



# JNK

JURNAL NERS DAN KEBIDANAN  
(JOURNAL OF NERS AND MIDWIFERY)

<http://jnk.phb.ac.id/index.php/jnk>



## Analysis of Anemia Incidence Determinants among Female Students at Islamic Boarding School Al Hidayah 2 Bangkalan



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### Article Information

#### History Article:

Received, 07/06/2022

Accepted, 14/07/2022

Published, 15/08/2022

#### Keywords:

anemia, menstrual pattern, sleep pattern, female student

### Abstract

The incidence of anemia is common in adolescent girls. Anemia causes decreased learning achievement due to lack of concentration. This research aimed to analyze the determinant factors associated with the incidence of anemia in female students at Islamic Boarding School Al Hidayah 2 Bangkalan. The research was observational analytic, a cross sectional design. The population was female students at Islamic Boarding School Al Hidayah 2 and the sample size was 72 people. The independent variables include menstrual patterns, sleep patterns, consumption patterns of food sources of iron and nutritional status. The dependent variable was anemia status. Data collection on menstrual patterns and sleep patterns used a questionnaire, consumption patterns with the Food Frequency Questionnaire and anemia status by testing hemoglobin levels. Analysis of the data by Contingency Coefficient test. The results showed that 27.8% of subjects experienced menorrhagia, 54.2% had poor sleep patterns, 58.3% had good food consumption patterns, 25.0% had underweight nutritional status, and 13.9% subjects experienced anemia. Correlation tests showed that the menstrual pattern was significantly related to anemia status ( $p=0.048$ ). Sleep pattern ( $p=0.776$ ), food consumption pattern ( $p=0.908$ ) and nutritional status ( $p=0.462$ ) were not significantly correlated with the incidence of anemia. Menstrual pattern is the most influential factor of anemia incidence. The longer of menstrual period will cause the greater the chance of the subject experiencing anemia.

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DOI: [10.26699/jnk.v9i2.ART.p148-153](https://doi.org/10.26699/jnk.v9i2.ART.p148-153)

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P-ISSN : 2355-052X

E-ISSN : 2548-3811

## INTRODUCTION

The 61st Nutrition Day in 2021 is commemorated with the theme "Healthy Adolescents Free of Anemia: Balanced Nutrition, Healthy Teens, Strong Indonesia". This theme was chosen because the incidence of anemia is still high. The 2018 Basic Health Research (Riskesmas) shows 3-4 out of 10 Indonesian teenagers suffer from anemia (Kemkes RI, 2021). The incidence of anemia is more often found in adolescent girls than boys.

In adolescent girls, weight gain and the onset of menstruation means that the need for iron is much greater than before puberty. The increase in muscle mass and blood volume during growth spurts increases the need for iron to build red blood cells, and increases the oxygen-carrying capacity of the blood, as well as the protein myoglobin in muscles (Lau, 2012). This condition is in accordance with the results of research conducted in China in 2003–2010. The results showed that from 283 elementary school students in China, the incidence of anemia was more common in adolescent girls than boys (Luo, 2010).

Several studies have been conducted in various Islamic boarding schools on the incidence of anemia. Among these studies were conducted at the Darussalam Islamic Boarding School in Bogor. From 84 students, it was known that 38.1% of students had mild anemia, while 20.2% had moderate anemia (Ekayanti, Rimbawan, & Kusumawati, 2020). In another study at the Manba'ul Hikam Islamic Boarding School in Sidoarjo, it was found that 65.4% of female students were anemic (Fitria & Puspita, 2020). Meanwhile, a study at the Thawalib Islamic Boarding School Sriwijaya Palembang showed 30% of students had symptoms of anemia because the hemoglobin level was less than normal (Sabrina, Zanaria, Diba, & Hestningsih, 2020).

Another study was conducted in a rural area of South India. In this research, the sample taken was young women aged 10-19 years with 314 respondents. The results showed that the factors associated with the incidence of iron deficiency anemia were low socioeconomic status and

underweight adolescents assessed from Body Mass Index (BMI) (Siddharam, Venketesh, & Thejeshwari H L, 2011).

Based on this background, this research was conducted with the aim of analyzing the determinant factors associated with the incidence of anemia in female students at Pondok Pesantren Al Hidayah 2 Bangkalan. The determinant factors include menstrual patterns, sleep patterns, consumption patterns of iron sources and nutritional status.

