

Risk Factors and Prevention Strategies for Anemia in Pregnant Women: a Retrospective Analysis in Ponorogo Regency

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ABSTRACT Adolescence is a transitional phase marked by significant physical, psychological, and social changes, often accompanied by challenges related to self-identity and social pressure. One of the critical concerns among adolescents is their vulnerability to stress, which may lead to poor emotional regulation and unhealthy coping behaviors. Religious coping is increasingly recognized as a potentially protective strategy for managing stress during this developmental period. This study aimed to analyze the correlation between religious coping mechanisms and stress levels among students at SMA Muhammadiyah 1 Surakarta. A descriptive analytic method with a cross-sectional design was employed. The study involved 196 respondents selected through purposive sampling. Data were collected using two standardized instruments: the Depression Anxiety Stress Scales (DASS-42) for measuring stress levels, and the Brief RCOPE scale for assessing positive and negative religious coping behaviors. Statistical analysis was conducted using the Spearman rank correlation test to determine the relationship between the variables. The results showed that 59.2% of respondents experienced moderate stress levels, 56.6% frequently applied positive religious coping, and 52.6% occasionally engaged in negative religious coping. The analysis revealed a significant negative correlation between positive religious coping and stress levels ($p = 0.000$), suggesting that increased use of positive religious coping strategies is associated with lower stress. Conversely, a significant positive correlation was found between negative religious coping and stress ($p = 0.000$), indicating that maladaptive religious responses tend to heighten stress levels. In conclusion, religious coping plays a significant role in influencing adolescent stress levels. Positive religious coping appears to mitigate stress, while negative coping exacerbates it. These findings support the integration of spiritual and psychosocial guidance in school-based mental health programs to promote resilience among adolescents.

INDEX TERMS adolescence, religious coping, stress, positive coping, negative coping

I. INTRODUCTION

Adolescence represents a critical developmental stage characterized by biological, psychological, and social changes that shape identity formation and emotional regulation. During this transitional period, adolescents often face intense academic pressure, peer influence, and self-esteem challenges, which make them more vulnerable to stress-related disorders [1], [2]. In Indonesia, recent data indicate a growing trend in mental health issues among adolescents, including anxiety, depression, and chronic stress, with school-related stressors cited as major contributing factors [3], [4].

Stress, if left unmanaged, can lead to serious consequences such as decreased academic performance, risky behavior, and long-term mental health disorders [5], [6]. One protective factor identified in literature is religious coping, defined as the use of religious beliefs and practices to manage stress and adversity [7]. Religious coping is typically categorized as positive (e.g., seeking spiritual support, trusting in a higher power) or negative (e.g., feelings of punishment, spiritual discontent) [8], [9]. Several studies

suggest that positive religious coping can enhance resilience and psychological well-being, particularly in collectivist cultures where religious identity is strongly integrated into daily life [10]–[13].

Recent advancements in psychological assessment have enabled researchers to more accurately evaluate the influence of religious coping mechanisms through validated instruments such as the Brief RCOPE, allowing for nuanced understanding of adolescent stress response patterns [14], [15]. However, current research in Indonesia remains limited, particularly in the context of senior high school students in urban Islamic-based educational settings. While some international studies have demonstrated significant correlations between religious coping and reduced stress levels [16]–[18], the findings are not always consistent and may be influenced by sociocultural and religious contexts [19], [20].

This research seeks to address the existing gap by investigating the relationship between religious coping mechanisms and stress levels among students at SMA Muhammadiyah 1 Surakarta. Using a cross-sectional design

with validated measurement tools the DASS-42 to measure stress and Brief RCOPE to assess religious coping the study aims to determine how the frequency and type of religious coping strategies influence adolescent stress outcomes. This is particularly relevant in Indonesia, where Islamic values and practices play a central role in education and youth development [21], [22].

The contributions of this study are threefold. First, it provides empirical evidence on the role of religious coping in adolescent mental health within the Indonesian Islamic school context. Second, it applies a dual-scale measurement approach (psychometric + religious coping) that offers a more comprehensive assessment of stress factors and protective mechanisms. Third, the study contributes policy-relevant insights for integrating religious and mental health education into school counseling programs.

II. METHODS

A. STUDY DESIGN

This study employed a quantitative, descriptive-analytic design with a cross-sectional approach to analyze the relationship between religious coping mechanisms and stress levels in adolescents. The cross-sectional design allows researchers to assess the correlation between variables at a single point in time without manipulating the independent variable, thus facilitating the identification of associations between religious coping and stress among students [31].

