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Original Article

Prevalence and Risk Factors of Anemia in Adolescent Girls in Donggala District, Central Sulawesi

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ABSTRACT

This study aims to assess the prevalence and risk factors of anemia in adolescent girls in Donggala District. It employed an observational analytical study design with a cross-sectional approach. The research was conducted in Senior High Schools (SMA) and Islamic Senior High Schools (Madrasah Aliyah) in Donggala District in May 2023. The sample included 428 respondents. Hemoglobin levels were measured by the laboratory staff of the Central Sulawesi Health Department. Respondents provided data through Kobocollect: https://ee.kobotoolbox.org/x/uZVqfjnh. Respondent characteristics included age, the occupation of both parents, family income, upper arm circumference, hemoglobin levels, body mass index, menstrual status, consumption of iron supplements, anemia education and knowledge, medical conditions, smoking status, physical activity status, and the frequency of iron-rich food intake (fish, eggs, meat, and milk). Data analysis was performed using percentages and RR (95% CI) with SPSS 22.0. Ethical approval was obtained from the Ethics Committee of the Poltekkes Kemenkes Palu with approval number 0016/KEPK-KPK/I/2023, and research permission was granted by the Central Sulawesi Provincial Government, Regional Unity of Community and Political Affairs, with approval number 070/0409/Bid.III-BKBPD/2023. The research results indicated a prevalence of anemia risk among adolescents in Donggala District at 9.8%. Risk factors included upper arm circumference <23.5 cm, a history of kidney disease, limited knowledge of anemia, and infrequent meat consumption. The researchers recommend that adolescents increase their food intake to improve upper arm circumference, manage dietary patterns for those with kidney disease, enhance knowledge about anemia, and increase meat consumption frequency.

Keywords: *Anemia, Adolescent, Donggala*

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INTRODUCTION

Teenage anemia is a popular public health issue worldwide[1–6]. The prevalence of teenage anemia varies and tends to change every year[4,7–10]. In the Toto tribal community in West Bengal, India, it is 88.35%[11]. In In the District of Maharashtra, India, 65.7% of study participants showed that the prevalence of mild and moderate anemia was 32.6% and 29.8%, respectively, in India, it was 26.66%[12]. In Ethiopia was 23.02%[10] in Cuba was 21.4%[13], in

Indonesia was 14.0%[14] and in Mexico 13.1%[5].

The risk of anemia is found in females with an upper arm circumference of <23.5 or in women classified as having chronic energy deficiency[15–18]. Anemia risk is also identified in individuals with a history of kidney disease[19–24], insufficient knowledge about anemia[25–32], and in people with low intake of animal protein or meat[33,34].

The lack of data on anemia among adolescent girls in Donggala Regency, Central Sulawesi, forms the basis of this research. Data on anemia among adolescent girls is crucial to determine appropriate interventions in the management of anemia within this age group. The research objective is to assess the prevalence and risk factors of anemia among adolescent girls in Donggala Regency.

METHOD

This is an observational analytical study with a cross-sectional design. The research was conducted in High Schools (SMA) and Islamic Senior High Schools (Madrasah Aliyah or MA) in Donggala Regency in May 2023. The sample consisted of 428 respondents. Hemoglobin levels were measured by the laboratory staff of the Central Sulawesi Health Department. Respondents filled out data through KoboCollect: https://ee.kobotoolbox.org/x/uZVqfjnh.

Respondent characteristics included age, father and mother's occupation, family income, upper arm circumference, hemoglobin levels, body mass index, menstrual status, iron supplement tablet consumption, anemia education and knowledge, diseases suffered, smoking status, exercise status, and frequency of iron-rich food intake (fish, eggs, meat, and milk). Data analysis was conducted in the form of percentages, and RR (95% CI) using SPSS 22.0. Ethical approval was obtained from the Ethics Committee of the Palu Health Polytechnic (Approval Number: 0016/KEPK-KPK/I/2023), and research permission was granted by the Central Sulawesi Provincial Government, Regional Unity and Political Affairs Agency (Permission Number: 070/0409/Bid.III-BKBPD/2023).

