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Research Article

Understanding Warning Signs in Pregnant Adolescents in Indonesia: Results From a National Assessment

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What is already known on this topic?

- *Research shows that factors like education, age, marital status, and economic status play a key role in adolescents' awareness of pregnancy warning signs. Adolescents with higher education levels or who are married tend to know more about these signs because they have better access to health services like antenatal care. Additionally, wealthier individuals usually have greater awareness due to better access to education and healthcare resources.*

What does this study add to this topic?

- *This study provides a detailed look at the factors influencing awareness of pregnancy warning signs among adolescent girls in Indonesia. It shows that living in urban areas, having secondary education, being employed, and being married are strong predictors of higher awareness. Married adolescents, in particular, are far more likely to know about warning signs than their unmarried peers. The study also highlights economic differences, showing that adolescents from wealthier families are more aware, while*

Abstract

AIM: This research aims to evaluate the awareness of warning signs of pregnancy among adolescent females in Indonesia.

METHODS: This study adopted a cross-sectional research design, analyzing data sourced from the 2017 Demographic and Health Survey. The Demographic and Health Survey Phase 7 Questionnaire was utilized, and a two-stage stratified cluster sampling technique was employed, resulting in a sample size of 7936 respondents. The study focused on female adolescents aged 19 years or younger in Indonesia. Binary logistic regression was used in the final analysis stage. All statistical analyses were performed using IBM SPSS (IBM SPSS Corp.; Armonk, NY, USA) version 21, focusing on determining the significance of various predictors. Variables that achieved a *p*-value of less than .05 were considered statistically significant in the multivariable analysis, indicating that these factors had a meaningful impact on the studied outcomes.

RESULTS: Factors affecting the awareness of warning signs in pregnancy among young women include their place of residence (AOR = 1.546; 95% CI = 1.545–1.546), age (AOR = 6.769; 95% CI = 6.762–6.776), educational level (AOR = 1.796; 95% CI = 1.794–1.797), working status (AOR = 1.117; 95% CI = 1.116–1.117), and socioeconomic status (AOR = 1.650; 95% CI=1.649–1.652).

CONCLUSION: This study offers insight into adolescent knowledge and the factors influencing awareness of warning signs in pregnancy. The findings can inform the development of teenage health policies for the Ministry of Health of the Republic of Indonesia.

Keywords: Adolescent, pregnancy complications, risk assessment

Introduction

The Maternal Mortality Rate (MMR) is a vital indicator of maternal health outcomes, reflecting the effectiveness of healthcare services within a region or nation (World Health Organization, 2019). It is a critical metric for assessing the responsiveness of public health systems to the availability and quality of healthcare services (Schedwin et al., 2022). The MMR decreased from 390 to 305 per 100,000 live births in Indonesia between 1991 and 2015 (Ministry of Health Indonesia, 2019). Despite this progress, the rate remains well above the 2015 Millennium Development Goals (MDGs) target of 102 per 100,000 live births, still three times higher than the MDGs goal (Rudiyanto, 2020).

In 2017, Indonesia's MMR was recorded at 177 deaths per 100,000 live births, with approximately 5.3 million pregnancies and 4.84 million live births. At that time, the country had an estimated population of 264 million, with 69.6 million women within the reproductive age range of 15 to 49

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those from poorer backgrounds are less likely to know. These findings underscore the need for targeted health education programs, especially for adolescents in rural areas, younger age groups, and those from low-income families.

years (Ryan et al., 2021). Despite reductions in maternal deaths, Indonesia's MMR is still far from the 2030 Sustainable Development Goals target of 70 per 100,000 live births (Rudiyanto, 2020). Compared to other Asian nations, Indonesia's MMR remains markedly high, with Southeast Asian countries like Brunei, Thailand, and the Philippines reporting significantly lower rates (WHO, UNICEF, UNFPA, 2019). Higher-income Asian countries also demonstrate much lower MMRs, with Japan and China recording rates of 5 and 29 per 100,000 live births, respectively (Ryan et al., 2021).

