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Regression Modelling Based on Characteristicsof Anemia in Female Adolescent

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Abstract. Each individual is desperately in need of nutrition adequacy for the whole life. As a matter of fact, mother or prospective mother is a vulnerable group that their nutritional status and health must be well-maintained. Otherwise, this particular group will potentially suffer from anemia; a nutritional problem in Indonesia in which, according to research, young women (female adolescents) of East Java reach 57.1% prevalence and those in Jember reach 41% prevalence. The aim of the study was to determine regression modeling based on the characteristics of anemia in young women. This is quantitative analytic research with a cross-sectional approach. The populations of the study were students of SMPN 4 Jember with 110 samples of female students taken through simple random sampling. The results of the study were variables of abnormal nutritional status, Medical (disease) records, and abnormal menstrual trends affecting anemia with regression modelling 1+e-5,565 (-1,659 (abnormal nutritional status) +5.661 (disease record detected) +3,544 (abnormal menstruation) Researchers recommendation for schools in accordance with the modelling that they could cooperate with parents, higher education institutions and health service institutions to optimize the students nutritional status that infection and abnormal menstrual trend could be immediately anticipated.

1. Introduction

Nutrition is one of important components in development which can eventually contribute for qualified human resources [1]. Each individual is desperately in need of nutrition adequacy for the whole life. One of unresolved nutritional problems in Indonesia is anemia. According to the Household Health Survey (SKRT) in 2010 26.5% of female adolescents; 40% WUS and 47% of children aged 0-5 years suffer from anemia.

Anemia in female adolescent is considered as public health problem when the prevalence reaches over 5% [3]. Whereas, as a matter of fact, according to research on young women in East Java, the prevalence of anemia reached 57.1%; with 41% of prevalence in Jember [2]. Furthermore, based on the Health Survey in 10 Districts the Safe Motherhood Partnership Family Approach (SMPFA) project in 2008/2009 57.4% of young women suffered from anemia [4]. WHO declare that anemia is

the 10 biggest health problems, but once progress in decreasing the incidence rate (prevalence) is still considered very low [5].Problems of Anemia become the topic of research in the Jember Polytechnic Research Master Plan (RIP) [6] also noted in the 2017-2045 National Research Master Plan (RIRN) specifying the handling of malnutrition problem [7].

In general, the high prevalence of iron-deficiency anemia is caused by several factors: chronic blood loss, insufficient iron intake, inadequate absorption and increased iron requirements [8]. Moreover, female adolescent experience monthly menstruation higher iron is needed, while in fact they usually consume less food compared to men [4], as well as cutting down certain foods and even carrying out un-recommended eating habit [8].

The impact of iron deficiency anemia, among others, reduces body endurance which is vulnerable to disease, the decrease of activities and learning courage, the decrease of fitness and productivity. Adolescence is the moments of rapid growth, and iron deficiency at this particular moment will likely result in poor height achievement [4].

Female adolescent anemia becomes health problem in Jember as the prevalence reaches over 40%.Based on the interviews with the Student Coordinator and UKS Coordinator in SMPN 4 Jember, the most frequently reported complaints were fainting during the ceremonies with pale facial performance and weak body as a sign of anemia. As a matter of fact, most local schools and Sub-district public health centers (Puskesmas) have not made specific efforts on health problems. SMPN 4 Jember students though the school is located in urban areas and belongs to group of superior junior high schools in Jember. Based on that fact, the research on this particular issue namely "Regression Modelling based on characteristics of Anemia in Female Adolescent" needs to be conducted, specifically with the aims: 1) identifying the characteristics of female adolescent in anemia cases; 2) analyzing the influence of characteristic factors; 3) determining regression models of characteristic factors of anemia in female adolescent as an effort to prevent them from that particular medical problem.

2. Research Method

This is a quantitative analytic research with a cross-sectional approach. The data collection was carried out atJember Junior High School 4 in July-August 2018. The study populations were the 110 students taken with simple random sampling technique and determined as research subjects. Inclusion criteria used are: 1) The ability of good communication; 2) Not more than 10% of absenteeism; 3) parents' approval for their involvement in the study. The variables of the study were anemia, characteristics of young women with nutritional status, medical (disease) records, menstrual trend, level of knowledge. The instruments included questionnaire characteristics of research subjects, digital scales, microtoise, WHO-Anthro Plus application and guidelines for Focus Group Discussion (FGD) implementation. Data processing is carried out in the stages of editing, coding, processing, cleaning and tabulating. The study analysis used logistic regression test to determine the influence of characteristic variables over anemia.

3. Resultand Discussion

3.1. The Analysis of Characteristic Factor of Anemia

Among the research subjects 36 out of 110 subjects (30.9%) were identified as suffering from anemia. As a matter of fact, it is considered to be a medium health problem when detected in the position of 20% -39.9% for anemia [3]. The school management boards and health centers should take it into a serious consideration so as not to grow up to a more serious problem. Further details can be seen Table 1 below.