B. STUDY LOCATION AND PERIOD

The research was conducted at **SMA Muhammadiyah 1 Surakarta**, a private senior high school located in Central Java, Indonesia. The data collection was carried out over a period of four weeks in **March 2024**, following ethical clearance and administrative approval from the school authorities and the local ethics committee.

C. POPULATION AND SAMPLING

The **target population** included all students enrolled at SMA Muhammadiyah 1 Surakarta in the 2023/2024 academic year. The **inclusion criteria** were: (1) active student status; (2) willingness to participate and provide informed consent; and (3) ability to complete the online or printed questionnaires independently. **Exclusion criteria** included: (1) students with a diagnosed mental health disorder currently under psychiatric treatment, and (2) incomplete responses. A **purposive sampling technique** was used to select participants based on their relevance to the study objectives. A total of **196 students** met the eligibility criteria and agreed to participate. This sample size was considered adequate for correlation analysis with a 95% confidence level and sufficient statistical power [32].

D. RESEARCH INSTRUMENTS

Two standardized instruments were used for data collection:

1. Depression Anxiety Stress Scale (DASS-42):

The DASS-42 is a validated self-report instrument consisting of 42 items, divided into three subscales: depression, anxiety, and stress. For this study, only the **14 items related to stress** were used. Each item is rated on a 4-point Likert scale ranging from 0 ("did not apply to me at all") to 3 ("applied to me very much or most of

the time"). The stress score was calculated by summing relevant item scores and interpreting them according to established categories: normal (0–14), mild (15–18), moderate (19–25), severe (26–33), and extremely severe (34+) [33].

2. Brief Religious Coping Scale (Brief RCOPE):

The Brief RCOPE measures both positive religious coping (PRC) and negative religious coping (NRC) using 14 items (7 each for PRC and NRC). Items are rated on a 4-point scale from 1 ("not at all") to 4 ("a great deal"). This instrument has been widely validated and adapted for adolescent populations in various cultural contexts, including Indonesia [34].

The Indonesian versions of both instruments were pre-tested on a group of 20 students from a neighboring school to ensure clarity and reliability in the local context. The Cronbach's alpha values were 0.88 for the stress subscale and 0.86 for the Brief RCOPE, indicating acceptable internal consistency [35].

E. DATA COLLECTION PROCEDURE

Before data collection began, informed consent forms were distributed to students and parents. Participants completed the DASS-42 and Brief RCOPE either in a supervised classroom setting using printed questionnaires or online through a secure Google Forms link. Researchers ensured that instructions were clearly communicated, and participants were encouraged to respond honestly and independently. Each session lasted approximately 20–30 minutes. Anonymity and confidentiality were maintained by assigning unique respondent codes and securing all data in password-protected files accessible only to the research team.

F. DATA ANALYSIS

Quantitative data were analyzed using SPSS version 26.0. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to summarize demographic data, stress levels, and religious coping scores. To assess the relationship between religious coping and stress levels, the Spearman's rank correlation test was employed due to the non-parametric distribution of the variables, as determined by the Kolmogorov-Smirnov test ($p < 0.05$) [36]. Statistical significance was set at $p < 0.05$. A negative correlation coefficient between positive religious coping and stress levels was interpreted as a protective association, whereas a positive correlation between negative religious coping and stress suggested a harmful relationship [37].

G. ETHICAL CONSIDERATIONS

This study was approved by the Research Ethics Committee of the Health Polytechnic of the Ministry of Health Surabaya (Poltekkes Kemenkes Surabaya). Ethical principles such as voluntary participation, informed consent, privacy, and the right to withdraw were strictly upheld. No financial incentives were offered, and no personal identifiers were collected.

H. LIMITATIONS

As a cross-sectional design, this study cannot establish causality, and its reliance on self-reported data may

introduce response bias. Additionally, the purposive sampling limits generalizability to other student populations in different socio-religious contexts [38], [39]. Nevertheless, the study provides a foundation for future research on the integration of religious coping assessments in adolescent mental health interventions, particularly within faith-based educational institutions.

III. RESULTS

This research was carried out at the North Ponorogo Health Center, a community health center (Puskesmas) Bangunsari. Jl. Pahlawan No.30, Ponorogo District. This health center is a public health service facility that provides outpatient care, the area is 11.00 Km². The boundaries of the North Ponorogo Health Center are Bangunsari, Keniten, Banyudono, Jingglong, Beduri, Mangkujayan, Pinggirsari, Cokromengggalan, Tamanarum, Nologaten.

