

## Maternal Risk Factors among Pregnant Women with Miscarriage

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### Abstract

**Background:** Approximately, 4.1% of maternal deaths in Indonesia occur due to miscarriage. Miscarriage might be caused by various factors such as fetal, maternal, and external factors. Monitoring and early detection of maternal factors might prevent miscarriage. This study aimed to analyze the influence of maternal factors on the incidence of miscarriage

**Methods:** This was an analytic observational study with a case-control design conducted in Banjar District, South Kalimantan in August–September 2022. Data was collected from the medical records of pregnant women who experienced miscarriage (n=60) and pregnant women who did not (n=120). Data was analyzed using the chi square test and logistic regression. The level of maternal risk factors for the incidence of miscarriage was determined from the odds ratio (OR) value at a 95% confidence interval.

**Results:** The results revealed that parity (p=0.000; OR=2.2), nutritional status (p=0.000; OR=77.1), level of education (p=0.001; OR=3.5), and employment status (p=0.000; OR=8.1) had a significant effect on the incidence of miscarriage.

**Conclusions:** Maternal factors such as parity, nutritional status, education level, and employment status influence on the incidence of miscarriage, therefore, it is essential to educate pregnant women on various factors related to miscarriage.

**Keywords:** Employment status, level of education, miscarriage, nutritional status, parity

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### Introduction

Miscarriage is the cessation of pregnancy before the fetus can live outside the uterus at a gestational age of less than 20 weeks or with a fetal weight of less than 500 grams.<sup>1,2</sup> The estimated incidence of miscarriage in pregnancy in the world ranges from 10–28%.<sup>1</sup> Each year, the frequency of miscarriage in Indonesia reaches 10–15% of 5 million pregnancies.<sup>3</sup> Miscarriage is one of the causes of bleeding in pregnant women. The bleeding rate in pregnancy reaches one-fifth of all pregnancies, with miscarriage rate of about 15% of all bleeding, thus representing a fairly high morbidity rate in the community.<sup>2</sup>

The first step to managing miscarriage

cases well is to encourage a healthcare worker to understand the pathogenesis as well as the risk factors of miscarriage. One of the most common risk factors for miscarriage is the fetal factors, maternal factors, and external factors.<sup>1,4</sup>

Although it is estimated that they only contribute 15% to the incidence of miscarriage, maternal factors are important to pay attention to, especially in efforts to prevent miscarriage, bleeding and maternal death. Unlike the infant's genetic factors, maternal factors are easier to detect and monitor so that prevention of miscarriage through controlling maternal factors is much more possible. One of the maternal factors that can affect the incidence of miscarriage is the age of the pregnant

woman. Pregnant women who are too young relatively have immature reproductive organs for pregnancy. Conversely, pregnant women who are too old relatively have a poor quality egg cells during the fertilization process when compared to women of healthy reproductive age.<sup>5,6,7</sup>

Parity is also a risk factor that can increase the incidence of miscarriage. The condition of a pregnant woman's uterus is affected by the number of children born.<sup>8</sup> Parity of 2–3 is considered optimal based on a maternal point of view. It was known that women with a parity of 1 and parity of more than 3 had a higher risk for maternal mortality. In addition, miscarriage increases by 26% at the age of more than 40 years with a parity of more than three.<sup>9,10</sup>

In addition to age and parity factors, the nutritional status of pregnant women and anemia are also closely related to the incidence of miscarriage. Research results reveal that underweight nutritional status had a higher risk of 2.34 times for spontaneous miscarriage than pregnant women with normal nutritional status.<sup>11</sup> To prevent the risk of chronic energy deficiency (CED) in pregnant women, women of childbearing age must have good nutrition, which is determined by an upper arm circumference (UAC) of not less than 23.5 cm.<sup>12</sup>

In addition to the maternal factors described above, the level of education also affects the increase in the rate of miscarriage. The low level of education of pregnant women may affect the ability of pregnant women and their families to understand material or knowledge provided by healthcare workers regarding antenatal care through health education. Therefore, this will further affect the ability of women to care for their pregnancies.<sup>13</sup>

In addition to education and knowledge of pregnant women, work can also affect the incidence of miscarriage. It is in accordance with the results of the study, that there was a significant relationship between employed pregnant women and the incidence of miscarriage compared to unemployed pregnant women. Such a finding is due to excessive workload that is not in accordance with the ability of pregnant women, including lifting heavy loads, working time of more than 5 hours and psychological stress caused by certain duties as the risk factor for miscarriage.<sup>13</sup>

According to data derived from the South Kalimantan Provincial Health Office in 2020, one of the districts that contributed to the high number of miscarriage cases in

South Kalimantan was Banjar District.<sup>14</sup> In fact, miscarriage is the most common case experienced by pregnant women in Banjar District and there was an increase in the incidence in 2021.