Table 1. Cross Tabulation of Characteristic Factors of Anemia in Female Adolescent

Variabel	Anemia		Without Anemia		Total	p-value
	N	%	N	%		

Nutrition Status						
Abnormal	24	70,6	36	47,4	60 (54,5)	0,024
Normal	10	29,4	40	52,6	50 (45,5)	
Knowledge			21			
Poor	7	20,6	36	27,6	28 (25,5)	0,229
Fair	13	38,2	19	47,4	49 (44,5)	
Good	14	41,2		25	33 (0,3)	
Illnes (Disease)Record						
Detected	26	76,5	3	3,9	29 (26,4)	0,001
Not Detected	8	23,5	73	96,1	81 (73,6)	
Menstruation						
Trend	25	73,5	19	0,25	44 (40)	0,001
Abnormal Normal	9	26,5	57	0,75	66 (60)	
Total	34	100	76	100	110 (100)	

Table 1 shows that 34 subjects were found suffering from anemia with abnormal nutritional status (70.9%), good knowledge (41%) had a medical (illness) record (76.5%), and with abnormal menstrual trend (73, 5%). Whereas, subjects of non-anemia have normal nutritional status (52.6%), those with sufficient knowledge (47.4%), no medical (illness) record (96.1%), and with normal menstrual pattern (57%).

Nutritional status was measured using the BMI / U indicator dominated by abnormal nutritional status of 54.5%. Chi Square test showed nutritional status factors associated with anemia and a significant value of 0.024 (p <0.05).In this study, abnormal nutritional status comprises inadequate and proper nutritions. Nutritional status represents nutritional balance in our body, iron included. Inadequate nutrition means nutritional imbalance enabling anemia to come out. However, a relevant research in America found that kids and teenagers with overweight nutritional status (>95 percentile) and with the risk of overweight (>85-<95 percentile) demonstrated iron deficiency. Subjects with overweight nutritional status 12 to 16 years of age subjects (9.1%) demonstrated the highest prevalence of iron deficiency. The condition of inadequate nutrition (Stunting, anemia or zinc deficiency) and overweight is the most common condition in some countries in Latin America [9]. Nutrition also indicates Anemic risk due to insufficient provision of food of iron and low physical activities [10].

The most subjects with sufficient knowledge of anemia were 44.5% and tested using questionnaire of 20 questions. The significant value of knowledge is 0.229 (p> 0.05) which means that knowledge is not related to anemia. This is in line with research on anemia in Lampung that most female students was mostly lack of knowledge (62%) [11]. Thus, this fact indicates that knowledge of health is not sufficiently provided for students of formal schools.

Hence, knowledge plays a pivotal role in health practices. Knowledge of nutrition obtained by most adolescents can affect their perceptions of nutrition [12][13][14][15][16]. Those who have good knowledge will surely select good types of food. However, adolescents of early years and with good nutrition knowledge cannot easily internalize it in their daily eating behavior [15]. Nevertheless, knowledge in this study is not merely related to anemia as the subjects are categorized as early adolescents whose main meals are normally provided by their parents.

Most subjects (73.6%) showed no medical (disease) record in the previous one month. The significant value with Chi Square test shows 0.01 (p <0.05) which means that the medical record related to anemia was quite low. The medical record indicated in the questions was related to infectious disease or chronic bleeding occurring for the previous month. Around 26.4% of subjects were detected to suffer from ISPA, diarrhea, gastritis, and malaria. Other studies also found that young women who suffer from infectious diseases 2.047 times potentially suffer from anemia compared to those of no infectious diseases [13].

The research location had zero Annual Paracite Incidence (API) and included as malaria free area [17], unless only one subject detected as from East Nusa Tenggara, popularly known as malaria endemic area. In addition, a study on malaria conducted in Zanzibar suggested that malaria was negatively related to Hb (b = -0.32; P <0.001). It dealt with blood loss and various severe or recurrent infectious diseases which can potentially reduce appetite and cause lethargy. Thus, it will likely indicate immediate effect over Hblevels or even diet disorder [18].

Sixty per cent of subjects have normal menstrual trend in terms of cycles and duration. The significant value with Chi Square test indicates 0.01 (p <0.05) which means that the menstrual cycle is correlated to anemia. Subjects are identified to have a normal menstrual trend when their menstrual cycles are of 21-35 days with periods of 3-7 days [15][16]. In this study, 40% of subjects experienced abnormal menstrual trend. Subjects at the age of 12-14 years have menarche. Other studies on anemia in Jakarta found that 68.7% of respondents experienced an abnormal menstrual cycle [21].

