The Prevalence of Adolescent Anemia among Students in Islamic Boarding School and It's Correlation with Nutrition Status and Age

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Abstract

Background: The prevalence and risk factors of anemia among adolescents in Islamic boarding schools varies from place to place and tends to be higher than the national prevalence of anemia in Indonesia. By knowing the prevalence of adolescent anemia among students in Islamic boarding schools and determining its correlation with nutrition status and age, we can make preventive procedures.
Objective: the prevalence of anemia in Islamic boarding school and It's Correlation with Nutrition Status and Age there.
Methods: The research is an observational analytic descriptive study with a cross-sectional design. The research instrument to be used are questionnaire for student's information, student's weight and height measurements, and hemoglobin levels. The collected data will be divided based on research variables and formed into a frequency distribution table. The data will then be analyzed descriptively and statistically.
Result: the prevalence of adolescent anemia is 17.5%. It was found that nutrition status (p value = < 0,01) and age (p value = 0,03) have correlation together with the incidence of adolescent anemia in Islamic boarding school.
Conclusion: the prevalence is 17.5%, which is lower than the studies I have read. nutrition status and age have correlation together with the incidence of adolescent anemia in Islamic boarding school.

Keywords : Anaemia; Islamic boarding school; Prevalence; Adolescent; Risk factor;

1. Introduction

Anemia, a condition in which hemoglobin (Hb) concentration and/or red blood cell (RBC) numbers are lower than normal and insufficient to meet an individual's physiological needs [1], that affects 22.8% of the world's population [2]. Anemia is associated with increased morbidity and mortality in women and children, poor birth outcomes, decreased work productivity in adolescent and adults, and impaired cognitive and

behavioral development in children [3]. The most common cause of anemia is iron deficiency (IDA), and non-nutritional causes included disease-related causes and genetic disorders. However, IDA and non-nutritional anemia are frequently viewed as equal due to the significant role of iron in both conditions.

According to the Indonesian national health research, the prevalence of anemia in Indonesia was 11.9% in 2007 and had increased to 21.7% in 2013 [4]. Iron - deficiency anemia is the largest cause of years lived with disability in children and adolescents worldwide [5]. Meanwhile, 15% of adolescent girls worldwide suffer from anemia, with 6% in developed and 27% in developing countries. The prevalence of anemia on adolescent itself varies. For instance, In Indonesia itself, based on a study by Rungngu et al (2016), the prevalence of adolescent anemia was 32% [6] and a retrospective study involving 709 laboratory records of Indonesian children and adolescents showed an IDA prevalence of 16% in the 5–11.9 years age group and 15.2% in the 12–18 years age group [7]. in Dembia, Ethiopia, the overall prevalence of anemia among adolescent girls was 25.5%, (95%CI, 21.4, and 29.2) [8]. Based on Isik Balci's research (2012), in the age range of 12 to 16 years old, found that the overall prevalence of anemia was 5.6%. 8.3% of the girls and 1.6% of the boys were anemic [9].

The prevalence of anemia among adolescents in Islamic boarding schools varies from study to study with different researched risk factors. Prevalence of anemia among adolescent girls in Islamic Boarding School in Kediri City was 29.93% with only nutrition status researched [10]. In Ekayanti et al (2020), Students with mild anemia were 38.1%, while 20.2% had moderate anemia with age, nutritional status and menstruation status researched as risk factors [11]. On another study in Kediri, there were 28 teenagers (29,1%) from 96 had anemia with age, nutrition status, nutrition knowledge, physical activity, and length of menstruation researched as risk factors [12].

The prevalence of anemia among adolescents in Islamic boarding schools varies from place to place and tends to be higher than the national prevalence of anemia in Indonesia. Risk factors also vary from study to study. However, Bangkalan, one of the cities with many Islamic boarding schools, has never been studied regarding the prevalence of adolescent anemia in Islamic boarding schools there. In this regard, the researcher is interested in examining the Prevalence of Anemia in Adolescents for students at Islamic boarding schools in Bangkalan and Its Correlation with Nutrition Status and Age. This research will be conducted at the Kramat and Ar-Rohmany Al-Ishaqy Islamic Boarding Schools. The research objective is for the prevalence of anemia in Islamic boarding school and Its Correlation with Nutrition Status and Age there. By knowing the prevalence of adolescent anemia among students and Its Correlation with Nutrition Status and Age, especially in Islamic boarding schools such as Kramat Islamic Boarding School and Ar-Rohmany Al-Ishaqy Islamic Boarding School, we can make preventive procedures in managing/treating students before it occurs.