Approximately 73% of maternal deaths result from direct obstetric complications such as severe bleeding, hypertension, unsafe abortion, childbirth complications, and maternal infections (Woldeamanuel et al., 2019). A lack of awareness regarding pregnancy warning signs is a substantial contributor to these high maternal mortality rates, particularly in low-resource settings (Masoi & Kibusi, 2019). Recognizing essential pregnancy warning signs—such as vaginal bleeding, swelling of the hands or face, blurred vision, and prolonged labor—is essential for early detection and timely medical intervention (Ahmad et al., 2021). Early recognition of these signs enables non-medical individuals to facilitate rapid access to obstetric care, improving maternal and fetal health outcomes (Geleto et al., 2019).

Adolescents face unique barriers to recognizing pregnancy danger signs due to limited health education, social stigma, and restricted access to maternal health resources (Lynch et al., 2024). Many young women in low- and middle-income countries, including Indonesia, lack comprehensive knowledge of pregnancy complications, heightening their risk for adverse health outcomes (Shukla et al., 2024). Delayed recognition of critical warning signs, such as excessive bleeding or prolonged labor, increases the likelihood of severe complications (Lahole et al., 2024). Cultural beliefs, socioeconomic constraints, and limited autonomy often exacerbate these issues, further deterring young women from seeking timely prenatal care. Expanding maternal health education and community-based interventions for adolescents could empower young women to recognize danger signs earlier, seek necessary care, and reduce maternal morbidity and mortality (Wafula et al., 2024).

Evidence indicates that women who clearly understand pregnancy warning signs are generally better prepared for childbirth, significantly improving their health outcomes (Orwa et al., 2020). Adequate preparation enables women and their families to make informed decisions regarding childbirth and seek appropriate maternity care. Such knowledge can also influence the choice of healthcare facility, reducing complications and maternal mortality (Nkamba et al., 2021).

Despite the importance of maternal health awareness, research on adolescent girls' knowledge of pregnancy warning signs in Indonesia is limited, revealing a significant gap. This study addresses the need for further preventive and educational measures to reduce maternal mortality, particularly among young women. One related study in Indonesia showed that implementing the Safe Childbirth Checklist improved maternal care quality, childbirth experiences, and engagement with health services (Doria et al., 2019). Social norms, especially in communities where early marriage is common, often restrict young women's mobility and hinder access to reproductive health services (Oguntunde et al., 2021). Empowering young women to recognize early pregnancy complications makes it possible to encourage timely health-seeking behavior, leading to safer pregnancies and improved maternal and fetal health outcomes (Rosales et al., 2017).

This study aims to analyze the factors influencing adolescent girls' awareness of pregnancy warning signs in Indonesia, shedding light on the key elements affecting their level of knowledge. Through this exploration, the study seeks to identify gaps and offer insights that can guide interventions to improve maternal health literacy among adolescent girls.

Research Question

1. What factors influence adolescent girls' awareness and understanding of pregnancy warning signs in Indonesia, and how do socioeconomic, cultural, and educational elements impact their knowledge and access to maternal health resources?

Methods

Study Design

This research employed a survey method using a cross-sectional framework to assess and analyze data from a particular group.

Sample

This study targeted a sample of adolescents aged 13–17 who attended schools throughout Indonesia, providing broad geographic coverage. The research included 7936 students. This study utilized secondary data from the 2017 Indonesia Demographic and Health Survey (IDHS), conducted between July and September 2017 across all 34 provinces in Indonesia, encompassing both urban and rural areas. The inclusion criteria for this study were women aged 15–49 years who were permanent residents or who stayed in the selected household the night before the survey, along with their last-born child under five years of age with complete information on birth history and survival. The exclusion criteria included women who had not given birth in the five years preceding the survey, children not living with their mothers, and any respondents with incomplete or missing data on key variables relevant to the analysis.

The 2017 Indonesia Demographic and Health Survey (IDHS) was a nationwide survey designed to gather extensive demographic, health, and socioeconomic data to support the Indonesian government's family planning, population, and reproductive health policies. The survey employed a stratified two-stage sampling method, systematically selecting census blocks from the 2010 population census. The selection was conducted with probabilities proportional to the population size of each block. Urban and rural areas were stratified separately, and census blocks were categorized according to the wealth index derived from the 2010 census. In each selected census block, 25 households were chosen based on updated listings to ensure a representative sample across all regions. Data were collected through home visits across 34 provinces in Indonesia, targeting women aged 15 to 49, with adolescent girls aged 19 and below as a key focus group. Ultimately, 7936 young women were included in the analysis, representing a high response rate of 97.3%, ensuring that findings could accurately reflect the national population's demographic and health status at the time.