Menstrual cycle normally happens irregularly due to the body adjustment; first two months with normal menstrual cycle, for instance, which is then followed by one or more months of no menstruation > 7 day cycle. Young women of long period of menstruationcycles (over 7 days)potentially lose more iron than those who have a normal menstrual cycle. Ten per cent of women are estimated to lose blood more than 80 ml per month. The amount of menstrual blood obviously deals with anemia as women have no sufficient Fe supply and absorption into the body unable to replace the loss of Fe during menstruation [22][23]. Cyclical variations and the duration of menstruation occur in female adolescents. Abnormal menstrual trendsuffered by female adolescentscan be caused by hormonal and stress factors. The excessive estrogen stimulation will cause irregular bleeding and with more blood [24]. Female teenagers who suffer from anemia will also have the potential to bleed more [25].

3.2. The Influence of Characteristic Factor over Anemia

Table 2 Logistic Regression Modeling of Characteristic Factors over Anemia in Female Teenagers

Variables	β	P-value	Exp(B)	Nagelkerke R-Square
Nutrition Status (Abnormal)	-1,659	0,048	0,190	
Ilness Record (Disease detected)	-5,661	0,001	0,003	
Menstruation Trend (Abnormal)	-3,533	0,029	0,002	
Constanta	5,565	0,001	261,037	0,77

Based on the table of logistic regression test result, variables of abnormal nutritional status, illness record, and abnormal menstrual trend simultaneously play pivotal role in anemia. The variables indicate that 77% of anemia is influenced by characteristic.The regression modelling of the study is

$$y(Anemia) = \frac{1}{1 + e^{-5,565\ ((-1,659.X\ (gizi\ tidak\ normal, -5,661.X\ (ada\ riwayat\ penyakit) - 3,544.X\ (menstruasi\ tidak\ normal))}} \quad (1)$$

The variable of nutritional status (abnormal) have a significant value of 0.048 (p <0.05) which indicates correlation between abnormal nutritional status and anemia. The Exp value (B) shows 0.19 which means that students abnormal nutritional status of 0.19 will likely experience anemia compared to those of normal nutritional status.

The variable of illness record (disease detected) shows p-value of 0.001 (p <0.05) which indicates correlation between illness record and anemia. The Exp (B) value shows 0.003 indicating students with illness record potentially have 0.003 times greater for anemia than those of no illness record.

The variable of menstrual trend (abnormal menstruation) with a p-value of 0.029 (p <0.05) indicates correlation between abnormal menstruation and anemia and the value of Exp (B) shows 0.002 which indicates that students of abnormal menstrual trend will likely have 0.002 times greater to suffer from anemia than those of normal menstrual trend.

Recommendationan additional iron of 0.56 mg / day due to 84 ml frequent menstrual blood loss suffered by the average of young women. With the assumption of 133 g / l Hb loss, female teenagers require additional 0.56 mg of per day [5]. However, as a matter of fact, the provision of blood-support tablets supposedly implemented at the study location never happened during the study.

This research contradicts another modeling suggesting that menstrual trend have no effect overanemia. Yet, only knowledge and diet have a more dominant influence [15] over anemia. This study shows that modeling was considerably influenced by menstrual cycles but the knowledge of subjects of studyshowed no effect over the same problem as subjects of early teenagers experienced abnormal menstrual trend due to hormonal factors (40%). In addition, subjects of this study are mainly those who are dependently chosen for their main meals.

The modeling in this study was reported to the school through FGD attended by the school principal, student coordinator, sports teacher, representative of parents and female students. Anemia prevalence 30.9% indicates a moderate health problem in Jember 4 State Junior High School [3]. The researcher showed the modeling of characteristic factors so that the school and parents can identify and control the influencing factors to minimize anemia. Researchers recommend the school to optimize the role of the Youth Health Cadre (KKR) formed to monitorthe nutritional status of female students. The KKR has an educational function and becomes the health role model for students at schools [17]. Schools and parents can also try to optimally achieve students' normal nutritional status through proper food selection. Good nutritional status will likely be able to prevent female students from infectious as well as chronical diseases and also abnormal menstrual trend. Proper meal provision for students can be continued to minimize students to consume unhealthy snacks at school. Researchers recommend that schools can cooperate with health service centers and higher education institutions to combat anemia through blood-support tablets and educational coachingfor TRC and female students.

4. Conclusion

The regression modelling of the study is:

$$y(Anemia) = \frac{1}{1 + e^{-5.565\,((-1.659\,X\,(gizi\,tidak\,normal,\,-\,5.661\,X\,(ada\,riwayat\,penyakit)-3.544\,X\,(menstruasi\,tidak\,normal))}}$$

Suggestion for future researchers is that they should include variables of the knowledge of mothers, nutrition intake and lifestyle in anemiamodeling. Schools can make useof Adolescent Health Cadres (KKR) in collaboration with health service centers and higher education institutions for blood supply tablets and educational coachesfor students and KKR.

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