Research Article

Analysis of Factors Affecting Premature Labor in Pregnant Women Based on Various Health and Environmental Aspects

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Abstract: Preterm birth, defined as birth before 37 weeks of gestation, is a significant global health problem, with rising rates in many regions worldwide. The World Health Organization (WHO) reports that approximately 15 million babies are born prematurely every year, and this number continues to increase. Preterm birth is a major contributor to neonatal morbidity and mortality, making it an urgent issue for public health. This study aims to explore the various factors influencing the occurrence of preterm birth, including medical, social, and environmental factors. The study employed an observational analysis with a case-control design to identify and analyze these factors. Data were collected from medical records of deliveries that took place between January and December 2024. The study used a total sample size of 100 participants, consisting of 50 cases of preterm birth and 50 control cases. The control group was selected using simple random sampling to ensure unbiased selection. The data were analyzed using the chi-square test, and logistic regression was applied to assess the strength of the relationships between identified factors and the occurrence of preterm birth. The findings of this study indicate that several factors significantly contribute to the likelihood of preterm birth, including parity, pregnancy spacing, infections, and blood pressure (p-value < 0.05). These factors were found to increase the risk of preterm birth. The study concludes by emphasizing the need for early intervention to identify and manage these risk factors, thus minimizing the incidence of preterm birth. It is also recommended that pregnant women receive education and support programs aimed at reducing risk factors. Further research, especially longitudinal studies, is suggested to explore the mechanisms underlying preterm labor and to develop more effective preventive strategies.

1. Introduction

Preterm birth, defined as birth occurring before 37 weeks of gestation, is a significant public health challenge. According to data from the World Health Organization (WHO), around 15 million babies are born prematurely each year worldwide, contributing to around 1 million infant deaths each year (WHO, 2023). In Indonesia, the prevalence of preterm birth varies, with studies showing an incidence rate of between 10% and 15% of total births (Ministry of Health of the Republic of Indonesia, 2020).

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The factors that influence the incidence of preterm birth vary widely, ranging from maternal health conditions, the environment, to socioeconomic factors. For example, studies show that mothers who have a history of chronic diseases, such as diabetes or hypertension, have a higher risk of experiencing preterm birth (Heikkila, 2021). In addition, high psychological stress can also contribute to preterm birth, where pregnant women who experience severe stress are more likely to give birth prematurely (Barber, 2021).

Infections, especially urinary tract infections and genital infections, have been shown to be one of the main risk factors for preterm birth. A study by Jamal (2017) showed that pregnant women with urinary tract infections have twice the risk of premature birth compared to those who do not have an infection. In addition, infections such as chorioamnionitis, which is an infection of the membranes surrounding the fetus, can trigger premature contractions and cause premature labor.

Other medical conditions, such as hypertension and gestational diabetes, can also contribute to the risk of premature labor. According to research conducted by Torchin (2017), pregnant women with hypertension have a higher risk of premature birth. This is due to complications that can arise from high blood pressure, which can affect blood flow to the placenta and fetal health. In addition, gestational diabetes can cause metabolic problems that can potentially trigger premature labor.

Anatomical abnormalities, both in the uterus and the cervix, can also be a factor in premature labor. Women with a short cervix or who are unable to support a pregnancy may experience premature labor. A study by Boelig (2016) found that women with a short cervix have a higher risk of premature birth, so it is important for medical personnel to conduct screening and early intervention in at-risk groups.

Other studies have shown that environmental factors, such as air pollution, can increase the risk of preterm birth. Research conducted in several major cities in Indonesia showed that exposure to air pollution is associated with an increased risk of preterm birth (Liu, 2019). This shows the importance of efforts to reduce pollution and improve environmental quality as part of a strategy to prevent preterm birth.

In addition, socioeconomic factors also play an important role. Pregnant women from lower economic backgrounds often have limited access to quality health care, which can increase the risk of complications during pregnancy (Huang, 2018). Therefore, efforts to increase access to health care and education about reproductive health are needed to reduce the incidence of preterm birth.

By understanding the incidence and factors that influence preterm birth, it is hoped that appropriate interventions can be carried out to reduce the risk and improve the health of mothers and babies. Further research is needed to explore other risk factors and find effective solutions to this problem.