## METHOD

This research was analytic observational research with a cross-sectional approach. The research was conducted at the Al Hidayah 2 Islamic Boarding School Bangkalan in September 2021. The population was female students of the Al Hidayah 2 Islamic Boarding School Bangkalan with a sample size of 72 peoples. Sampling technique with purposive sampling.

The data collected in this research included data on menstrual patterns, sleep patterns, consumption patterns of food sources of iron, data on weight and height to calculate BMI/nutritional status, and data on hemoglobin (Hb) levels to determine anemia status. Menstrual pattern and sleep pattern data were taken using a structured interview technique using a questionnaire instrument containing written questions. Data on food consumption patterns of iron sources were obtained with the Food Frequency Questionnaire (FFQ) instrument. Data on weight and height were collected by measuring weight with a scale and height with a microtoise. Data on Hb levels were collected through capillary blood sampling which was then checked using an Hb checker (Easy Touch GCHb Blood Multi Function Monitoring System).

Statistical tests were conducted to analyze the relationship between menstrual patterns and the incidence of anemia, eating patterns with the incidence of anemia, sleeping patterns with the incidence of anemia and nutritional status with the incidence of anemia by using the correlative hypothesis test (contingency coefficient).

**RESULTS****Table 1: Characteristics of Research Subjects**

Variabel	Mean ± SD
Age (years)	14,61 ± 1,66
Weight (kg)	50,27 ± 12,01
Height (m)	1,52 ± 0,06
Body mass index	21,72 ± 4,62
Iron Source Food Consumption Score	71,53 ± 24,65
Sleep time (hours)	7,40 ± 1,46
Hemoglobin Level (g/dl)	13,26 ± 1,68

The characteristics of the research subjects are presented in Table 1. An overview of the determinants and anemia status of the research subjects can be seen in Table 2. Meanwhile, the results of the correlation test between variables can be seen in Table 3.

**Table 2: Frequency Distribution of Determinant Factors and Nutritional Status of Research Subjects**

Variabel	n	%
<b>Menstrual Pattern</b>		
Hipomenorea	1	1,4
Normal	51	70,8
Menorrhagia	20	27,8
<b>Sleep Pattern</b>		
Not enough	39	54,2
Enough	33	45,8
<b>Food Consumption Patterns of Iron Sources</b>		
Not enough	30	41,7
Well	42	58,3
<b>Nutritional status</b>		
Underweight	18	25,0
Normal	32	44,4
Overweight	9	12,5
Obesity	13	18,1
<b>Anemia Status</b>		
Anemia	10	13,9
No Anemia	62	86,1

The results of statistical tests showed that the menstrual pattern was significantly correlated with anemia status. The percentage of subjects with anemia and menorrhagia was seen to be greater than that of subjects who were not anemic. This shows that subjects who experience menorrhagia tend to be at risk for anemia. Menorrhagia is a condition in which a person experiences menstruation for more than 8 days or a large volume of blood with an indicator of changing pads 5-6 times per day (Prawirohardjo, 2014).

**Table 3: Contingency Coefficient Correlation Test Results between Determinant Factors and the Incidence of Anemia**

Determinant Factor	Anemia Status		P
	Anemia n (%)	Non-Anemia n (%)	
<b>Menstrual Pattern</b>			
Hipomenorea	0 (0,0)	1 (1,6)	0,048*
Normal	4 (40,0)	47 (75,8)	
Menorrhagia	6 (60,0)	14 (22,6)	
<b>Sleep Pattern</b>			
Not enough	5 (50,0)	34 (54,8)	0,776
Enough	5 (50,0)	28 (45,2)	
<b>Food Consumption Patterns of Iron Sources</b>			
Not enough	4 (40,0)	26 (41,9)	0,908
Well	6 (60,0)	36 (58,1)	

Nutritional status			
Underweight	4 (40,0)	14 (22,6)	0,462
Normal	4 (40,0)	28 (45,2)	
Overweight	0 (0,0)	9 (14,5)	
Obesity	2 (20,0)	11 (17,7)	

\*Signifikan  $p < \alpha (0,05)$

Excessive menstruation in adolescent girls is a driving factor for anemia (Andriani & Wirjatmadi, 2012a). The large volume of blood that comes out will cause more iron to be lost compared to subjects with normal menstrual patterns. And the advanced stage of iron deficiency is indicated by low blood hemoglobin levels (Andriani & Wirjatmadi, 2012b).