A. ANALYSIS OF THE INFLUENCE AND MAGNITUDE OF GESTATIONAL AGE RISK ON THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN THE THIRD TRIMESTER

The findings showed that pregnant women who had a longer gestational age in the third trimester were more likely to experience anemia (69.4%) compared to those who were not anaemic (52.4%). The Chi-Square test showed that H₀ (null hypothesis) was rejected due to a p-value of 0.027, which is less than the significance threshold of 0.05. This shows that the incidence of anemia in pregnant women during the third trimester is significantly influenced by gestational age. Furthermore, the results of the Logistics Regression Analysis test with OR 2.054 (95% CI 1.078 – 3.914) did not pass 1 were decided to be significant. The status of risky gestational age has a risk of 2.054 times compared to the status of non-risky gestational age. as shown in [TABLE 1](#).

B. ANALYSIS OF THE INFLUENCE AND RISK OF MATERNAL AGE ON THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN THE THIRD TRIMESTER

In the results of this study, it was found that third-trimester women whose mothers were older had a higher risk of developing anemia, with a prevalence of 30.5%. In contrast to individuals who do not suffer from anemia by 14.5%. A

p-value of 0.009 was found in the findings of the Chi-Square test, which is less than a significance level of 0.05. As a result, H₀ (null hypothesis) was rejected, suggesting a substantial relationship between maternal age and the prevalence of anemia in the third trimester of pregnancy. And the results of the Logistic Regression Analysis test showed that the OR of 2.602 (95% CI 1.247 – 5.430) did not pass 1 was decided significantly. Age status Mothers at risk have a risk of 2,602 times compared to the age status of mothers who are not at risk. as shown in [TABLE 2](#).

C. ANALYSIS OF THE INFLUENCE AND RISK OF NUTRITIONAL STATUS ON THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN THE THIRD TRIMESTER

In this study, there was a difference in the nutritional status of anemia and non-anemia pregnant women in the third trimester. Compared to the anemia group (25.8%), pregnant women with superior nutritional conditions (not anemia) had a greater risk percentage (28.2%). However, a p-value of 0.727 was found in the findings of the Chi-Square test, exceeding the significance level of 0.05. This suggests that there is no clear link between the occurrence of anemia in the third trimester of pregnancy and nutritional status. based on the data analyzed in this study. The influence between a woman's nutritional status and the likelihood of anemia during the third trimester of pregnancy. In addition, the results of the Logistic Regression Analysis test showed that the OR of 0.884 (95% CI: 0.443 – 1.764) passing 1 was decided to be insignificant. Nutritional status at risk has a risk of 0.884 times compared to nutritional status at risk, shown in [TABLE 3](#).

D. ANALYSIS OF THE EFFECT AND AMOUNT OF PARITY RISK ON THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN THE THIRD TRIMESTER

There was a difference in parity between the pregnant women in this study who had anemia in the third trimester and those who did not. Anemia was more common in pregnant women with higher parity, so the percentage of 6.5% compared to 0.8% in the group that did not suffer from anemia a p value of 0.043 was found in the findings of the Chi-Square test, which was less than a significance level of 0.05. As a result, H₀ (null hypothesis) was rejected, suggesting a substantial relationship

TABLE 1

Analysis of the Influence and Magnitude of Gestational Age Risk on the Incidence of Anemia in Pregnant Women in the Third Trimester

Usia Kehamilan	Status Anemia			X ²	P Value	OR	95% CI
	Case	Control	Total				
Beresiko	43 (69,4)	65 (52,4)	108 (58)	4,869	0,027	2,054	1,078- 3,914
Tidak Beresiko	19 (30,6)	59 (47,6)	78 (42)				
Total	62 (100)	124 (100)	186 (100)				

TABLE 2

Analysis of the Influence and Risk of Maternal Age on the Incidence of Anemia in Pregnant Women in the Third Trimester

Gestational Age	Status Anemia			X ²	p-value	OR	95% CI
	Case	Control	Total				
Risk	43 (69,4)	65 (52,4)	108 (58)	4,869	0,027	2,054	1,078- 3,914
No Risk	19 (30,6)	59 (47,6)	78 (42)				
Total	62 (100)	124 (100)	186 (100)				

TABLE 3

Analysis of the Influence and Risk of Nutritional Status on the Incidence of Anemia in Pregnant Women in the Third Trimester							
Nutritional Status	Kejadian Anemia			x ²	p-value	OR	95% CI
	Case	Control	Total				
Risk	16 (25,8)	35 (28,2)	51 (27,4)	0,122	0,727	0,884	0,443-1,764
No Risk	46 (74,2)	89 (71,8)	135 (72,6)				
Total	62 (100)	124 (100)	186 (100)				

between parity and prevalence of anemia in the third trimester of pregnancy. And the results of the Regression Analysis Logistics test showed that the OR of 8.483 (95% CI 0.927 – 77.592) passed 1 was decided to be insignificant. The at-risk parity status has a risk of 8.483 times compared to the non-at-risk parity status, as shown in TABLE 4.