2. Method

The research is an observational analytic descriptive study with a cross-sectional design. The research instrument to be used are questionnaire to gather information such as the student's age, gender, and length of stay, data on weight and height measurements, and hemoglobin levels from complete blood count. The collected data has been divided based on the research variables and formed into frequency distribution tables. The data then was analyzed descriptively and statistically using SPSS ver.26 for windows and chi-square test to evaluate the correlation between dependent variables and the independent variables. From analyzation, Prevalence, p-value, and OR will be acquired and the research result will be considered "meaningful" if $P < 0.05$.

3. Research Result

3.1. Subject Characteristic

Table 1. Subject characteristic

Variable	Total	Percentage
Prevalence		
Anaemic	16	17.5%
Not Anaemic	75	82.5%
Nutrition Status		
Normal	67	73.6%
Abnormal	24	26.4%
Age		
12-14 years old	17	18.7%
15-19 years old	74	81.3%

Subjects are in the age range of 12-19 years, most of the subjects, 81.3%, are 15 years old and above, whilst only 18.7% are 12-14 years old. Most students (73.6%), have normal nutrition status with the average body weight of the subjects was 51.44 kg and the average height was 152.8 cm, with those that are below normal are 26.4%. The participants are mostly female students, around 66%. The students that were participating are mostly long-time residences that have stayed for years in the boarding schools, as much as 91.2%. Around 21% of students have menstruation during the research period.

3.2. Prevalence

Based on table 1, the average haemoglobin level of the students was 13.38 g/dL. Anaemia status in this study used an indicator of haemoglobin levels. This is because we do the measurement for accuracy and precise results, and it also becomes an indicator of screening individuals or populations to determine the prevalence of anaemia. A total of 82.5% students had normal haemoglobin levels 12 g/dL and the prevalence rate of anaemia among students is 17.5%.

3.3. Risk Factor

Table 3. Risk Factor

	Anaemia						95% CI	
Variable	**Yes**	**No**	**Total**	**Percentage**	**P**	**OR**	**Lower**	**Upper**
Nutrition Status								
Normal	6	61	67	73.6%	<0.01	7.2	2.26	23.32
Abnormal	10	14	24	26.4%				
Age								
12-14 years old	0	17	17	18.7%	0.03	9.8	0.56	173.02
15-19 years old	16	58	74	81.3%				

3.3.1. Nutrition Status

Based on table 3 showed that most of the respondents (67 %) are normal and did not have anaemia. The highest incidence of anaemia was in those that have abnormal nutritional status (11%). The result of a statistic test using Chi square test obtained that p-value < 0.01, that can be concluded if there are the relationship between nutrition status and the incidence of anaemia in adolescent in Islamic boarding school.

3.3.2. Age

Based on table 3 showed that all incidence of anemia was anemia in middle to late teenage. None of the students that are 12-14 years old have anemia. The result of a statistic test obtained that p-value is p-value 0.03 that can be concluded if there are no significant relationship between age and the incidence of anemia in a teenager.

3.4. The Risk Factor that Influenced the Incidence of Adolescent Anemia in Islamic Boarding School

Table 5. The Result of Multivariate Analysis of Risk Factors

			95% CI	
	P	OR	Lower	Upper
Nutrition Status	**<0.01**	**7.2**	**2.26**	**23.32**
Age	**0.03**	**9.8**	**0.56**	**173.02**

Based on multiple regression logistic statistical test, there are found that nutrition status (p value = < 0,01, OR = 7,2) and age (p value = 0,03, OR = 9.8) were have correlation together with the incidence of adolescent anaemia in Islamic boarding school. Nutrition status appears to be the most significant compared with the other risk factors.

4. Discussion

4.1. Prevalence

A total of 82.5% students had normal hemoglobin and the prevalence rate of anemia among students is 17.5%. According to the Indonesian national health research, the prevalence of anemia in Indonesia was 11.9% in 2007 and had increased to 21.7% in 2013 [4]. Meanwhile, 15% of adolescent girls worldwide suffer from anemia, with 6% in developed and 27% in developing countries. The prevalence of anemia at the boarding school in Bangkalan, it is surprisingly lower but it is the same as a retrospective study involving 709 laboratory records of Indonesian children and adolescents showed an IDA prevalence of 16% in the 5–11.9 years age group and 15.2% in the 12–18 years age group [7].