2. Proposed Method

This study used a quantitative approach with a case-control design to identify factors that influence preterm labor. Samples were taken from medical records of mothers giving birth in hospitals during the period January to December 2024. A total of 100 respondents were randomly selected with clear inclusion criteria, namely pregnant women aged 18 to 35 years and had entered the third trimester of pregnancy. Data were collected through a review of medical record data consisting of parity, pregnancy spacing, infection during pregnancy and hypertension during pregnancy. The data obtained were then analyzed using SPSS statistical software to identify the relationship between the independent variables and the dependent variable (the incidence of preterm labor). Logistic regression analysis was used to determine factors that significantly contribute to the risk of preterm labor. In addition, in-depth interviews were also conducted with several respondents to obtain more in-depth qualitative information about their experiences during pregnancy.

3. Results

Table 1. Univariat Analysis.

Variabel D	Frequency (f)	Percent (%)
Premature Labor		
Yes	50	50
No	50	50
Parity		
Grandemulti<4	23	23
	77	77
Pregnancy spacing		
<2 Years	36	36
≥ 2 Years	64	64
Infection during pregnancy		
Yes	19	19
No	81	81
Blood pressure		
Hypertension	47	47
Normal	53	53

Table 1. Shows that half of the respondents have a history of premature delivery and normal delivery (50%), a small portion (23%) are grandemulti mothers, almost half (36%) have a pregnancy interval of <2 years, a small portion (19%) experience infection during pregnancy and almost half (47%) of mothers experience hypertension during pregnancy.

Table 2. Cross tabulation of factors influencing preterm delivery

Variabel	Premature labor				Total	p-value	OR
	Premature		No				
	F	%	F	%			
Parity						0.003	4.66 (1,788-12,865)
Grandemulti	17	17	6	6	23		

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<4	33	33	44	44	77	
Pregnancy Spacing						
<2 years	21	21	15	15	36	0.008	2,965
≥ 2 years	29	29	35	35	64		(1,397-9,340)
Infection during pregnancy						
Yes	15	15	4	4	19	0.004	4.04
No	35	35	46	49	81		(1,325-10,675)
Blood pressure						
Hypertension	32	32	15	15	47	0.016	3,240
Normal	18	18	35	35	53		(1,327-7,910)

Table 3 shows the cross tabulation between parity and premature birth, it turns out that out of 50 mothers with premature birth, 17% were caused by grandemulti parity. The results of statistical tests with chi-square calculations obtained a p-value = 0.003 <0.05, this means that there is a relationship between parity and premature birth with OR 4.66 (CI 1.788-12.865) which means that childbirth with grandemulti parity has a 4.6 times greater risk of causing premature birth. Cross tabulation between pregnancy spacing and premature birth, it turns out that out of 50 mothers with premature birth, 21% were caused by pregnancy spacing <2 years. The results of statistical tests with chi-square calculations obtained a p-value = 0.008 <0.05, this means that there is a relationship between pregnancy spacing and premature labor with OR 2.965 (CI 1.397-9.340) which means that labor with a pregnancy spacing of <2 years has a 2.9 times greater risk of causing premature labor.

Cross-tabulation between infection during pregnancy and premature labor, it turns out that out of 50 mothers with premature labor, 15% were caused by pregnancy infection. The results of statistical tests with chi-square calculations obtained a p-value = 0.004 <0.05, this means that there is a relationship between pregnancy infection and premature labor with OR 4.04 (CI 1.325-10.675) which means that labor with pregnancy infection has a 4 times greater risk of causing premature labor.

Cross-tabulation between blood pressure and premature labor, it turns out that out of 50 mothers with premature labor, 32% were caused by hypertension in pregnancy. The results of the statistical test using chi-square calculations obtained a p-value = 0.016 <0.05, this means that there is a relationship between hypertension and premature labor with OR 3.249 (CI 1.327-7.910), which means that labor with hypertension during pregnancy has a 3.2 times greater risk of causing premature labor.

4. Discussion

The results of the statistical test with chi-square calculations obtained a p-value = 0.003 <0.05, this means that there is a relationship between parity and premature labor with an OR of 4.66 (CI 1,788-12,865), which means that childbirth with grandemulti parity has a 4.6 times greater risk of causing premature labor.

Parity, which refers to the number of births a woman has experienced, has a significant relationship with the incidence of premature labor. Several studies have shown that women

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with high parity, namely those who have given birth several times, tend to have a higher risk of experiencing premature labor compared to women who are pregnant for the first time (Koulai, 2020). This may be due to various factors, including physical and psychological fatigue experienced by women with high parity.

A study in Indonesia found that women with more than two parities had a 1.5 times higher risk of premature birth compared to women who had given birth for the first time (Wheeler, 2018). This study suggests that repeated pregnancies may lead to a decline in maternal physical and mental health, which in turn may affect pregnancy outcomes. In addition, women with high parity may also experience more complications during pregnancy, such as gestational hypertension or gestational diabetes, which may increase the risk of preterm delivery.