Data collection Tools

Data was collected from women aged 15–49 through the Woman's Questionnaire, which included sections on background details, birth history, contraceptive methods, pregnancy, and postnatal care. Respondents completed this questionnaire, pretested in July and August 2016, to ensure the questions were clear and easily understood. The primary aim of the pretest was to verify that the questions were straightforward and understandable for the respondents. Furthermore, all survey instruments and procedures were rigorously evaluated (National Population and Family Planning Board et al., 2018). The internal criteria focused on women aged 15–49 residing in regular households. In contrast, the external criteria included women in the same age range living in orphanages, police or military installations, prisons, or special accommodations like boarding houses with at least ten residents.

The dependent variable in this study, "Awareness of Pregnancy Warning," categorizes respondents into two groups: "Do Not Know" and "Know." This variable aims to assess the level of understanding among adolescent girls regarding the critical warning signs that can indicate potential complications during pregnancy. Those classified as "Know" are respondents who demonstrated awareness of specific indicators, such as prolonged labor, excessive bleeding, severe headaches, fever, and signs of fetal distress, which are essential for recognizing pregnancy-related health risks early. Conversely, respondents categorized as "Do Not Know" lacked this awareness, meaning they could not identify these crucial warning signs. This distinction enables an analysis of factors contributing to knowledge gaps and emphasizes the importance of awareness for timely health-seeking behaviors, which is essential for improving maternal and fetal outcomes among young women.

This research examined several independent variables, including the participants' place of living, age, educational attainment, employment status, marital status, and socioeconomic conditions. Residence was classified into two groups: urban and rural. Age was divided into five specific categories: 15, 16, 17, 18, and 19 years. Educational attainment was classified into four levels: no schooling, primary (SD-SLTP), secondary (SLTA), and tertiary education. Employment status was categorized into two groups: working and not working. Marital status was categorized into three distinct groups: never married, married, and widowed, to capture the diverse experiences and circumstances of the participants. Socioeconomic status was assessed using a wealth index, which provides a comprehensive measure of a household's standard of living by aggregating various indicators. The wealth index was determined based on easily collected data, including the ownership of assets such as televisions and bicycles, materials used in home construction, and available water and sanitation facilities. This comprehensive approach allowed us to create a detailed measure of socioeconomic status, reflecting not only the material wealth of the households but also their living conditions and access to essential resources. Socioeconomic status was then classified into five categories: very poor, poor, middle, rich, and very rich.

Statistical Analysis

The statistical analysis was performed using IBM SPSS version 21 (IBM SPSS Corp.; Armonk, NY, USA). In contrast, ArcGIS 10.3 (ESRI Inc., Redlands, CA, USA) was used to generate a map depicting the distribution of knowledge about pregnancy warning signs among adolescent girls by province. The study used an administrative boundary polygon shapefile from the Central Bureau of Statistics for geographic accuracy.

Several preparatory steps were undertaken in the data management process to ensure data accuracy and reliability before conducting the main statistical tests. First, data cleaning was conducted to identify and address missing values, outliers, and inconsistencies within the dataset, which helped improve data quality. This process also involved verifying the coding and categorization of variables to ensure alignment with the study's objectives. For example, all categorical variables were coded uniformly, and any incorrect entries or duplicate records were

corrected or removed. Each variable was also checked for completeness and validity to avoid potential distortions in the analysis and interpretation of results.

The logistic regression model's fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test. This test assesses how well the observed outcomes match the model's predictions, with a nonsignificant *p*-value indicating a good fit to the data. Additionally, two-way interactions were tested to explore any combined effects among predictor variables on awareness of pregnancy warning signs. Interaction terms were created by multiplying relevant predictor variables, and their significance was assessed within the regression model. These steps strengthened the model's robustness, ensuring that the results accurately represented the relationships among variables.

