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Pregnancy test and measurements related to miscarriages among experienced pregnant women in Indonesia

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ABSTRACT

Miscarriage is one of the major reproductive health problems that contribute to maternal morbidity and mortality in Indonesia. This study aims to explore the relationship between prenatal check-ups, medical measurements, and the risk of miscarriage in women who have experienced pregnancy. Using data from the Indonesian Family Life Survey (IFLS) 2014-2015, this study involved 14,952 female respondents. Multivariate analysis showed that age, hemoglobin test, fetal height measurement, blood pressure measurement, tetanus toxoid (TT) injection, and iron supplementation significantly affected the risk of miscarriage ($p < 0.05$). The main findings of this study were the age, Hb test, fetal height examination, pelvic examination, weighing, height measurement, blood pressure measurement, administration of TT injections, and administration of iron pills associated with miscarriages among experienced pregnant women. However, limited access to health services and low levels of education about the importance of early pregnancy check-ups remain significant challenges, especially in rural areas. This study recommends increasing public awareness, education, and access to reproductive health services as an effort to reduce miscarriage rates in Indonesia.

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INTRODUCTION

Pregnancy is one of the important phases in a woman's life, but it is often marked by challenges and risks, one of which is miscarriage (Quenby et al., 2021). Miscarriage, or spontaneous abortion, refers to the loss of a fetus before the gestational age reaches 20 weeks, and is one of the main causes of maternal morbidity and mortality (Moore et al., 2023). In Indonesia, the prevalence of miscarriage is estimated to be quite high, although accurate data is difficult to obtain given the limitations of the reporting system and public awareness of reproductive health issues (Leone et

al., 2024). Appropriate early management of pregnancy and intensive monitoring are expected to reduce the number of miscarriages, especially in women who have had pregnancy experience (Bailey et al., 2019).

A pregnancy test is the first step commonly taken by women to determine whether they are pregnant. This test, which is now available in the form of a urine test that can be done at home, provides fast and relatively accurate results (Baker et al., 2020). However, although a pregnancy test can detect pregnancy well, this test cannot provide complete information about the health of the fetus or the potential risk of miscarriage (Robinson, 2020). Therefore, in addition to a pregnancy test, other medical measurements such as monitoring pregnancy hormone levels, ultrasound examinations (USG), and cervical length measurements are important in identifying the risk of miscarriage in pregnant women, especially those who have a history of previous miscarriages (Yu et al., 2024).

For women who have experienced previous pregnancies, miscarriage can be an emotional and traumatic experience (Chemouny & Wendland, 2024). Therefore, understanding the factors that can influence the risk of miscarriage is essential to reduce the incidence. In the Indonesian context, factors such as age, nutritional status, medical history, lifestyle, and traditional medicine often affect women's reproductive health (Lee et al., 2024). In addition, limited access to adequate health services, especially in rural areas, is a major challenge in detecting and managing the risk of miscarriage early (Otiso et al., 2024).

The importance of pregnancy tests and other medical measurements becomes more apparent for women who have experienced pregnancy, given that they may be at higher risk of miscarriage in subsequent pregnancies. For example, studies have shown that women with a history of miscarriage are more likely to miscarry in subsequent pregnancies (Ye et al., 2024). On the other hand, timely pregnancy tests and other medical examinations can help identify health problems that may not have been previously apparent, such as infections or abnormalities in the structure of the uterus (Abbani et al., 2023). Therefore, measurements carried out by medical personnel such as ultrasound and hormone level tests play a vital role in efforts to prevent further miscarriages (Shalou & Polyakov, 2024).

However, in Indonesia there is still a lack of education about the importance of pregnancy-related medical tests and measurements, especially among women who live in areas with limited access to health care. Many pregnant women do not know how to do early check-ups, and do not even understand the importance of follow-up check-ups to monitor the risk of miscarriage (Rizkianti et al., 2021). Therefore, this article aims to provide insight into the importance of pregnancy tests and medical measurements related to miscarriage, and how they may affect women who have experienced pregnancy in Indonesia. The main focus of this study is to identify factors associated with the risk of miscarriage and how appropriate measurements can help prevent or reduce the incidence of miscarriage among Indonesian women.

RESEARCH METHOD

This study is cross-sectional design by using secondary data from Indonesian Family Life Survey (IFLS). IFLS is a big survey that followed the same persons overtime and 83% representative of Indonesian population. This study focused on women who experienced pregnancy before the survey was conducted in 2014-15. There are several parts of IFLS that reflected by book's name. However, this study only picked up the Book 4 that focused on women health. IFLS sampling method was following the guideline from Statistics Indonesia and stratified based on urban and rural area. This current study excluded the women who did not completely joining the interview and missing data existing. The total study sample were 14,952 women.