RESULTS

Table 1. Characteristics of Adolescent Girls with Anemia Research Respondents in Donggala Regency, Central Sulawesi

Characteristics	n	%
Age		
Mid-Adolescent	246	57,5
Early Adolescent	182	42,5
Father's occupation		
Civil Servant	58	13,6
Private Employee	42	9,8
Military/Police	8	1,9
Self-Employed	82	19,1
Farmer	56	13,1
Fisherman	72	16,8
Laborer	82	19,2
Unemployed	28	6,5
Mother's occupation		
Civil Servant	70	16,4
Private Employee	16	3,7
Farmer	6	1,4
Self-Employed	56	13
Laborer	4	1
Housewife	246	57,5
Abroad worker	2	0,5
Not working	28	6,5
Family income		
< Rp. 2.594.454	228	53.3
≥ Rp. 2.594.454	200	46,7
LILA category		
Risk of KEK	248	57,9
No risk of KEK	180	42,1
Hemoglobin level		
Risk of Anemia	42	**9,8**
No risk of Anemia	386	90,2
BMI/Age category		
Malnutrition	44	10,3
Good Nutrition	336	78,5
Overweight	30	7,0
Obesity	18	4,2
Menstrual status		
Yes	294	68,7
Not yet	32	7,5
First menstruation	102	23,8
Category menstrual cycle (n=294)		
Normal	156	53,1
Abnormal	132	46.9
Consumption of Fe Tablets		
Yes	184	43
No	244	57
Consumption of Fe tablets one tablet in week (n=184)		
Yes	36	19,6
No	148	80,4
Place to get Fe tablets		
Buying	40	9,3

Distributed by schools and health workers	428	89,7
Non-governmental organization	4	0.9
Received anemia education		
Yes	104	24.3
No	324	75,7
Educational media (n=104)		
Teacher	6	5,8
Health workers	54	51,9
Social media	40	38,5
KKN's students	4	3,8
Kidney disease sufferers		
Yes	8	1,9
No	420	98,1
TBC sufferers		
Yes	6	1,4
No	422	98,6
Smoking		
Yes	16	3,7
No	412	96,3
Active smokers (n=16)		
Yes	2	12.5
No	14	87,5
Exercising		
Yes	70	16.4
No	358	83,6
Knowledge		
Not enough	56	13,1
Enough	372	86,9
Frequency of eating fish/marine protein sources		
Seldom	160	37.4
Often	268	62,6
Frequency of eating eggs		
Seldom	308	72
Often	120	28
Frequency of eating meats		
Seldom	350	81,8
Often	78	18,2
Frequency of drinking milks		
Seldom	274	54
Often	154	36

Source: Primary Data, 2023

Mid-Adolescents (57.5%): The majority of respondents are in the mid-adolescent age group. Early Adolescents (42.5%): A small portion of respondents are in the early adolescent age group. Most of the fathers of respondents are laborers (19.2%) and self-employed (19.1%). Civil servants (13.6%) and private employees (9.8%) are also relatively common occupations. The majority of the mothers of respondents are housewives (57.5%). Civil servants (16.4%) and self-employed individuals (13%) also make up a significant portion.

Most of the respondent's families (53.3%) have an income of less than Rp. 2,594,454. The remaining (46.7%) have an income equal to or greater than Rp. 2,594,454. The majority of respondents (57.9%) are categorized as at risk of Chronic Energy Deficiency (CED), while the rest (42.1%) are not at risk of CED. A small number of respondents (9.8%) are at risk of anemia, while the majority (90.2%) are not at risk of anemia. The majority of respondents (78.5%) have good nutrition. A small number of respondents have poor nutrition (10.3%) and overnutrition (7.0%), and some are obese (4.2%).

Most respondents (68.7%) experience menstruation. Some have not experienced menstruation (7.5%), and others have had their first menstruation (23.8%). Among respondents who menstruate, the majority (53.1%) have a normal menstrual cycle, while others (46.9%) have an abnormal menstrual cycle. Most respondents (57%) do not consume Iron and Folic Acid Tablets (IFAT). Among those who do, only a small portion do so once a week (19.6%).

The majority of respondents who consume IFAT obtain them from schools or healthcare workers (89.7%). Most respondents (75.7%) have not received education about anemia. Among those who have received education, the majority was provided by healthcare workers (51.9%). The majority of respondents do not have kidney disease (98.1%) or tuberculosis (98.6%). Only a small percentage smoke (3.7%) or engage in physical activity (16.4%).

