us/494 (accessed Sep. 25, 2023).
17. WHO, WHO recommendations on antenatal care for a positive pregnancy experience. World Health Organisation, 2016. [Online]. Available: https://www.who.int/publications/i/item/9789241549912
18. T. H. Tulchinsky, E. A. Varavikova, and M. J. Cohen, "Family health and primary prevention," in The New Public Health, 4th ed., T. H. Tulchinsky, E. A. Varavikova, and M. J. B. T.-T. N. P. H. (Fourth E. Cohen, Eds. San Diego: Academic Press, 2023, pp. 467–549. doi: https://doi.org/10.1016/B978-0-12-822957-6.00007-7.
19. D.-M. Wei et al., "The role of social support in family socio-economic disparities in depressive symptoms during early pregnancy: Evidence from a Chinese birth cohort," J. Affect. Disord., vol. 238, pp. 418–423, Oct. 2018, doi: 10.1016/j.jad.2018.06.014.
20. S. Begun, A. Barman-Adhikari, C. O'Connor, and E. Rice, "Social support and pregnancy attitudes among youth experiencing homelessness," Child. Youth Serv. Rev., vol. 113, p. 104959, Jun. 2020, doi: 10.1016/j.childyouth.2020.104959.
21. E. Riggs et al., "Afghan families and health professionals' access to health information during and after pregnancy," Women and Birth, vol. 33, no. 3, pp. e209–e215, May 2020, doi: 10.1016/j.wombi.2019.04.008.
22. B. S. Allport-Altillo et al., "Parents' Perspectives on Supporting Father Involvement in African American Families During Pregnancy and Early Infancy," J. Natl. Med. Assoc., vol. 112, no. 4, pp. 344–361, Aug. 2020, doi: 10.1016/j.jnma.2020.04.002.
23. S. van Pelt, K. Massar, L. van der Eem, L. Shields-Zeeman, J. B. F. de Wit, and R. A. C. Ruiter, "'If you don't have enough equipment, you're not going to provide quality services': Healthcare workers' perceptions on improving the quality of antenatal care in rural Tanzania," Int. J. Africa Nurs. Sci., vol. 13, p. 100232, 2020, doi: 10.1016/j.ijans.2020.100232.
24. J. Mutowo, M. Yazbek, A. van der Wath, and C. Maree, "Barriers to using antenatal care services in a rural district in Zimbabwe," Int. J. Africa Nurs. Sci., vol. 15, p. 100319, 2021, doi: 10.1016/j.ijans.2021.100319.
25. K. H. Abegaz and E. M. Habtewold, "Trend and barriers of antenatal care utilization from 2000 to 2016 Ethiopian DHS: A data mining approach," Sci. African, vol. 3, p. e00063, May 2019, doi: 10.1016/j.sciaf.2019.e00063.
26. M. Toolan et al., "A systematic review and narrative synthesis of antenatal interventions to improve maternal and neonatal health in Nepal," AJOG Glob. Reports, vol. 2, no. 1, p. 100019, Feb. 2022, doi: 10.1016/j.xagr.2021.100019.
27. A. P. Kare, A. B. Gujo, and N. Y. Yote, "Quality of antenatal care and associated factors among pregnant women attending government hospitals in Sidama Region, Southern Ethiopia," SAGE Open Med., vol. 9, p. 205031212110580, Jan. 2021, doi: 10.1177/20503121211058055.
28. L. Schummers et al., "Variation in relationships between maternal age at first birth and pregnancy outcomes by maternal race: a population-based cohort study in the United States," BMJ Open, vol. 9, no. 12, p. e033697, Dec. 2019, doi: 10.1136/bmjopen-2019-033697.
29. I. Mogren et al., "Maternal height and risk of caesarean section in singleton births in Sweden—A population-based study using data from the Swedish Pregnancy Register 2011 to 2016," PLoS One, vol. 13, no. 5, p. e0198124, May 2018, doi: 10.1371/journal.pone.0198124.
30. G. Branjerdporn, P. Meredith, T. Wilson, and J. Strong, "Maternal–Fetal Attachment: Associations with Maternal Sensory Processing, Adult Attachment, Distress and Perinatal Loss," J. Child Fam. Stud., vol. 30, no. 2, pp. 528–541, 2021, doi: 10.1007/s10826-020-01876-1.
31. M. A. Alsammani, A. M. Jafer, S. A. Khieri, A. O. Ali, and M. A. Shaaeldin, "Effect of Grand Multiparity on

Pregnancy Outcomes in Women Under 35 Years of Age: a Comparative Study.," Med. Arch. (Sarajevo, Bosnia Herzegovina), vol. 73, no. 2, pp. 92–96, Apr. 2019, doi: 10.5455/medarh.2019.73.92-96.

32. G. K. Al-Shaikh, G. H. Ibrahim, A. A. Fayed, and H. Al-Mandeel, "Grand multiparity and the possible risk of adverse maternal and neonatal outcomes: a dilemma to be deciphered," BMC Pregnancy Childbirth, vol. 17, no. 1, p. 310, 2017, doi: 10.1186/s12884-017-1508-0.