The outcome of this study is miscarriage event. Women were asked whether they experienced the miscarriage as birth outcomes. The main independent variables of this study were pregnancy check-up, measurements, and tests. Those including hemoglobin test, height fetus

check, hips check, weight and height measurements, blood pressure measurement, internal examination, tetanus toxoid injection, and iron pills. Those variables were asked whether women have received the services during their pregnancy (yes/no). The control variables are women's age and marital status. The analysis was done for univariate, bivariate, and multivariate. The univariate was done using frequency and percentage for categorical variables and mean, minimum, and maximum for numeric variable. The bivariate analysis was tested by Chi-square and t-test. Then the multivariate was employed binary logistic regression. The data was analyzed by STATA version 18. Ethical clearance of the secondary data was obtained by Gadjah Mada University, Indonesia and RAND corporation, USA.

RESULTS AND DISCUSSIONS

The results of this study consisted of three parts. The first is univariate analysis which aimed to describe the general characteristics of variables of interest. Table 1 below presents the frequency and percentage of women experienced pregnancy with total 14,952 individuals. Regarding dependent variable, 11.76% out of total study samples have experienced miscarriage. They were in mean age 35 years old and the majority of them were married (95.03%). The independent variables of interest revealed women have not received the test, check, and measurement services during pregnancy before getting miscarriage. Those including not received hemoglobin test (76.53%), height fetus (67.31%), hips (78.53%), weight (52.62%), height (72.77%), blood pressure (51.05%), internal exam (78.44%), TT injection (65.45%), and iron pills (58.42%).

Table 1. General characteristic of the study sample

Variables	Frequency	Percentage (%)
Miscarriage		
No	13,194	88.24
Yes	1,758	11.76
Age	Mean = 34.47	Min - Max = 15 - 57
Marital status		
Married	14,209	95.03
Separated	93	0.62
Divorced	307	2.05
Widowed	343	2.29
Hb test (no)	11,443	76.53
Yes	3,509	23.47
Height fetus check (no)	10,064	67.31
Yes	4,888	32.69
Hips check (no)	11,742	78.53
Yes	3,210	21.47
Weight measurement (no)	7,868	52.62
Yes	7,084	47.38
Height measurement (no)	10,880	72.77
Yes	4,072	27.23
Blood pressure measurement (no)	7,633	51.05
Yes	7,319	48.95
Internal exam check (no)	11,729	78.44
Yes	3,223	21.56
Given TT injection (no)	9,786	65.45
Yes	5,166	34.55
Given iron pill (no)	8,735	58.42
Yes	6,217	41.58

The second is bivariate analysis that shows in Table 2 below. The test was done using Chi-square test for categorical independent variables and t-test for continuous independent variable. It was found that each independent variable including mother's age, hemoglobin test, height fetus check, hips check, weight measurement, height measurement, blood pressure measurement,

internal exam check, given TT injection, and given iron pills was significantly associated with miscarriage event. However, only marital status found insignificantly associated with miscarriage.

Table 2. Association between each independent variable and miscarriage

Independent variables	Miscarriage		Total	*Chi-square (p-value)*
	No	Yes		
Age				-11.25***
Marital status				
Married	88.32	11.68	14209	2.09
Separated	87.10	12.90	93	
Divorced	85.99	14.01	307	
Widowed	87.17	12.83	343	
Hb test (no)	86.41	13.59	11443	157.64***
Yes	94.21	5.79	3509	
Height fetus check (no)	84.30	15.70	10064	461.05***
Yes	96.36	3.64	4888	
Hips check (no)	85.92	14.08	11742	283.75***
Yes	96.73	3.27	3210	
Weight measurement (no)	83.44	16.56	7868	369.26***
Yes	93.58	6.42	7084	
Height measurement (no)	86.27	13.73	10880	150.04***
Yes	93.52	6.48	4072	
Blood pressure measurement (no)	83.66	16.34	7633	315.17***
Yes	93.02	6.98	7319	
Internal exam check (no)	86.46	13.54	11729	166.44***
Yes	94.73	5.27	3223	
Given TT injection (no)	83.75	16.25	9786	550.38***
Yes	96.75	3.25	5166	
Given iron pill (no)	83.38	16.62	8735	479.27***
Yes	95.08	4.92	6217	

Note: ***p-value<0.001, **p-value<0.01, *p-value<0.05

The last is multivariate analysis employed binary logistic regression which presents in Table 3 below. By using 95% confidence interval, it was found that age, hemoglobin test, height fetus check, hips check, weight measurement, height measurement, blood pressure measurement, given TT injection, and given iron pills were statistically significant with miscarriage event. In detail, compared to younger age of women, increasing one year of women age was 1.01 times more likely to have miscarriage. Moreover, even thought women received the services of hemoglobin test, height measurement, and blood pressure measurement, they were 1.29, 1.78, and 2.66 times more likely to have miscarriage compared to those did not receive those services. In opposite side, women who received height fetus check, hips check, weight measurement, TT injection, and iron pills were reducing the probability to get miscarriages by 62%, 41%, 35%,72%, and 54% respectively. However, marital status and internal exam check were not significantly associated with having miscarriage. The pseudo-R square of multivariate analysis in this model was 0.0841, means all independent variables in this study could explained the factors of miscarriage by 8.41%. However, the others predictors did not include in this study.