The prevalence of anemia among adolescents in Islamic boarding schools varies from study to study. Unlike the studies before, the prevalence of anemia in our research in Bangkalan is also not as big as the others. Prevalence of anemia among adolescent girls in Islamic Boarding School in Kediri City was 29.93% [10] and In Ekayanti et al (2020), Students with mild anemia were 38.1%, while 20.2% had moderate anemia

[11]. On another study in Kediri, there were 28 teenagers (29,1%) from 96 that had anemia [12]. A study in Bogor has a prevalence of 21,9% [13], which is not as small as Bangkalan but it is different than the others just like the prevalence in Bangkalan.

4.2. Risk Factor

4.2.1. Nutrition Status

Nutritional status is the condition of an individual's body as a result of food consumption and use of nutrients. Nutritional status analyzed based on the characteristics of the subjects Based on BMI, it shows that most of the students (73.6%) have normal nutritional status. This may occur because one of the benefits lived in Islamic Boarding School is the pattern of consumed nutrition almost the same, so none of the students has different quantities or menu, ideally, especially breakfast because it is usually a must if we stay in boarding school. there is a correlation between breakfast habit with the incidence of anemia in junior high school student [14].

Around 26% of students are abnormal, this may be due to excessive food intake or their own eating habit, like giving their own portion to others to avoid eating a full meal or taking others portion so that everyone “finishes” their meal. The habit of consuming unhealthy snacks in adolescents with high-calorie foods is directly related to the risk of being overweight and obese [15]. Excessive intake of carbohydrates and fats is a risk factor for overweight. Unbalanced intake and less active behavior (sedentary lifestyle), which is quite common in boarding schools, can also increase the risk of being overweight in adolescents [16]. The results of the statistical test showed a statistically significant relationship between nutritional status and anemia ($p<0.1$; OR=7.2; 95% CI=2.26-23.32). Students who have abnormal nutritional status are 7.2 times more likely to experience anemia than adolescents who have normal nutritional status.

We should highlight the presence of anemia in adolescent with low BMI. This may be the result of an overall deficient diet, limited in macro and micronutrients [17]. Lack of nutrients contributes to anemia rates in women with low BMI, better intake and absorption on those that are normal may result in better nutrition acquirements which reduce their chance of getting anemia.

A study on adolescent girls in Iran reported that overweight adolescents had low hemoglobin levels and showed an increased prevalence of iron deficiency anemia compared to adolescents with normal nutritional status [18]. Increased hepcidin concentrations are more common in obese women, especially extreme obesity [19] which can interfere with iron absorption, causing anemia. But, with that 2 research, it is still a debate whether obesity is a prevalence factor of anemia, due to the fact that obese adolescents usually have more food intake which may leads to better nutrition, although that too seems to be inconsistent, according to Trowbridge, et al (1993) [20]. According to research by Ornelas, et al , some were more vulnerable to this condition despite the fact that the prevalence of obesity among these was not the largest in the study sample [17].

4.2.2. Age

On research conducted by Widjaja, et al (2014), there was a significant difference between age groups, although the age group division were more significant in their research thus giving more “transparent” result [7]. Teenager or adolescence is a critical period of increased nutritional demand for development, often coupled with behavioral challenges and reduced dietary intake and quality, and therefore warrants careful consideration [21]. Teenage or adolescence is also a time for puberty. According to research by Isik Balci, et al (2012), pubertal growth spurts is one of the traits that makes age a factor for adolescent anemia. Male teenagers may be affected by their bodies’ pubertal growth demands only, but female teenagers also will

eventually have their first menstruation in this period and will have menstruation until their menopause comes when they become elderlies [9].