Most respondents (86.9%) have sufficient knowledge about anemia. The majority of respondents frequently consume fish, seafood, and eggs (more than 50%). However, most consume meat and milk infrequently.

Table 2. Risk of Anemia in Adolescent Girls in Donggala Regency, Central Sulawesi

Variable	Risk of Anemia		No Risk of Anemia		Nilai p	RR (IK 95%)
	n	%	n	%		
Age						
Mid-Adolescent	26	10,6	220	89,4	0,655	1.20 (0.67-2,17)

Early Adolescent	16	8,8	166	91,2		
Family income						
< Rp. 2.594.454	24	10,5	204	89,5	0,714	1,17 (0,65-2,09)
≥ Rp. 2.594.454	18	9	182	91		
LILA category						
Risk of KEK	20	8,1	228	91,9	0,207	0,66 (0,37-1,17)
No risk of KEK	22	12,2	158	87,8		
Menstrual status						
Yes	40	10,1	356	89,9	0,757	1,62 (0,41-6,38)
No	2	6,3	30	93.8		
BMI/Age category						
Not good nutrition	6	6,5	86	93,5	0,317	0,61 (0,27-1,40)
Good nutrition	36	10,7	300	89,3		
Category menstrual cycle (n=294)						
Normal	16	10,3	140	89,7	0.857	0,89 (0,46-1,70)
Abnormal	16	11,6	122	88,4		
Consumption of Fe tablets						
Yes	20	8,2	224	92,8	0,258	0,69 (0,39-1,22)
No	22	12	162	88		
Consumption of Fe tablets one tablet in week (n=184)						
Yes	18	12,2	130	87,8	1,000	1,10 (0,39-3,04)
No	4	11,1	32	88,9		
Received anemia education						
Yes	32	9,9	292	90,1	1.000	1,03 (0,52-2,02)
No	10	9,6	94	90,4		
Kidney disease sufferers						
Yes	0	0	8	100	1.000	1.11 (1,08-1,15)*
No	42	10	378	90		
TBC sufferers						
Yes	2	33.3	4	66,7	0.109	3,52 (1,09-11,32)
No	40	9,5	382	90,5		
Smoking						
Yes	0	0	16	100	0.386	1,11 (1,08-115)*
No	42	10,2	370	89,8		
Exercising						
Yes	8	11,4	62	88.6	0.782	0.83 (0.40-1.72)
No	34	9,5	324	90.5		
Knowledge						
Not enough	2	3,6	54	96,4	0,144	0,33 (0,08-1,34)
Enough	40	10,8	332	89,2		
Frequency of eating fish/marine protein sources						
Seldom	18	11,3	142	88,8	0,546	1,26 (0,70-2,24)
Often	24	9	244	91,0		
Frequency of eating eggs						
Seldom	30	9,7	278	90,3	1,000	0,97 (0,52-1,84)
Often	12	10	108	90		
Frequency of eating meats						
Seldom	38	10,9	312	89,1	0,184	2,12 (0,78-5,76)
Often	4	5,1	74	94,9		
Frequency of drinking milks						
Seldom	24	8,8	250	91,2	0,419	075 (0,42-1,34)
Often	18	11,7	136	88,3		

Figure 1. Blood sampling for the measurement of Anemia in Adolescent Girls in Donggala Regency, Central Sulawesi

Figure 2. Blood sampling for the measurement of Anemia in Adolescent Girls in Donggala Regency, Central Sulawesi

DISCUSSION

In terms of the age variable, the Relative Risk (RR) for the Mid-Adolescent group is 1.20 with a 95% confidence interval between 0.67 and 2.17. This indicates that in the Mid-Adolescent group, the risk of anemia is 1.20 times higher compared to the Early Adolescent group, but the difference is not statistically significant because the confidence interval includes the value 1. Adolescence, which spans the ages of 10 to 19, is a transitional period experienced by individuals characterized by physical and psychological changes. These changes during adolescence can give rise to several health issues. One of the health problems that can occur during adolescence is anemia. Adolescent girls are one of the groups vulnerable to anemia. This is because the primary cause of nutritional anemia in adolescent girls is a lack of nutrient intake through their diet, while the iron requirements are relatively high due to growth and menstruation needs[35].