On the other hand, women who are pregnant for the first time may be more likely to attend prenatal care programs and receive better support, which may contribute to better pregnancy outcomes. Research shows that better access to prenatal care can reduce the risk of preterm delivery (Kashani, 2024). Therefore, education and support for pregnant women, especially those with high parity, are essential to reduce the risk of preterm delivery.

However, it is important to note that the relationship between parity and preterm delivery is not always linear. Several studies have shown that women with low parity may also be at higher risk of preterm delivery, especially if they have certain health conditions or experience high psychological stress (Waldenstrom, 2017). Therefore, a holistic and individualized approach to pregnancy management needs to be applied to reduce the risk of preterm delivery.

Overall, the relationship between parity and the incidence of preterm birth shows the importance of a deep understanding of the factors that affect maternal health during pregnancy. By knowing these risk factors, appropriate interventions can be designed to support pregnant women and improve pregnancy outcomes. The results of statistical tests with chi-square calculations obtained a p-value = 0.008 <0.05, this means that there is a relationship between pregnancy spacing and preterm birth with OR 2.965 (CI 1.397-9.340) which means that childbirth with a pregnancy spacing of <2 years has a 2.9 times greater risk of causing preterm birth.

Pregnancy spacing, which is the interval between one pregnancy and the next, is also an important factor influencing the risk of preterm birth. Research shows that pregnancy spacing that is too short, especially less than 18 months, can increase the risk of preterm birth (Shachar, 2016). This is due to the lack of time for the mother's body to fully recover from the previous birth, which can affect the health of the mother and fetus in the next pregnancy.

A study in Indonesia found that women who had a pregnancy spacing of less than 18 months had a 1.7 times higher risk of preterm birth compared to women who had a longer pregnancy spacing (Marinovich, 2021). This study suggests that interventions to raise

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awareness of the importance of healthy pregnancy spacing are needed, especially among women at high risk.

In addition, pregnancy spacing that is too short can cause physical and mental fatigue in the mother, which can affect health during pregnancy. Women who have children with short pregnancy spacing may also experience higher stress, which can contribute to the risk of preterm birth (Brhane, 2019). Therefore, psychological support and health education are essential to help pregnant women manage stress and maintain their health.

On the other hand, too long a pregnancy interval can also have a negative impact. Research shows that women who have a pregnancy interval of more than 5 years may also experience a higher risk of preterm birth, possibly due to undiagnosed health factors or decreased fertility (Jansa, 2018).

By understanding the relationship between pregnancy interval and the incidence of preterm birth, it is important for health care providers to provide the necessary information and support to couples planning a pregnancy. Educating the public about the importance of a healthy pregnancy interval can help reduce the risk of preterm birth and improve the overall health of mothers and babies.

The results of the statistical test with the chi-square calculation obtained a p-value = 0.004 <0.05, this means that there is a relationship between pregnancy infection and preterm birth with OR 4.04 (CI 1.325-10.675) which means that childbirth with pregnancy infection has a 4 times greater risk of causing preterm birth.

Research shows that urinary tract infections (UTIs) and genital infections are the two types of infections most often associated with preterm birth. In a study conducted by Werter. (2023), found that pregnant women who experience UTI have a higher risk of experiencing preterm labor compared to those who are not infected. This study involved more than 500 pregnant women and showed that treatment of infection can significantly reduce the risk of preterm labor.

The importance of early detection and treatment of infection during pregnancy cannot be ignored. Screening and treatment programs for infection can help reduce the rate of preterm labor. For example, a study in Brazil showed that interventions to treat urinary tract infections in pregnant women can reduce the rate of preterm labor by 30% (Wang, 2024). Thus, attention to reproductive health and management of infection during pregnancy are important steps to prevent preterm labor.

In addition, education about the signs of infection and the importance of prenatal care also needs to be improved. Pregnant women should be given adequate information about the risks of infection and its impact on pregnancy. By increasing awareness and access to health care, it is hoped that the rate of preterm labor caused by infection can be reduced.

The results of the statistical test with chi-square calculations obtained a p-value = 0.016 <0.05, which means that there is a relationship between hypertension and premature labor with OR 3.249 (CI 1.327-7.910), which means that labor with hypertension during pregnancy

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has a 3.2 times greater risk of causing premature labor. Hypertension during pregnancy, including conditions such as preeclampsia and gestational hypertension, is another significant risk factor for premature labor. According to data from the American College of Obstetricians and Gynecologists (ACOG), around 6-8% of pregnant women experience hypertension, and this condition can have serious impacts on the health of the mother and fetus (Premkumar, 2016). Hypertension can cause impaired blood flow to the placenta, which in turn can lead to complications such as stunted fetal growth and premature labor.