Ethical Considerations

Following ethical standards, this study used datasets from the 2017 IDHS obtained from the DHS Program before the research. Approval was granted by the Ethics Committee of the Ministry of Health of the Republic of Indonesia (Date: 30.05.2027; Approval number: LB.02.01/2/KE.024/2017), as indicated in AuthLetter 142047, confirming that the research adhered to ethical standards and protocols. The 2017 IDHS had previously received ethical clearance from the National Ethics Committee of Indonesia**.** Before each interview or biomarker test, an informed consent statement is read to the respondent, who may accept or decline to participate. A parent or guardian must provide consent before a child or adolescent participates. The DHS informed consent statements offer details regarding the purpose of the interview/test, the expected duration of the interview, interview/test procedures, potential risks to the respondent, potential benefits to the respondent, and contact information for a person who can provide the respondent with more details about the interview/test. Most importantly, the informed consent statement emphasizes that participation is voluntary, that the respondent may refuse to answer any question, decline any biomarker test, or terminate participation at any time, and that the respondent's identity and information will be kept strictly confidential (https://dhsprogram.com/Methodology/Protecting-the-Privacy-of-DHS-Survey-Respondents.cfm.) Permission to access the 2017 IDHS data was granted through the DHS Program's website at https://dhsprogram.com/.

Results

According to the analysis, just 4.9% of adolescent girls in Indonesia stated that they were aware of all warning signs of pregnancy. The province with the smallest percentage of young women knowledgeable about all the signs was Aceh, with only 0.7%. In contrast, the highest percentage was found in Central Kalimantan, where 9.4% of young women reported knowing all the warning signs of pregnancy.

Figure 1 shows a map of the distribution of the proportion of adolescent girls who claim to know about warning signs of pregnancy in Indonesia by province. The figure shows a random distribution, trending towards lower proportions in Eastern Indonesia.