Based on data, most of the respondent is in a late teen, late teen is the transitional age becoming an adult. In this phase, someone can think more deep and good to choose the better thing in their life specially to consumed nutrition that needed by the body [12]. But this often ended up as a bad move, occasionally what they want is not what they need. As they are become more "adult", they also become more and more conscious of their own body and appearance, which cause them to do some unnecessary diets. According to Isik balci et al research (2012) In adolescents, the fear of gaining weight and not being liked, examination anxiety and, irregular eating habits are the major causes for the lower intake of animal source foods leading to anemia [9]. My hypothesis is that the remaining 17.5% that have anemia did this, but this still needs more research to be validated.

4.3. The Risk Factor that Influenced the Incidence of Adolescent Anemia in Islamic Boarding School

Based on multiple regression logistic statistical test, there are found that nutrition status (p value = < 0.01, OR = 7,2), age (p value = 0.03, OR = 9.8) and Gender (p value = 0.01, OR = 4.1) were have correlation together with the incidence of adolescent anemia in Islamic boarding school. Only duration of stay that has no correlation with the incidence of adolescent anemia in Islamic boarding school (p value = 0.1). Nutrition status appears to be the most significant compared with the other risk factors.

Nutrition status is the most significant compared with the other risk factors, because it effects is also as significant. The habit of consuming unhealthy snacks in adolescents with high-calorie foods is directly related to the risk of being overweight and obese (Sedibe et al., 2018). Excessive intake of carbohydrates and fats is a risk factor for overweight. Unbalanced intake and less active behavior (sedentary lifestyle), which is quite common in boarding schools, can also increase the risk of being overweight in adolescents (Alberga et al., 2012). A study on adolescent girls in Iran reported that overweight adolescents had low hemoglobin levels and showed an increased prevalence of iron deficiency anemia compared to adolescents with normal nutritional status [18]. Increased hepcidin concentrations are more common in obese women, especially extreme obesity [19] which can interfere with iron absorption, causing anemia. But, with that 2 research, it is still a debate whether obesity is a prevalence factor of anemia, due to the fact that obese adolescents usually have more food intake which may leads to better nutrition, although that too seems to be inconsistent, according to Trowbridge, et al (1993) [20]. According to research by Ornelas, et al, some were more vulnerable to this condition despite the fact that the prevalence of obesity among these was not the largest in the study sample [17].

Age was also a significant risk factor but what it affects also depends on the mental maturity of the teenagers themselves. Teenage or adolescence is also a time for puberty. Teenager or adolescence is a critical period of increased nutritional demand for development, often coupled with behavioral challenges and reduced dietary intake and quality, and therefore warrants careful consideration [21]. According to research by Isik Balci, et al (2012), pubertal growth spurts is one of the traits that makes age a factor for adolescent anemia [9]. According to Isik balci et al research (2012) In adolescents, the fear of gaining weight and not being liked, examination anxiety and, irregular eating habits are the major causes for the lower intake of animal source foods leading to anemia [9]. This is happening more on female students than male students, since Male students are less concerned with weight and adopt fewer strategies compared to women [23]. This may cause of an overall deficient diet. Lack of macro and micronutrients contributes to higher anaemia rates in women with low BMI [17].

Male teenagers may be affected by their bodies' pubertal growth demands only, but female teenagers also will eventually have their first menstruation in this period and will have menstruation until their menopause

comes when they become elderlies [9]. Menstruation can cause an anemia by spontaneous menstrual losses that demanded more iron intake [7]. Heavy or prolonged menstruation may also cause blood lost anemia due to the reduced number of circulation red blood cells [24].

4.4. Limitation

The research didn't take the data of the exact nutrition they consume during the research thus this research cannot determine whether it also affects with the nutrition status. This research didn't take students eating pattern data, that may affect with the student's nutrition status. The age gap may not be narrow enough, more age groups with less range can make this research more accurate than it is.

5. Conclusion

- The prevalence rate of anaemia among students in the Islamic boarding school is 17.5%.
- There is a correlation between age and adolescent anaemia among Islamic boarding school students
- There is a correlation between type of gender and adolescent anaemia among Islamic boarding school students
- There is a correlation between nutrition status and adolescent anaemia among Islamic boarding school students
- There is no significant correlation between the student's duration of stay and the adolescent anaemia among Islamic boarding school students.

6. Suggestion

After conducting this research, suggestions that can be given are that the exact nutrition consume can be research further to determine whether it also affects with the nutrition status and prevalence of anaemia. The age gap on the future researches can be narrower, more age groups with less range can make research on the "age" risk factor more accurate than it is.

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