A longitudinal study conducted by Bertagnolli (2016) showed that pregnant women with hypertension have a 2-3 times higher risk of preterm birth compared to pregnant women without hypertension. This study involved more than 1 million births and found that hypertension can trigger preterm birth through the mechanisms of oxidative stress and inflammation. This shows the importance of managing hypertension during pregnancy to prevent preterm birth.

Preeclampsia, which is characterized by high blood pressure and organ damage, has also been shown to be closely associated with preterm birth. According to research by Roberts and Janssen (2023), preeclampsia can cause placental separation, which has the potential to trigger preterm birth. Data shows that about 15% of all cases of preeclampsia end in preterm birth, highlighting the need for close monitoring of pregnant women who experience this condition.

Management of hypertension during pregnancy involves regular monitoring of blood pressure and the use of safe antihypertensive drugs. A study by Gagliardi (2014) showed that appropriate treatment of hypertension can reduce the risk of preterm birth and improve pregnancy outcomes. Therefore, health workers need to pay special attention to pregnant women with hypertension to reduce the risk of complications. Finally, education about a healthy lifestyle is also important in managing hypertension during pregnancy. Pregnant women are advised to maintain a balanced diet, exercise regularly, and avoid stress. With a comprehensive approach to maternal health, it is hoped that the number of premature births associated with hypertension can be reduced.

5. Conclusions

Suggestions that can be given based on the results of this study are the importance of increasing educational programs for pregnant women regarding the importance of good nutrition and health management. Hospitals and health centers need to provide nutritional and mental health counseling services to support pregnant women during pregnancy. In addition, family involvement in the pregnancy process should be encouraged to increase the social support needed by pregnant women. In the future, further research is needed to explore other factors that may contribute to preterm labor, such as environmental and genetic factors. Longitudinal research can also provide deeper insight into how these factors interact

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throughout pregnancy. By understanding the various aspects that influence preterm labor, it

is hoped that more effective strategies can be found for its prevention.

References

Barber, K. S., Huber, L. R. B., Portwood, S. G., Boyd, A. S., Smith, J., & Walker, L. S. (2021). The association between having a preterm birth and later maternal mental health: An analysis of US pregnancy risk assessment monitoring system data. *Women's Health Issues, 31*(1), 49–56. https://doi.org/10.1016/j.whi.2020.08.007

Bertagnolli, M., Luu, T. M., Lewandowski, A. J., Leeson, P., & Nuyt, A. M. (2016). Preterm birth and hypertension: Is there a link? *Current Hypertension Reports, 18*, 1–8. https://doi.org/10.1007/s11906-016-0637-6

Boelig, R. C., Orzechowski, K. M., & Berghella, V. (2016). Cervical length, risk factors, and delivery outcomes among women with spontaneous preterm birth. *The Journal of Maternal-Fetal & Neonatal Medicine, 29*(17), 2840–2844. https://doi.org/10.3109/14767058.2015.1105957

Brhane, M., Hagos, B., Abrha, M. W., & Weldearegay, H. G. (2019). Does short inter-pregnancy interval predict the risk of preterm birth in Northern Ethiopia? *BMC Research Notes, 12*, 1–6. https://doi.org/10.1186/s13104-019-4439-1

Gagliardi, L., Rusconi, F., Bellù, R., Zanini, R., & Italian Neonatal Network. (2014). Association of maternal hypertension and chorioamnionitis with preterm outcomes. *Pediatrics, 134*(1), e154–e161. https://doi.org/10.1542/peds.2013-3898

Heikkilä, K., Pulakka, A., Metsälä, J., Alenius, S., Hovi, P., Gissler, M., ... & Kajantie, E. (2021). Preterm birth and the risk of chronic disease multimorbidity in adolescence and early adulthood: A population-based cohort study. *PLOS One, 16*(12), e0261952. https://doi.org/10.1371/journal.pone.0261952

Huang, H., Woodruff, T. J., Baer, R. J., Bangia, K., August, L. M., Jellife-Palowski, L. L., ... & Sirota, M. (2018). Investigation of association between environmental and socioeconomic factors and preterm birth in California. *Environment International, 121*, 1066–1078. https://doi.org/10.1016/j.envint.2018.07.027