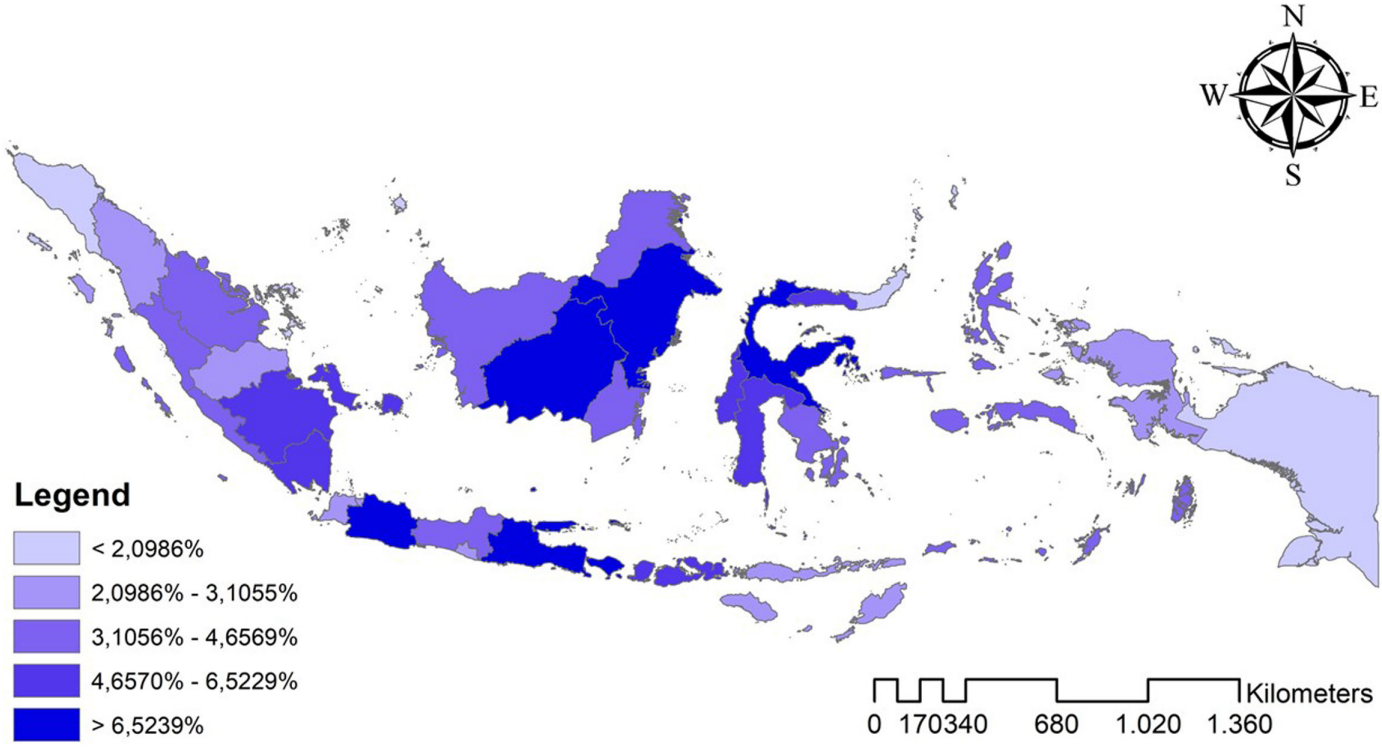

Figure 1.
*Map of the Distribution of the Proportion of Adolescent Girls Who Claim to Know About Warning Signs in Pregnancy in Indonesia by Province (*n = *7936).*

Table 1.
Collinearity Test Results on Knowledge About Warning Signs in Pregnancy in Adolescent Girls in Indonesia (N = 7936)

	Collinearity Statistics	
Variable	**Tolerance**	**VIF**
Residence	0.780	1.282
Age	0.786	1.272
Level of education	0.789	1.267
working status	0.927	1.079
Marital status	0.847	1.181
Socioeconomic level	0.747	1.340

The dependent variable is "Awareness of pregnancy warning."
Note: VIF = variance inflation factor.

Table 1 presents the findings from the collinearity test, indicating no significant issues among the independent variables. The analysis revealed that all variables had tolerance values exceeding 0.10, and the variance inflation factor (VIF) for each variable was below 10.00. These results imply no significant multicollinearity affecting the independent variables in the regression model.

Table 2 presents data on respondents' residences, indicating that a more significant proportion of adolescents aware of pregnancy warning signs live in rural areas (59.2%) compared to urban areas (40.8%). Age is also a significant factor in increasing awareness among older adolescents; specifically, 44.1% of those who are aware are 19 years old, followed by 34.4% of 18-year-olds. In contrast, only 1.2% of 15-year-olds demonstrate awareness, suggesting a clear trend indicating that older adolescents possess greater knowledge of pregnancy warning signs.

Education level plays a crucial role in awareness, with most informed respondents having completed secondary education (78.5%). Awareness is significantly lower among those with primary (18.9%) and tertiary (2.6%) education, underscoring the importance of secondary education in enhancing awareness. Furthermore, the data reveal that working adolescents are more likely to be aware of pregnancy warning signs (28.3%) than their non-working counterparts (71.7%). Marital status also influences awareness, with the majority of informed adolescents being married (89.7%), indicating a strong association between marriage and knowledge of pregnancy warning signs.

Finally, awareness levels vary across socioeconomic statuses, with the highest levels of awareness found among adolescents from impoverished backgrounds (26.5%). In contrast, only 8.3% of those from wealthy backgrounds demonstrate awareness. These findings highlight significant demographic and socioeconomic influences on awareness of pregnancy warning signs, emphasizing the necessity for targeted health education interventions to address these disparities.

Table 3 displays the results of the binary logistic regression analysis on the awareness of pregnancy warning signs among adolescent girls in Indonesia. For this analysis, the baseline category used for comparison is "unaware of pregnancy warning signs."