## DISCUSSION

The results of this research indicate that there is an effect of menstrual pattern on anemia status, and this is statistically significant (0.048). Based on data from table 1, it shows that most of the subjects experienced normal menstruation (70.8%), which means that students experienced menstruation for 5-7 days with a normal amount of blood that came out as much as 30-70 milliliters per day. The blood that comes out during menstruation certainly affects the subject's Hb level, which decreases during menstruation. If this happens continuously every month without any additional foods that contain lots of iron or iron supplements, then of course this can increase the risk of anemia.

Several other studies have also shown a significant relationship between menstrual patterns and the incidence of anemia (Adiyani, Heriyani, & Rosida, 2020; Astuti & Kulsum, 2020). In a study at SMPN 18 Banjarmasin, menstrual patterns were translated into menstrual cycles, length of menstruation and volume of menstrual blood. Menstrual cycle and length showed a significant relationship with the incidence of anemia. Meanwhile, menstrual blood volume did not show a significant relationship with the incidence of anemia (Ansari, M H, Farida Heriyani, 2020).

Sleep patterns of research subjects with parameters of sleep duration were not significantly associated with the incidence of anemia. Several previous studies also showed that there was no significant relationship between sleep patterns or sleep duration with the incidence of anemia (Indah, 2017; Musrah & Widyawati, 2019). In this study, the sleep pattern parameter used was only the length of sleep. Meanwhile, there are several other parameters such as sleep efficiency, sleep start time, sleep disturbances, drug use habits and activities that can interfere with sleep that can affect sleep quality

(Rompas et al., 2013). Several studies show a significant relationship between sleep patterns and the incidence of anemia (Fitria & Puspita, 2020; Rompas et al., 2013). Therefore, the length of sleep alone is considered inadequate to measure sleep quality.

The pattern of consumption of food sources of iron did not show a significant relationship with the incidence of anemia. The pattern of consumption of food sources of iron was assessed with the Food Frequency Questionnaire (FFQ) instrument. The parameters used are the type and frequency of consumption of food sources of iron during the last month. The results of the research showed that the majority of subjects had good consumption patterns, namely various types and high frequency. However, the weakness of this method is that it cannot assess the amount of food consumed so it cannot describe the actual nutritional intake (Sirajuddin, Surmita, & Astuti, 2018). Therefore, although most of the research subjects had consumed a variety of iron-rich foods, the adequacy of the amount of iron intake could not be assessed.

In the nutritional status variable, the percentage of anemic subjects with underweight status was greater than non-anemic subjects with underweight status. However, the nutritional status of the subjects did not show a significant relationship with the incidence of anemia. The nutritional status category in this research was obtained from the anthropometric assessment method (weight and height) which was influenced by the intake of macronutrients as an energy source. The weakness of this method is that it is unable to detect deficiencies of certain nutrients such as zinc and iron (Supariasa, 2016). Whereas iron intake will provide a more significant relationship with the incidence of anemia than energy intake (Indartanti & Kartini, 2014). The results of this research are in line with

the results of previous studies on the female adolescent population in Yogyakarta (Judha, 2020), in Banjarmasin (Adiyani et al., 2020), and in Semarang (Indartanti & Kartini, 2014).

## CONCLUSION

The determinant factor that is significantly correlated with the incidence of anemia is menstrual pattern. The longer the menstrual period and the greater the volume of menstrual blood (menorrhagia), the greater the chance of the subject experiencing anemia. Sleep patterns, dietary consumption patterns of iron sources and nutritional status were not significantly correlated with the incidence of anemia in research subjects.

## SUGGESTION

Examination of hemoglobin levels in adolescent girls should be done regularly to prevent anemia. Subsequent studies on the pattern of consumption of food sources of iron should use quantitative methods so that actual iron intake can be assessed. Further studies on sleep patterns should use various parameters so that sleep patterns can be assessed comprehensively.

## ACKNOWLEDGMENT

Thank you to Universitas Nahdlatul Ulama Surabaya as the funding provider for this research through the UNUSA LPPM research grant program. Thank you to the caretakers of the AL Hidayah 2 Islamic Boarding School Bangkalan for their willingness to serve as a research site.

## FUNDING

This research was entirely funded by Universitas Nahdlatul Ulama Surabaya.

## CONFLICTS OF INTEREST

Authors declare that no conflicts of interest in this research.

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