This study aimed to analyze the effect of maternal factors including age, parity, nutritional status, level of education, and employment status on the incidence of miscarriage.

## Methods

This study was a quantitative study with case-control method. The study was initiated by collecting data on miscarriage cases. The researcher further identified maternal factors as the risk factors for the incidence of miscarriage through comparison with pregnant women who did not experience miscarriage. The case group involved all pregnant women who experienced miscarriage (n=60) and with no miscarriage (n=120). The sample size was adjusted to the study objectives and the type of data by applying the formula for determining the minimum sample size for analytical observational research.

Secondary data were applied in the current study, that were derived from the medical records of respondents in 2021 found among village midwives in the work area of Astambul Community Health Center, including maternal age, parity, nutritional status, maternal education level as well as maternal employment status. Nutrition status was determined by UAC size (UAC of <23.5 cm indicates poor nutritional status of pregnant women).

The study data were analyzed bivariate using the chi-square test with an odds ratio (OR) value at a 95% confidence interval. Multivariate analysis was also conducted using logistic regression, the results of statistical tests were declared significant if the significance value (p-value) was lower than the tolerable error value ( $\alpha=5\%$ ).

This study obtained permission and approval from the research ethics committee Universitas Padjadjaran Bandung with number 833/UN6.KEP/EC/2022.

## Results

There was no significant difference in the proportion of age between pregnant women who experienced miscarriage and those who did not have miscarriage (p 0.104). In addition to age, other maternal factors, namely parity,

**Table 1 Characteristics of Respondents Based on Age, Parity, Nutritional status, Level of Education, and Employment Status**

Variable	Miscarriage				p-value
	Yes (n=60)		No (n=120)		
	n	%	n	%	
Age					
<20 years old*	1	1.7	1	0.8	0.104 (OR 2.2)
20–35 years old	48	80	108	90	
>35 years old*	11	18.3	11	9.2	
Parity					
0*	22	36.7	17	14.2	0.000* (OR 3.7)
1–3	37	61.7	103	85.8	
> 3*	1	1.6	0	0.00	
Nutritional status					
UAC < 23.5cm	34	56.7	2	1.7	0.000* (OR 77.1)
UAC ≥ 23.5cm	26	43.3	118	98.3	
Level of education					
Elementary*	45	75	64	53.3	0.001* (OR 3.5)
Junior high school*	4	6.7	3	2.5	
Senior high school	10	16.7	51	42.5	
Higher education	1	1.6	2	1.7	
Employment status					
Employed	22	36.7	8	6.7	0.000* (OR 8.1)
Unemployed	38	63.3	112	93.3	

Note: \*) Based on Chi Square test, \*) Significant at 95% confidence level, \*) variable that were combined, UAC= Upper arm circumference

nutritional status, level of education, as well as previous status showed a significant difference in the proportion between pregnant women who experienced miscarriage and those who did not have miscarriage.

Furthermore, factors such as parity ( $p=0.000$ ), nutritional status ( $p=0.000$ ), level of education ( $p=0.001$ ), and employment status ( $p=0.000$ ) had a significant effect on the incidence of miscarriage as shown in Table 2.

## Discussion

This study explored resulting that chronic energy deficiency (UAC) was one of the factors

that influenced the incidence of miscarriage. Similar studies conducted in Jombang and Malang have shown that there was a relationship between chronic energy deficiency (CED) and the incidence of miscarriage.<sup>12,15</sup> The Banjar tribe in South Kalimantan is one of the tribes whose attitudes and actions are still influenced by local values, culture and beliefs. In a study conducted on pregnant women in the Banjar tribe comply with taboos both during pregnancy and childbirth. The taboos to comply with during pregnancy and childbirth are dietary restrictions and taboos for doing certain activities. Dietary restrictions include abstinence from eating fruit, creeping