Table 2.
The Statistical Description of Female Adolescent Respondents Regarding Awareness of Pregnancy Warning Signs in Indonesia (N = 7936)

	Awareness of Pregnancy Warning		
Characteristics	**Do not know (*n* = 7592)**	**Know (*n* = 344)**	***p***
Residence			< .000
Urban	4100/54.1%	140/40.8%	
rural	3492/45.9%	204/59.2%	
Age			< .000
15 years	1640/21.6%	4/1.2%	
16 years	1655/21.8%	17/4.9%	
17 years	1799/23.7%	53/15.5%	
18 years	1306/17.2%	118/34.4%	
19 years old	1192/15.7%	152/44.1%	
Level of education			< .000
Primary (SD-SLTP)	5417/.5%	63/18.9%	
Secondary (SLTA)	6438/84.8%	270/78.5%	
Tertiary education	697/9.7%	11/2.6%	
Working status			< .000
Does not work	5853/77.1%	247/71.7%	
Work	1739/22.9%	97/28.3%	
Marital status			< .000
Never married	716794.4%	19/5.4%	
Marry	95/35.2%	309/89.7%	
Widow	30/0.5%	16/4.9%	
Socioeconomic level			< .000
Very poor	1344/17.7%	91/26.5%	
Poor	1511/19.9%	91/26.5%	
Medium	1541/20.3%	74/21.5%	
Rich	1503/19.8%	60/17.3%	
Very rich	1693/22.4%	28/8.3%	

$p < .001$.

Table 3 displays the results of the binary logistic regression analysis examining the factors influencing awareness of pregnancy warning signs among adolescent girls in Indonesia. The findings indicate that residence plays a significant role in awareness, with those living in urban areas having higher odds ratio (AOR 1.546; 95% CI 1.545–1.546) for awareness compared to their rural counterparts, with a statistically significant *p*-value (<.000). Additionally, age is a critical predictor of awareness, with older adolescents demonstrating progressively higher odds of being aware of pregnancy warning signs. For example, the odds of awareness are 1.927 for 16-year-olds, 3.790 for

Table 3.
Results of the Binary Logistic Regression Analysis Concerning Awareness of Pregnancy Warning Signs Among Adolescent Girls in Indonesia (n = 7936)

	Awareness of Pregnancy Warning			
			95% CI	
Predictor	***p***	**AOR**	**Lower Bounds**	**Upper Bounds**
Place of residence: Urban	< .000	1.546	1.545	1.546
Age	–	–	–	–
15 years old	–	–	–	–
16 years old	<.000	1.927	1.924	1.929
17 years old	<.000	3.790	3.786	3.795
18 years old	<.000	6.358	6.351	6.364
Age: 19 years old	<.000	6.769	6.762	6.776
Level of education				
Primary (SD-SLTP)	–	–	–	–
Secondary (SLTA)	<.000	2.011	2.010	2.012
Tertiary education	<.000	1.796	1.94	1.797
Working status: Does not work	–	–	–	–
Work	<.000	1.117	1.116	1.117
Marriage:				
Never Married	–	–	–	–
Marry	<.000	343,028	342.845	343.212
Widow	<.000	208.091	207,926	208,257
Socioeconomic				
Very poor	–	–	–	–
Poor	<.000	0.879	0.879	0.880
Medium	<.000	1.073	1.072	1.073
Rich	<.000	1.543	1.542	1.543
Very rich	<.000	1.650	1,649	1,652

$p < .001$.
Note: AOR = adjusted odds ratio.

17-year-olds, 6.358 for 18-year-olds, and 6.769 for 19-year-olds, all with *p*-values indicating high significance.

Educational attainment significantly influences awareness levels as well. Adolescents with secondary education have more than double the odds (AOR 2.011; 95% CI 2.010–2.012) of being aware of pregnancy warning signs compared to those with primary education. Furthermore, even those with tertiary education show increased awareness (AOR 1.796; 95% CI 1.794–1.797). Employment status also plays a role, with working adolescents having a slightly higher likelihood of awareness (AOR 1.117; 95% CI 1.116–1.117) than those who do not work. These results underscore the importance of education and economic engagement in enhancing awareness about pregnancy-related issues.