E. ANALYSIS OF THE INFLUENCE AND MAGNITUDE OF EDUCATIONAL RISKS ON THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN THE THIRD TRIMESTER

There was variation in educational attainment in the third trimester of pregnancy in this study. who had a higher risk of developing anemia compared to individuals who were not at risk. Pregnant women with primary education had a higher risk (1.6%) compared to those with higher education (0.8%). In secondary education, the risk is greater than that of no risk, namely (69.4%) and (63.7%).

The results of the Chi-Square test showed that there was a difference between a significance value of 0.05 and a p value of 0.617. As a result, it was decided to accept the null hypothesis (H0), which argued that there was no clear relationship between education level and the prevalence of anemia in the third trimester of pregnancy. Based on the data analyzed in this study. And the results of the Logistic Regression Analysis test showed that the OR of 0.735 (95% CI 0.390 – 1.386) passed 1 was decided to be insignificant. The risk of education status has a risk of 0.735 times compared to the status of education without risk as shown in TABLE 5.

IV. DISCUSSION

A. INTERPRETATION OF RESULTS

1. Gestational Age and Anemia

The study revealed a significant correlation between

gestational age and the incidence of anemia in third-trimester pregnant women (p-value = 0.027, OR = 2.054). This aligns with physiological changes during pregnancy, where iron demands escalate in the later stages to support fetal growth and increased maternal blood volume [26]. The higher prevalence of anemia in the third trimester (69.4%) compared to non-anemic women (52.4%) underscores the critical need for targeted interventions during this period. These results are consistent with prior research indicating that anemia risk peaks in the second and third trimesters due to heightened iron requirements [27].

2. Maternal Age and Anemia

Maternal age emerged as another significant risk factor (p-value = 0.009, OR = 2.602). Women under 20 or over 35 exhibited a higher anemia prevalence (30.5%) compared to those aged 20–35 (14.5%). This finding reflects the biological and nutritional challenges faced by younger and older mothers, such as incomplete physiological maturation or declining iron absorption efficiency [28]. Similar studies have reported that extreme maternal ages correlate with poorer pregnancy outcomes, including anemia, due to inadequate nutrient reserves or increased parity [29].

3. Parity and Anemia

Parity also significantly influenced anemia incidence (p-value = 0.043, OR = 8.483). Multiparous women (≥3 pregnancies) had a higher anemia risk, likely due to cumulative iron depletion from repeated pregnancies [30]. This aligns with global data showing that grand multiparity exacerbates iron deficiency anemia [31]. However, the wide confidence interval (95% CI: 0.927–77.592) suggests variability in parity's impact, possibly due to confounding factors like interpregnancy intervals or supplementation adherence.

TABLE 4.

Analysis of the Effect and Amount of Parity Risk on the Incidence of Anemia in Pregnant Women in the Third Trimester							
Parity	Kejadian Anemia			x ²	p-value	OR	95% CI
	Case	Control	Total				
Risk	4 (6,5)	1 (0,8)	5 (2,7)	5,035	0,043	8,483	0,927-77,592
No Risk	58 (93,5)	123 (99,2)	181 (97,3)				
Total	62 (100)	124 (100)	186 (100)				

TABLE 5.

Analysis of the Influence and Magnitude of Educational Risks on the Incidence of Anemia in Pregnant Women in the Third Trimester							
Education	Incidence of Anemia			x ²	p-value	OR	95% CI
	Case	Control	Total				
Basic	1 (1,6)	1 (0,8)	2 (1,1)	0,967	0,617	0,735	0,390 – 1,386
Intermediate	43 (69,4)	79 (63,7)	122 (65,6)				
High	18 (29)	44 (35,5)	62 (33,3)				
Total	62 (100)	124 (100)	186 (100)				

4. Nutritional Status and Education

Contrary to expectations, nutritional status (p -value = 0.727) and education level (p -value = 0.617) did not significantly affect anemia rates. This contrasts with studies linking malnutrition and low education to anemia [32], but may reflect the homogeneous sample or effective universal iron supplementation programs in Ponorogo [33]. The non-significant OR for education (0.735) implies that knowledge alone may not translate to behavioral change without systemic support.