**Table 2 Most Influential Maternal Factors on the Incidence of Miscarriage**

Variable	B Coef	SE (B)	P-value*)	Adj OR (IK 95%)
Age	0.62	0.70	0.378	1.86 (0.46-7.42)
Parity	1.45	0.55	0.009*	4.29 (1.44-12.75)
Nutritional status	4.56	0.85	0.000*	95.73 (18.03-508.14)
Level of education	1.68	0.59	0.005*	5.36 (1.66-17.30)
Employment status	2.57	0.62	0.000*	13.11 (3.84-44.70)
Constant	-18.16	3.18	0.000*	

Note: \*) Based on logistic regression test, \*) Significant at the 95% confidence level,  $R^2$  (Nagelkerke)=62.7%

vegetables, prickly fish and drinking ice.<sup>16</sup> This condition is one of the causes of low nutritional status (UAC) among pregnant women in South Kalimantan.

During pregnancy, metabolism in the body will increase and if it is not followed by efforts to meet energy needs, it will inhibit fetal growth and development, the increase in the size of uterine organs, as well as changes in body composition and metabolism. In the pre-pregnancy period, nutrition plays an important role in the growth of organs in the uterus, one of which is the growth of the endometrium. Endometrium is a place or area of implantation of the conception product between ovum and spermatozoa. Poor endometrial growth will have an adverse impact on the growth of the uterine organ.<sup>12</sup>

Interestingly, employed women had a risk of having a miscarriage 13.11 times higher than those who were unemployed. Such findings revealed that work activities during pregnancy have a risk factor for miscarriage. The higher the intensity and frequency of work performed, the greater the possibility of miscarriage. The correlation between employment status and the incidence of miscarriage is supported by a study in Japan which found that the proportion of employed women was higher in the miscarriage group than those in the non-miscarriage group.<sup>9</sup> Other studies also found that employment status was related to the incidence of miscarriage.<sup>13,17,18</sup> Employment status is one of the risk factors that cause miscarriage due to an increase in activity. The problem that may disrupt women's reproductive health is working in a dangerous place and working long hours since it can cause fatigue for pregnant women. This situation can interfere with pregnancy and can increase the risk of miscarriage.<sup>19</sup> Most of the villagers in the study site worked as farmers and traders. For pregnant women, farming was a fairly heavy and tiring job both in terms of workload, ergonomics, and the work environment, while the workload in trading activities was more focused on the aspect of work frequency due to continuous activities.<sup>16</sup>

Most pregnant women who experienced miscarriages only had a basic level of education. The effect of education level on the incidence of miscarriage in this study is relevant to the other studies. The results of these studies indicated that the number of women with a low level of education who experienced miscarriages was higher compared to those with higher levels of education.<sup>13,17,20</sup> The behavior is strongly influenced by knowledge

and attitudes. Education is a source of knowledge and attitudes of pregnant women. The higher the education of pregnant women, the higher the knowledge they have and the greater the support for positive actions in terms of preventing miscarriage.<sup>21,22</sup> Most of the highest levels of education completed by residents in the study area were elementary school, so it was considered to influence the way pregnant women perform pregnancy care and the fulfillment of nutritional needs, this further leads to the potential to cause miscarriage.<sup>13</sup>

The proportion of parity at risk in pregnant women who experienced miscarriage was proven to be higher than the proportion of parity at risk in the group of pregnant women who did not experience miscarriage (OR 4.29). This is in accordance with a control study conducted in Japan which found that the incidence of spontaneous miscarriage was more common in women with parity of more than three.<sup>9</sup> Similar finding was also obtained from several studies conducted which showed the effect of parity on the incidence of miscarriage.<sup>17,20,23</sup> The safest parity from a maternal perspective is 2-3, the risk of spontaneous miscarriage was proven to increase with the increase in the number of parity.<sup>5,20</sup> The incidence of miscarriage in high parity women is related to the condition of the endometrium in the uterine corpus area that has experienced a decline in function and reduced vascularity. This occurs due to degeneration and necrosis of the wound bundle of placental implantation during a previous pregnancy in the endometrial wall.<sup>24,25</sup>