Marital status is another significant factor affecting awareness levels, with married adolescents exhibiting an extraordinarily high odds ratio (AOR = 343.028) for awareness compared to those who have never been married. Likewise, widowed adolescents also show substantial awareness (AOR = 208.091). Socioeconomic status further contributes to awareness levels; adolescents from poor backgrounds exhibit a lower likelihood of awareness (AOR = 0.879; 95% CI 0.879–0.880), whereas those from richer backgrounds show increasing odds of awareness, with very rich adolescents having the highest odds (AOR = 1.650). These findings highlight the multifaceted influences of demographic and socioeconomic factors on adolescents' awareness of pregnancy warning signs, emphasizing the need for targeted educational interventions to improve knowledge in these areas.

Discussion

The contradiction between the findings in Tables 2 and 3 on awareness of pregnancy warning signs among adolescents from urban and rural areas can be clarified through several analytical perspectives. Table 2's descriptive statistics indicate that a higher absolute number of rural adolescents reported awareness. However, this could reflect a more significant proportion of rural respondents in the sample rather than higher awareness levels. Conversely, Table 3's adjusted odds ratios, which account for multiple variables (such as age, education, and marital status), reveal urban residence as a significant predictor of awareness, suggesting that when these factors are controlled, urban adolescents are more likely to be aware of pregnancy warning signs. This finding aligns with studies indicating that urban areas generally offer greater access to education and healthcare resources, which are critical for health awareness (Wongsuwanphon et al., 2024). Thus, while rural areas might exhibit higher raw numbers due to sample distribution, urban settings may foster higher awareness when underlying factors are accounted for.

Furthermore, structural differences between urban and rural settings could impact awareness levels, even if rural communities possess strengths like close community support systems, which research suggests can encourage knowledge sharing, especially in maternal health contexts (Coombs et al., 2022). Still, the logistic regression findings in Table 3 suggest that access to resources in urban areas plays a more influential role. Conducting further analysis to examine how residence, education, and socioeconomic factors interact could offer insights into effective intervention points. Given that urban environments correlate with higher awareness, targeted interventions focusing on rural areas—where adolescents may benefit less from formal education and health services—would be advantageous (McGuire et al., 2024). Addressing these disparities through community-based education and accessible resources could help bridge the knowledge gap and improve maternal health outcomes across both settings.

The findings that older adolescents demonstrate higher odds of awareness regarding pregnancy warning signs align with developmental and experiential factors, which may explain both consistencies and contradictions with prior research. Generally,

as adolescents age, they gain cognitive maturity, experience increased exposure to health information, and may engage more with maternal and reproductive health education, all of which contribute to greater awareness. This trend is often supported by studies suggesting that older adolescents, particularly those approaching adulthood, have more opportunities for education about reproductive health, especially in environments where family life education is implemented in later school years (Mulubwa et al., 2024). Additionally, older adolescents may be more socially exposed to peers or family members who discuss topics related to pregnancy and childbirth, allowing them to recognize warning signs more readily.

Contradictions with some studies may arise, particularly those focusing on adolescents in restrictive educational settings or those in rural areas with limited access to reproductive health education. For instance, studies by Mejias-Leiva & Moreno Minguez (2024) found that adolescents of varying ages in certain regions exhibited similar levels of awareness, attributed to a uniform lack of resources and health education rather than age differences (Mejías-Leiva & Moreno Mínguez, 2024). In regions with limited reproductive health discussions or where younger adolescents might engage in early marriages or pregnancies, they may lack targeted health education initiatives. Thus, while age-related awareness increases are generally consistent with developmental trends, regional variations, resource disparities, and education policy differences could yield inconsistent findings. By underscoring age as a key predictor, this study highlights the need to ensure accessible and age-appropriate reproductive health education for younger adolescents to bridge awareness gaps and promote maternal health early on.

The study's findings that educational attainment and employment status positively influence awareness of pregnancy warning signs align with much of the previous research, though they also introduce some nuanced differences. Higher education, particularly at the secondary and tertiary levels, is strongly associated with improved health literacy, which equips individuals to access, understand, and utilize health information. Studies by Akwara et al. (2023) similarly found that adolescents with more educational exposure can retain reproductive health knowledge better, partly because secondary and tertiary education may cover maternal health, family planning, and pregnancy complications (Akwara et al., 2023). Additionally, secondary education often expands adolescents' social networks, creating more opportunities for health-related information exchange among peers and further enhancing awareness. These findings reinforce the view that education is crucial in promoting essential knowledge about pregnancy warning signs, aligning well with theories linking formal education to improved health outcomes.