B. COMPARISON WITH SIMILAR STUDIES

The study's findings on gestational age and maternal age align with global research. For instance, a meta-analysis by [34] confirmed that third-trimester anemia is prevalent in low-resource settings due to inadequate prenatal care. Similarly, [35] reported that adolescent pregnancies in Southeast Asia face a 2.5-fold higher anemia risk due to nutritional competition between maternal growth and fetal demands. However, the non-significance of nutritional status diverges from studies like [36], which identified chronic energy deficiency as a key anemia predictor. This discrepancy may stem from differences in dietary habits or local supplementation efficacy. The parity results echo [37], but the high OR here suggests Ponorogo's mothers may have shorter interpregnancy intervals, exacerbating iron loss.

C. LIMITATIONS AND WEAKNESSES

Sample Homogeneity: The study focused on a single health center, limiting generalizability. Regional variations in diet, healthcare access, or cultural practices may alter risk factor dynamics [38].

1. **Retrospective Design:** Reliance on historical data introduced potential biases, such as incomplete records or recall inaccuracies.
2. **Confounding Variables:** Unmeasured factors (e.g., socioeconomic status, supplement adherence) could influence anemia rates but were not analyzed.
3. **Small Sample Size:** The control group ($n=124$) may lack power to detect subtle associations, particularly for education and nutrition.

D. IMPLICATIONS OF FINDINGS

Clinical Practice:

1. **Targeted Screening:** Prioritize third-trimester women, adolescents, and multiparous mothers for hemoglobin monitoring.
2. **Supplementation Adherence:** Strengthen counseling to ensure consistent iron-folate tablet uptake, especially for high-risk groups [39].

Policy Recommendations:

1. **Nutrition Programs:** Integrate iron-rich food distribution (e.g., fortified staples) with prenatal care.
2. **Education Campaigns:** Address gaps in maternal health literacy through community workshops [40].

Research Directions:

1. **Longitudinal Studies:** Track anemia trends with larger, diverse cohorts to validate risk factors.
2. **Qualitative Analyses:** Explore cultural barriers to supplement use or dietary diversity.

V. CONCLUSION

This study aimed to identify the risk factors influencing the incidence of anemia among third-trimester pregnant women in Ponorogo Regency, Indonesia, and to evaluate their significance in clinical and public health contexts. The findings revealed that gestational age ($OR = 2.054$, $p = 0.027$), maternal age ($OR = 2.602$, $p = 0.009$), and parity ($OR = 8.483$, $p = 0.043$) were statistically significant predictors of anemia, emphasizing the heightened vulnerability of older mothers, women in advanced pregnancy stages, and those with multiple pregnancies. In contrast, nutritional status ($OR = 0.884$, $p = 0.727$) and education level ($OR = 0.735$, $p = 0.617$) did not exhibit significant associations, suggesting that broader systemic interventions beyond nutritional education may be required. These results align with global evidence on maternal anemia while highlighting region-specific trends, such as the pronounced impact of parity, which may reflect local reproductive patterns or healthcare accessibility. However, the study's retrospective design and single-center sampling limit generalizability, necessitating further research with larger, multi-regional cohorts to validate these findings. Future investigations should incorporate longitudinal assessments of iron supplementation adherence, dietary habits, and socioeconomic determinants to refine targeted interventions. Additionally, qualitative studies exploring cultural and behavioral barriers to anemia prevention could enhance program effectiveness. The implications of this study underscore the need for tailored antenatal care strategies, particularly for high-risk groups, including intensified hemoglobin monitoring, optimized iron supplementation protocols, and community-based awareness initiatives. By addressing these evidence-based priorities, healthcare providers and policymakers can mitigate anemia-related complications, ultimately improving maternal and neonatal outcomes in similar low-resource settings.

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DATA AVAILABILITY

The anonymized dataset supporting this study's findings is available from the corresponding author upon reasonable request, subject to ethical restrictions.

AUTHOR CONTRIBUTIONS

All authors made substantial contributions to this research. Swastika Sari Sakina led the study conceptualization,

methodology development, data collection, and initial manuscript drafting. Nani Surtinah provided critical supervision throughout the research process, contributed to data validation and interpretation, and substantially revised the manuscript. Budi Joko Santoso was responsible for statistical analysis, software implementation, and data visualization. Agung Suharto contributed to resource acquisition, investigation, and manuscript review. All authors participated in study design, results interpretation, and final manuscript approval, and each takes full responsibility for the published work.

DECLARATIONS

ETHICAL APPROVAL

Ethical clearance was obtained from the Research Ethics Committee of the Health Polytechnic Ministry of Health Surabaya. The study protocol complied with ethical principles for research involving human participants.

CONSENT FOR PUBLICATION PARTICIPANTS.

Written informed consent was obtained from all participants and their legal guardians (for minors), which included permission for anonymous data publication.

COMPETING INTERESTS

The authors declare no financial or non-financial conflicts of interest related to this work.

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