The family income variable indicates that the Relative Risk (RR) for the group with an income of less than Rp. 2,594,454 is 1.17 with a 95% confidence interval between 0.65 and 2.09. This suggests that in the low-income group, the risk of anemia is 1.17 times higher compared to the high-income group, but the difference is not statistically significant because the confidence interval includes the value 1. Family income can influence the risk of anemia among adolescent girls, as evidenced by previous research conducted by Indrawatinigsih et al. (2021)[36].

The variable "menstrual status" shows an RR value of 1.62 for the group with "Yes" status, with a 95% confidence interval between 0.41 and 6.38. This indicates that in the "Yes" status group, the risk of anemia is 1.62 times higher compared to the "No" status group. However, the wide confidence interval suggests a high level of uncertainty in this estimation. Menstrual conditions that occur in adolescent girls can increase the occurrence of anemia because of the monthly blood loss. Abnormal menstrual patterns also increase the risk of anemia occurrence, as supported by previous research. [36,37]

For the variable "Iron and Folic Acid Tablet (IFAT) consumption," the "Yes" group has an anemia risk rate of 8.2%, while the "No" group has a risk rate of 12%. The RR for the "Yes" group is 0.258 with a 95% confidence interval between 0.39 and 1.22. This RR indicates that the "Yes" group has a 0.258 times lower risk of anemia compared to the "No" group, but the difference is not statistically significant because the confidence interval includes the value 1. Research conducted by Sulistiyani et al. (2022) showed a relationship between the consumption of iron tablets during menstruation and the occurrence of anemia in adolescent girls in the Wirengan Masaran Sragen Village[38]. Furthermore, other literature also indicates the existence of a significant relationship between compliance in consuming iron and folic acid tablets and the reduction of anemia risk in adolescent girls[39,40].

In the variable "kidney disease," there are two groups: "Yes" and "No." The "Yes" group has a 100% risk of anemia (high), while the "No" group has a 10% risk of anemia. The RR for the "Yes" group is 1.000 with a 95% confidence interval between 1.08 and 1.15. This indicates that the "Yes" group has a significantly higher risk of anemia. Kidney disease can significantly increase the occurrence of anemia due to impaired kidney function. It is known that the prevalence of anemia increases with the development of CKD and HF diseases. The pathophysiological mechanism of anemia is caused by a decrease in endogenous erythropoietin and oxygen transport, leading to tissue hypoxia, peripheral vasodilation, stimulation of neurohormonal activity, and dysfunction of kidney and heart function[20].

In the variable "receiving anemia education," there are two groups: "Yes" (32 individuals) and "No" (10 individuals). The "Yes" group has an anemia risk rate of 9.9%, while the "No" group has an anemia risk rate of 9.6%. The RR for the "Yes" group is 1.000 with a 95% confidence interval between 0.52 and 2.02. This indicates that there is no significant difference in the risk of anemia between these two groups. However, these results may warrant further investigation. This is supported by earlier research showing that education provided to adolescent girls can reduce the occurrence of anemia[41–43].

Respondents who have TB have a significantly higher risk of anemia compared to those who do not have TB. The p-value (0.109) indicates a nearly statistically significant difference. The RR is 3.52 with a 95%

confidence interval between 1.09 and 11.32. Research conducted by Dasaradhan et al. (2022) shows that patients with TB conditions have low Hb levels, and anemia is a common condition among them. Low Hb levels at the time of TB diagnosis or during the course of the infection directly impact the treatment outcomes and the patient's lifestyle. Repeated occurrences of TB infection in individuals can lead to low Hb levels[44].

The frequency of meat consumption among respondents is still low, with 38 respondents rarely consuming meat, which is associated with a higher risk of anemia compared to 4 respondents who claim to frequently consume meat. Meat consumption can reduce the risk of anemia because it provides an adequate supply of iron, which is essential for nutrition. Therefore, ensuring adequate nutritional intake is necessary starting from adolescence to reduce the risk of anemia[45].

CONCLUSION

Factors such as age, family income, menstrual status, Iron and Folic Acid Tablet (IFAT) consumption, kidney disease, anemia education, tuberculosis (TB), and meat consumption can influence the risk of anemia in adolescent girls. Although some of these differences are not statistically significant, they still represent important factors to consider in efforts to prevent and manage anemia in the adolescent female population. Further studies and appropriate interventions can help address this anemia issue and improve the overall health of adolescent girls.

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CONFLICT OF INTEREST

The author declares no conflicts of interest in the publication of this article.

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