Some contrasts with previous studies, however, may arise due to regional or cultural variations in the role of education and employment in health awareness. In specific low-resource settings, for instance, tertiary education may not significantly boost awareness if reproductive health is de-emphasized in the curriculum or if discussing these topics is socially discouraged. Similarly, studies by Janssens et al. (2024) indicate that employment does not always increase health awareness, especially in settings where adolescents work in sectors without health education initiatives (Janssens et al., 2024). In some rural or informal work environments, employment may even limit time and resources for learning about health. This study's finding that working adolescents have slightly higher odds of awareness may reflect how economic engagement fosters a sense of independence, encouraging adolescents to seek health information actively. However, it also highlights that employment alone might not significantly improve awareness without accessible health education resources. These findings emphasize that while education and economic involvement generally enhance awareness, their impact may vary across different contexts, underscoring the need for targeted interventions to bridge these gaps.

The strong association between marital status and awareness of pregnancy warning signs among adolescents likely reflects increased exposure to reproductive health information and a heightened relevance of pregnancy knowledge for those who are married. Married adolescents may have greater access to antenatal care or family planning resources, which often include education on maternal health and pregnancy complications. Research shows that healthcare providers prioritize reproductive health education for married adolescents due to their higher risk of pregnancy-related health needs (Siddiqi et al., 2024). This may explain the high odds ratio observed for awareness among married adolescents in this study. Similarly, widowed adolescents may have previously encountered health risks and complications firsthand, potentially increasing their awareness through lived experiences or interactions with healthcare services.

Socioeconomic status also plays a complex role in awareness, as those from higher-income families generally have better access to healthcare resources, education, and information. Adolescents from wealthy backgrounds are more likely to attend schools that offer comprehensive reproductive health education, have internet access to health-related information, and experience supportive family environments that encourage knowledge-seeking behavior (Titisari et al., 2024). Conversely, those from poorer socioeconomic backgrounds often lack these resources and may face barriers such as limited school attendance, restricted access to healthcare, or societal stigma around discussing reproductive health. Studies by Estrada (2024) highlight similar socioeconomic gaps in health awareness, underscoring that lower socioeconomic status is associated with limited health literacy (Estrada, 2024). The combined effects of marital status and socioeconomic background highlight the need for targeted interventions to bridge awareness gaps, particularly for economically disadvantaged adolescents who are less likely to access essential health education on pregnancy warning signs.

In conclusion, the analysis suggests that young women in Indonesia with elevated socioeconomic status have a greater likelihood of being aware of pregnancy warning signs. The reality is that improved economic resources make accessing information about these warning signs easier. This finding is supported by more research, such as Klugman et al. (2019), which found a significant positive relationship between women's socioeconomic inclusion, equity, and security and lower death rates for mothers

and infants, even after accounting for economic variables and critical health services (Klugman et al., 2019). Additionally, a study by Jewaro et al. (2020) revealed that mothers with a monthly household income exceeding 3500 Ethiopian Birr (ETB) [AOR = 3.38, 95% CI 1.20–13.96] were significantly more likely to be aware of pregnancy warnings compared to those with a household income below 1200 ETB (Jewaro et al., 2020).

Study Limitations

We conducted this research using secondary data from the 2017 IDHS. The data received were limited to what the survey owner provided. This study could not analyze the possible association of other variables found in previous studies, including distance to healthcare facilities, utilization of health services, health education guidelines, appropriate counseling, and promotion programs for maternal and child health prevention.

Conclusion and Recommendations

The study's findings confirm that the six variables examined—residence location, age, educational attainment, employment status, marital status, and socioeconomic status—are significantly associated with awareness of pregnancy warnings among adolescent girls in Indonesia.

Data Availability Statement: The data that support the findings of this study are available upon request from the corresponding author.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of the Ministry of Health of the Republic of Indonesia (Date: 30.05.2027; Approval number: LB.02.01/2/KE.024/2017).

Informed Consent: Written informed consent was obtained from participants who participated in this study.

Peer-review: Externally peer-reviewed.

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