Our study has shown that age was not a maternal factor that affected on the incidence of miscarriage. The highest incidence of miscarriage occurred in women aged around 20 years.<sup>26</sup> Another study conducted in Sweden, Nepal, Bengkulu, and Central Java revealed an actual increase in the incidence of miscarriage in women aged 20-35 years.<sup>27-30</sup> According to several studies conducted in Bandung, Central Java, Makassar, Palembang there was a significant relationship between maternal age and the incidence of miscarriage.<sup>11,20,23,25</sup> Likewise several studies conducted in the United States and Norway that miscarriage was influenced by the characteristics of the mother, one of which was age.<sup>5,6</sup> Women who get pregnant at the age of less than 20 years are prone to have a miscarriage because the reproductive function of a woman is not fully developed or the reproductive organs are immature for pregnancy which can harm



the health of the mother and the growth and development of the fetus. The uterus and pelvis of women who are less than 20 years old have not yet grown to adult size so when pregnancy and childbirth occur, they are more likely to experience complications, including miscarriage. Meanwhile, at the age of more than 35 years, miscarriage occurs due to reduced function of the reproductive organs, chromosomal abnormalities, and chronic disease.<sup>17</sup> The difference in the results of this study, the incidence of miscarriage is more common in mothers who are of a safe age and may be influenced by other factors such as maternal knowledge about care and nutrition that must be met during the pregnancy period so that it affected the condition of pregnancy and fetal development and increased the risk of miscarriage at a safe age.

The limitation of the study is that it does not consider other maternal factors such as maternal illness, birth spacing, economic/income level and living environmental conditions as external factors in the incidence of miscarriage. Apart from that, it does not involve in-depth data regarding the socio-economic status of respondents. It is necessary to carry out further studies on other determinant factors with a larger sample size and using a qualitative approach in order to dig deeper into the factors that influence miscarriage.

In conclusion, parity, nutritional status, level of education, and employment status affect the incidence of miscarriage.

As an implication of this study, health education about maternal risk factors needs to be carried out in efforts to prevent miscarriage, for example health education about parity, risky physical activity and nutritional status in pregnant women. The main factor that needs to be considered is improving the nutritional status of pregnant women because the highest miscarriage rate occurs in pregnant women with low nutritional status or UAC less than 23.5 cm. It is necessary to carry out further studies on other determinant factors with a larger sample size and using a qualitative approach in order to dig deeper into the factors that influence miscarriage.

## References

1. Kementerian Kesehatan Republik Indonesia. Pedoman nasional asuhan pasca keguguran yang komprehensif. Jakarta: Kementerian Kesehatan RI; 2020.
2. Syam HH, Bayuaji H, Rinaldi A, Mantilidewi KI, Praharsini RK, editors. Bunga rampai obstetri dan ginekologi praktis. 1<sup>st</sup> Ed. Bandung: Unpad Press; 2021.
3. Wahyuni IS, Kartini F, Raden A. Dampak kejadian pasca abortus spontan pada ibu hamil. *J Kesehatan*. 2022;13(1):091-101.
4. Darmawati. Mengenali abortus dan faktor yang berhubungan dengan kejadian abortus. *Idea Nurs J*. 2011;2(1):12-8.
5. Rossen LM, Ahrens KA, Branum AM. Trends in risk of pregnancy loss among US women, 1990-2011. *Paediatr Perinat Epidemiol*. 2018;32(1): 19-29.
6. Magnus MC, Wilcox AJ, Morken NH, Weinberg CR, Håberg SE. Role of maternal age and pregnancy history in risk of miscarriage: prospective register based study. *BMJ*. 2019;364:l869.
7. Hidayati N. The Relationship Of Maternal Mother Age With Incidence Of Abortion. *Oksitosin, Kebidanan*. 2014;1(2):96-101.
8. Ruqaiyah R. Faktor yang Berhubungan dengan Kejadian Abortus Inkomplit di RSIA Sitti Khadijah I Makassar Tahun 2018. *J Kesehatan Delima Pelamonia*. 2018;2(2):93-8.
9. Baba S, Noda H, Nakayama M, Waguri M, Mitsuda N, Iso H. Risk factors of early spontaneous abortions among Japanese: A matched casecontrol study. *Hum Reprod*. 2011;26(2):466-72.
10. Utami NS, Nadapdap TP, Fitria A. Faktor yang memengaruhi kejadian abortus di Rumah Sakit Umum Imelda Pekerja Indonesia Medan tahun 2020. *J Kesehat Almuslim*. 2021;7(1):1-7.
11. Hadi R, Akbar IB, Budiman. Hubungan indeks masa tubuh terhadap kejadian abortus spontan di RSUP DR. Hasan Sadikin Bandung pada tahun 2017-2018. In: Ahmadi D, Ilmiah K, Nurrahman A, Wawang P, Dewi MK, Diari S, editors. *Prosiding Pendidikan Dokter*. Bandung: Universitas Islam Bandung; 2020. p. 330-4
12. Subiastutik E, Maryanti SA. Hubungan kekurangan energi kronis (KEK) dengan kejadian abortus. *Tunas-Tunas Ris Kesehat*. 2017;VII.
13. Putri LM. Faktor risiko utama maternal penyebab abortus di puskesmas kecamatan IV kota kabupaten Agam. *J Endurance*. 2018;3(2):383-99.
14. Puskesmas Astambul. Laporan tahunan ibu hamil. Martapura: Puskesmas Astambul; 2021.
15. Madumurti SDR, Rosita E, Sayekti S. Hubungan kurang energi kronik pada ibu hamil dengan kejadian abortus. *J*