Jamal, S., & Srivastava, R. (2017). A retrospective analytical study of the epidemiology and causes of preterm birth. *Int J Reprod Contracept Obstet Gynecol, 6*(12), 5453–5457. https://doi.org/10.18203/2320-1770.ijrcog20175259

Janša, V., Blickstein, I., Lučovnik, M., Fabjan-Vodušek, V., Verdenik, I., & Tul, N. (2018). The impact of inter-pregnancy interval on subsequent risk of preterm birth. *The Journal of Maternal-Fetal & Neonatal Medicine, 31*(5), 621–624. https://doi.org/10.1080/14767058.2017.1293027

Janssen, L. E., de Boer, M. A., von Königslöw, E. C., Oudijk, M. A., & de Groot, C. J. (2023). The association between spontaneous preterm birth and maternal hypertension in the fifth decade of life: A retrospective case-control study. *BJOG: An International Journal of Obstetrics & Gynaecology, 130*(5), 507–513. https://doi.org/10.1111/1471-0528.17368

Kashani-Ligumsky, L., Neiger, R., Segal, E., Cohen, R., & Lopian, M. (2024). Is parity a risk factor for late preterm birth? Results from a large cohort study. *Journal of Clinical Medicine, 13*(2), 429. https://doi.org/10.3390/jcm13020429

Koullali, B., Van Zijl, M. D., Kazemier, B. M., Oudijk, M. A., Mol, B. W., Pajkrt, E., & Ravelli, A. C. (2020). The association between parity and spontaneous preterm birth: A population-based study. *BMC Pregnancy and Childbirth, 20*, 1–8. https://doi.org/10.1186/s12884-020-02940-w

Liu, Y., Xu, J., Chen, D., Sun, P., & Ma, X. (2019). The association between air pollution and preterm birth and low birth weight in Guangdong, China. *BMC Public Health, 19*, 1–10. https://doi.org/10.1186/s12889-018-6307-7

Marinovich, M. L., Regan, A. K., Gissler, M., Magnus, M. C., Håberg, S. E., Mayo, J. A., ... & Pereira, G. (2021). Associations between interpregnancy interval and preterm birth by previous preterm birth status in four high-income countries: A cohort study. *BJOG: An International Journal of Obstetrics & Gynaecology, 128*(7), 1134–1143. https://doi.org/10.1111/1471-0528.16606

Maulina, R., Qomaruddin, M. B., Sumarmi, S., Fahrul, A., & Haryuni, S. (2022). Antenatal depression as a stunting risk factor: A systematic review. *Open Access Macedonian Journal of Medical Sciences, 10*(F), 234–240. https://doi.org/10.3889/oamjms.2022.8501

Premkumar, A., Henry, D. E., Moghadassi, M., Nakagawa, S., & Norton, M. E. (2016). The interaction between maternal race/ethnicity and chronic hypertension on preterm birth. *American Journal of Obstetrics and Gynecology, 215*(6), 787-e1. https://doi.org/10.1016/j.ajog.2016.08.019

Shachar, B. Z., Mayo, J. A., Lyell, D. J., Baer, R. J., Jeliffe-Pawlowski, L. L., Stevenson, D. K., & Shaw, G. M. (2016). Interpregnancy interval after live birth or pregnancy termination and estimated risk of preterm birth: A retrospective cohort study. *BJOG: An International Journal of Obstetrics & Gynaecology, 123*(12), 2009–2017. https://doi.org/10.1111/1471-0528.14165

Torchin, H., & Ancel, P. Y. (2016). Epidemiology and risk factors of preterm birth. *Journal de Gynécologie, Obstétrique et Biologie de la Reproduction, 45*(10), 1213–1230. https://doi.org/10.1016/j.jgyn.2016.09.013

Waldenström, U., Cnattingius, S., Vixner, L., & Norman, M. (2017). Advanced maternal age increases the risk of very preterm birth, irrespective of parity: A population-based register study. *BJOG: An International Journal of Obstetrics & Gynaecology, 124*(8), 1235–1244. https://doi.org/10.1111/1471-0528.14368

Wang, E., Tang, P., & Chen, C. (2024). Urinary tract infections and risk of preterm birth: A systematic review and meta-analysis. *Revista do Instituto de Medicina Tropical de São Paulo, 66*, e54. https://doi.org/10.1590/s1678-9946202466054

Wheeler, S., Maxson, P., Truong, T., & Swamy, G. (2018). Psychosocial stress and preterm birth: The impact of parity and race. *Maternal and Child Health Journal, 22*, 1430–1435. https://doi.org/10.1007/s10995-018-2523-0

World Health Organization. (2023). *Born too soon: Decade of action on preterm birth*. World Health Organization.