33. S. Rajbanshi, M. N. Norhayati, and N. H. Nik Hazlina, "High-risk pregnancies and their association with severe maternal morbidity in Nepal: A prospective cohort study.," PLoS One, vol. 15, no. 12, p. e0244072, 2020, doi: 10.1371/journal.pone.0244072.
34. K. Ogawa et al., "Association between very advanced maternal age and adverse pregnancy outcomes: a cross sectional Japanese study," BMC Pregnancy Childbirth, vol. 17, no. 1, p. 349, 2017, doi: 10.1186/s12884-017-1540-0.
35. P. Sharma, Y. Marimuthu, S. Basu, N. Sharma, Y. M. Mala, and B. Nagappa, "Intensified case finding for screening tuberculosis among antenatal women in Delhi, India; A facility-based prospective observational study," Clin. Epidemiol. Glob. Heal., vol. 12, p. 100816, Oct. 2021, doi: 10.1016/j.cegh.2021.100816.
36. A. Waller, J. Bryant, E. Cameron, M. Galal, I. Symonds, and R. Sanson-Fisher, "Screening for recommended antenatal risk factors: How long does it take?," Women and Birth, vol. 31, no. 6, pp. 489–495, Dec. 2018, doi: 10.1016/j.wombi.2018.01.005.
37. M. Gehani et al., "Effectiveness of antenatal screening of asymptomatic bacteriuria in reduction of prematurity and low birth weight: Evaluating a point-of-care rapid test in a pragmatic randomized controlled study," EClinicalMedicine, vol. 33, p. 100762, Mar. 2021, doi: 10.1016/j.eclinm.2021.100762.
38. S. Rudrum, "Pregnancy and birth in the global South: a review of critical approaches to sociocultural risk illustrated with fieldwork data from northern Uganda," Heal. Risk Soc., vol. 19, no. 1–2, pp. 1–18, 2017, doi: 10.1080/13698575.2016.1265646.
39. M. Wilson et al., "Assessing the determinants of antenatal care adherence for Indigenous and non-Indigenous women in southwestern Uganda," Midwifery, vol. 78, pp. 16–24, 2019, doi: 10.1016/j.midw.2019.07.005.
40. Z. G. Khodr, A. T. Bukowinski, G. R. Gumbs, and A. M. S. Conlin, "Tetanus, diphtheria, and acellular pertussis vaccination during pregnancy and reduced risk of infant acute respiratory infections," Vaccine, vol. 35, no. 42, pp. 5603–5610, Oct. 2017, doi: 10.1016/j.vaccine.2017.08.041.
41. K. B. Fortner et al., "Reactogenicity and immunogenicity of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) in pregnant and nonpregnant women," Vaccine, vol. 36, no. 42, pp. 6354–6360, Oct. 2018, doi: 10.1016/j.vaccine.2018.07.012.
42. M. Ozdil et al., "Pertussis antibody levels in infants and their mothers receiving combined tetanus-diphtheria toxoid and acellular pertussis vaccine during pregnancy in Turkey," Eur. J. Obstet. Gynecol. Reprod. Biol., vol. 265, pp. 212–216, Oct. 2021, doi: 10.1016/j.ejogrb.2021.08.033.
43. A. P. V. Faria, T. P. R. da Silva, E. W. R. Vieira, S. A. F. Lachtim, E. M. Rezende, and F. P. Matozinhos, "Factors associated with tetanus vaccination in pregnant women living in Minas Gerais State, Brazil: A cross-sectional study," Public Heal. Pract., vol. 2, p. 100203, Nov. 2021, doi: 10.1016/j.puhip.2021.100203.
44. Afuwape, J. Parsons, D. Bick, J. Dale, and S. C. Hillman, "Vaccines and pregnancy," InnovAiT Educ. Inspir. Gen. Pract., vol. 15, no. 1, pp. 14–18, Jan. 2022, doi: 10.1177/17557380211051765.
45. M. S. Tanner, A. Malhotra, M.-A. Davey, E. M. Wallace, B. W. Mol, and K. R. Palmer, "Maternal and neonatal complications in women with medical comorbidities and preeclampsia," Pregnancy Hypertens., vol. 27, pp. 62–68, Mar. 2022, doi: 10.1016/j.preghy.2021.12.006.
46. D. Karthik, K. Vijayarekha, B. Sreedevi, and R. Bhavani, "Analysis of Hypertensive Disorder on High-Risk Pregnancy for Rapid Late Trimester Prediction Using Data Mining Classifiers," 2022, pp. 495–502. doi: 10.1007/978-981-16-2422-3_38.
47. G. Shechter-Maor, D. Sadeh-Mestechkin, Y. Ganor Paz, R. Sukenik Halevy, O. Markovitch, and T. Biron-Shental, "Does parity affect pregnancy outcomes in the elderly gravida?," Arch. Gynecol. Obstet., vol. 301, no. 1, pp. 85–91, 2020, doi: 10.1007/s00404-019-05386-4.
48. B. Koullali et al., "The association between parity and spontaneous preterm birth: A population based study," BMC Pregnancy Childbirth, vol. 20, no. 1, pp. 1–8, 2020, doi: 10.1186/s12884-020-02940-w.