- Kebidanan. 2020;10(2):80–92
16. Inayah HK. Pengetahuan lokal ibu hamil tentang tanda bahaya kehamilan dan persalinan di Puskesmas Alalak Tengah Kota Banjarmasin. *An-Nadaa*. 2020;7(1):18–26.
  17. Akbar A. Faktor penyebab abortus di Indonesia tahun 2010-2019: studi meta analisis. *J Biomedik*. 2019;11(3):182–91.
  18. Jumiati J. Faktor yang berhubungan dengan abortus di RSUD Mutia Sari Duri periode 2017. *J Bidan Komunitas*. 2017;II(1):57–64.
  19. Insan MN. Hubungan faktor usia dan pekerjaan terhadap kejadian abortus di Puskesmas Kecamatan Kramat Jati Jakarta Timur [Minor thesis]. Jakarta: Universitas Binawan; 2019 [Cited 2022 May 17]. Available from: <http://repository.binawan.ac.id/id/eprint/12>.
  20. Ruqaiyah R, Herliana E, Mirnawati M. Faktor-faktor yang berhubungan terhadap kejadian abortus pada ibu hamil di Rumah Sakit Umum Bahagia Makassar 2019. *J Kesehatan Delima Pelamonia*. 2019;3(1):9.
  21. Notoatmodjo S. Ilmu perilaku kesehatan. Jakarta: PT. Rineka Cipta; 2012.
  22. Dinas Kesehatan Kabupaten Banjar. Profil Dinas Kesehatan Kabupaten Banjar 2017 [Internet]. Martapura, Kabupaten Banjar: Dinas kesehatan Kabupaten Banjar; 2018 [Cited 2021 October 31]. Available from: <https://dinkes.banjarkab.go.id/profil-kesehatan-kabupaten-banjar/>.
  23. Silitonga JM, Sitorus RJ, Yeni. Faktor-faktor penyebab kejadian abortus spontan di Rumah Sakit Umum Pusat Dr. Mohammad Hoesin Palembang. *J Ilmu Kesehat Masy*. 2017;8(2):100–8.
  24. Luthfiana ML, Yanuarini TA, Mediawati M. Faktor-faktor yang berpengaruh terhadap kejadian abortus inkomplit Di RSUD Gambiran Kota Kediri tahun 2016. *J Ilmu Kesehat*. 2017;6(1):66–76.
  25. Yanti L. Faktor determinan kejadian abortus pada ibu hamil: case control study. *Medisains*. 2018;16(2):95–100.
  26. Kortsmit K, Jatlaoui TC, Mandel MG, Reeves JA, Oduyebo T, Petersen E, et al. Abortion Surveillance-United States. *MMWR Surveill Summ*. 2020;69(7):1–29.
  27. Adolfsson A, Larsson PG. Cumulative incidence of previous spontaneous abortion in Sweden in 1983–2003: a register study. *Acta Obstet Gynecol Scand*. 2006;85(6):741–7.
  28. Mehata S, Menzel J, Bhattarai N, Sharma SK, Shah M, Pearson E, et al. Factors associated with induced abortion in Nepal: data from a nationally representative population-based cross-sectional survey. *Reprod Health*. 2019;16(1):68.
  29. Wahyuni S, Ngadiyono, Sumarni S. Faktor resiko yang berhubungan dengan kejadian abortus Di RSUD Ungaran Jawa Tengah. *J Kebidanan*. 2017;6(13):1–11.
  30. Fahriani M, Ramadhaniati Y, Oktarina A. Hubungan usia ibu hamil dan paritas dengan kejadian abortus inkompletus di RS Dr. Sobirin Kabupaten Musi Rawas. *J Sains Kesehat*. 2019;26(2):61–9.