Table 3. Binary logistic regression of correlation pregnancy test and measurement on miscarriage

Variables	Adjust Odds ratio	Std. err.	*p-value*	[95% conf. interval]	
				Lower	Upper
Age	1.01	0.00	0.033	1.00	1.01
Marital status					
Married (ref)					
Separated	0.99	0.32	0.985	0.53	1.85
Divorced	1.01	0.17	0.955	0.72	1.41
Widowed	0.72	0.12	0.056	0.52	1.01

Variables	Adjust Odds ratio	Std. err.	*p-value*	[95% conf. interval]	
				Lower	Upper
Hb test (ref: no)	1.29	0.14	0.019	1.04	1.60
Height fetus check (ref: no)	0.38	0.05	0.000	0.30	0.48
Hips check (ref: no)	0.59	0.08	0.000	0.45	0.78
Weight measurement (ref: no)	0.65	0.10	0.006	0.48	0.88
Height measurement (ref: no)	1.78	0.20	0.000	1.43	2.21
Blood pressure measurement (ref: no)	2.66	0.40	0.000	1.99	3.56
Internal exam check (ref: no)	0.91	0.10	0.373	0.74	1.12
Given TT injection (ref: no)	0.28	0.03	0.000	0.23	0.35
Given iron pill (ref: no)	0.46	0.05	0.000	0.38	0.57
cons	0.15	0.02	0.000	0.12	0.20
Log-likelihood	-4958.0815				
Pseudo R2	0.0841				

Based on the analysis above, there are some main points to be focused. Almost 12% of women have experienced miscarriages. Hemoglobin test, height, and blood pressure test are important even thought they received those services, but the risk of being miscarriages remained high. The preventive services to reduce the risk of being miscarriages are height fetus, hips, weight of mother, internal exam, tetanus toxoid injection, and give iron pills.

Based on the results of this study, age was shown to have a significant effect on the risk of miscarriage. Every additional year of age increases the chance of miscarriage by 1%. This finding is in line with previous studies showing that the risk of miscarriage increases in older women. Women over the age of 35 have a higher risk of miscarriage, mainly due to decreased egg quality and hormonal changes that can interfere with the pregnancy process (Forbes, 2017). Biological factors such as chromosomal abnormalities in the fetus are also more common in older pregnancies, which can increase the risk of miscarriage (du Fossé et al., 2020).

Marital status is also an interesting variable, with widow status showing an AOR of 0.72 and a p-value approaching 0.05, although it did not reach strong significance. Married women tend to have a higher risk of miscarriage when compared to unmarried women, although this finding is still contextual and requires further research (Mare et al., 2024). Some factors that may influence this include better social support and mental health in married women, which may affect the success of their pregnancies (Alquaiz et al., 2024; Bhamani et al., 2024). Meanwhile, women who are widowed may experience changes in lifestyle and different access to health care, although this is not significant enough to draw strong conclusions (Widhowati et al., 2024).

Medical tests and physical examinations performed during pregnancy also have a significant impact on reducing the risk of miscarriage, as seen in the variables of Hb test and fetal height measurement. The Hb test had an AOR of 1.29 (p-value 0.019), indicating that women who underwent this test tended to have a lower risk of miscarriage. This is consistent with the findings of a previous study, which stated that detection and treatment of anemia in pregnancy can reduce the risk of miscarriage because anemia can cause complications in the mother that disrupt the balance of nutrients and oxygen for the fetus (Paradkar et al., 2024). In addition, fetal height measurement reduced the risk of miscarriage, indicating that monitoring fetal growth can help detect problems early and prevent miscarriage. Routine measurements can help in detecting fetal developmental disorders and taking necessary medical steps to protect the fetus (Lipkin et al., 2020).

The use of TT (Tetanus Toxoid) injection and iron pills also had a significant effect, respectively, indicating that both interventions can reduce the risk of miscarriage. TT injection has long been known to prevent tetanus infection, which can cause serious complications for the fetus and mother. Women who received TT vaccination had a lower risk of infection during pregnancy, which indirectly contributed to a decrease in miscarriage rates (Dad et al., 2021). In addition, iron pills help prevent iron deficiency anemia which can be associated with miscarriage which revealed

that pregnant women who took iron supplements had better pregnancy outcomes (Zhang et al., 2021). Both of these interventions, along with appropriate medical tests and measurements, play a major role in increasing pregnancy success and reducing the risk of miscarriage.

CONCLUSION

In sum, this study shows that the risk of miscarriage in Indonesia is significantly influenced by age, medical history, and access to adequate health services. Although most women undergo pregnancy tests and certain medical measurements, such as fetal height measurements, blood pressure checks, and iron supplementation, the prevalence of miscarriage remains quite high, at around 11.76%. In addition, interventions such as tetanus toxoid injections and iron pill consumption have been shown to be effective in reducing the risk of miscarriage. These results emphasize the importance of reproductive health education and equal distribution of health services, especially for women in remote areas, to reduce miscarriage rates and improve the quality of maternal health.

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