Haemoglobin Level of Pregnant Women was Associated with History of Anemia During Adolescent Period: Findings from the Indonesia Family Life Survey

by Sri Achadi Nugraheni

Haemoglobin Level of Pregnant Women was Associated with History of Anemia During Adolescent Period: Findings from the Indonesia Family Life Survey

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ABSTRACT

Introduction: Low hemoglobin levels in pregnant women are global health problem that adversely affect the mother's and newborn's health. There is no study proving the effect of anemia during adolescence in pregnancy, especially in Indonesian population. This study aimed to investigate the effect of anemia in adolescence on the hemoglobin level during pregnancy, using Indonesian Family Life Survey (IFLS) data.

Methods: This retrospective cohort study used the 1997, 2007 and 2014 IFLS data. The hemoglobin levels in adolescents aged 10-18 years were obtained from the IFLS-II data in 1997. Then, the hemoglobin levels during pregnancy from the same individuals were tracked from the IFLS-IV in 2007 and IFLS-V in 2014. Data from 210 subjects were included in the analysis as these subjects had the complete data on hemoglobin levels during adolescence and pregnancy and all other considered confounding variables, such as maternal age, iron protein, vitamin C consumption, education, working status, residence, socioeconomic status, gestational age at data collection, parity, antenatal care, iron supplement consumption. Data was analyzed by T tests, Pearson's correlation tests and General Linear Model.

Results: The mean hemoglobin levels of pregnant women was 11.23 g/dL with standard deviation 1.271 and the prevalence of anemia during adolescence was 34.3%. There was a significant difference of 0.447 g/dL in the average hemoglobin levels in pregnant women with and without history of anemia during adolescence (p=0.023). The hemoglobin levels in pregnant women also differed among trimesters of gestational age (p=0.001). After being controlled for vitamin C and protein consumption, anemia status during adolescence still has a significant effect on lowering hemoglobin level during pregnancy.

Conclusion: Anemia during adolescence negatively impacts pregnant women's hemoglobin levels. Prevention programs for anemia in pregnant women should be started from adolescence period.
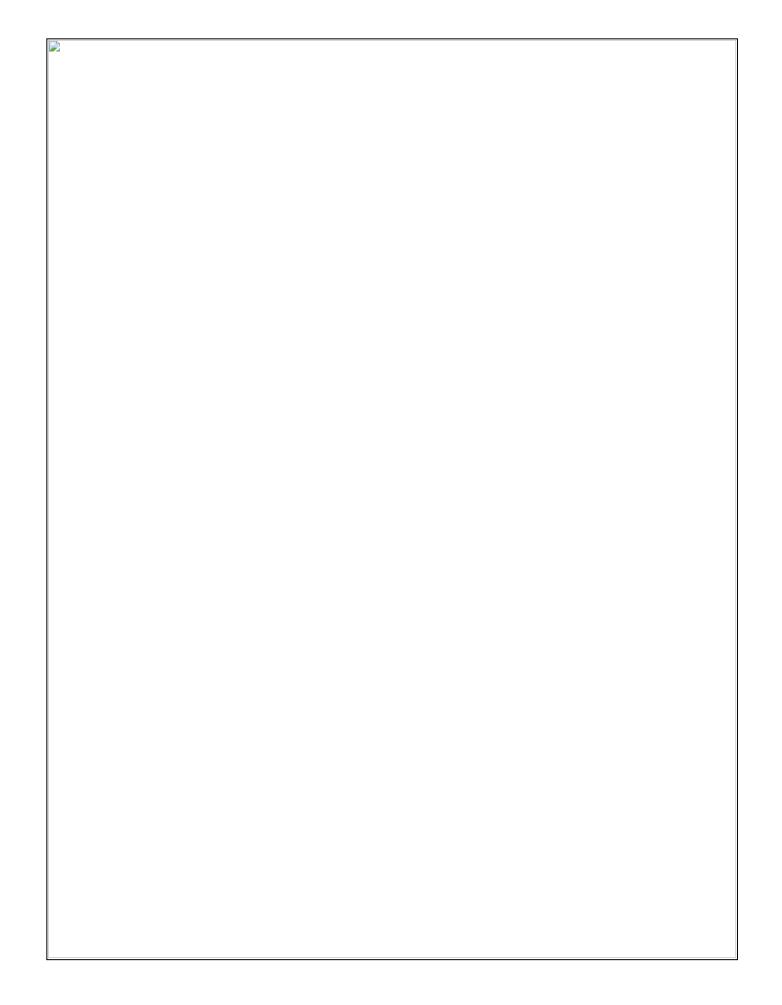
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INTRODUCTION

Hemoglobin is essential for oxygen circulation from the lungs to all cells in human body.[1,2] Low hemoglobin levels lead to multiple adverse health problems and additional costs to the health system and society.[3,4] Pregnancy is the most vulnerable phase in the life cycle to experience low hemoglobin level.[5] Pregnant women with low hemoglobin levels have a higher risk for postpartum hemorrhage and maternal death.[6–12] It has not been proven that a history of anemia during adolescence is the main cause of a low hemoglobin level during pregnancy. However, a study showed that anemia condition in adolescence continually impact the health status in the following phase of life, which is the preconception stage to pregnancy.[13]

Low hemoglobin levels in adolescents affect oxygen transport in the blood which lead to lower physical and mental capacity, and result in a decrease in quality of life.[14] Low hemoglobin levels during the pregnancy would also threat newborns' health. The newborns of mothers with low hemoglobin levels are more likely to experience premature birth, low birth weight, and death.[6,8,15,16] They also have a higher chance to have brain and body cell growth problems and acquire nutritional problems, including stunting and wasting.[17–20] This condition could continually decrease the immune system protecting the children from infection and hinder the intelligence quotient (IQ) development at school age period.[17–20] In the long term, these children would have a higher risk of low cognitive and motoric performance and acquire neurophysiologic impairment.[21,22]

The prevalence of low hemoglobin levels among pregnant women is approximately 40% or 614 million worldwide.[23–25] Most of these problems occur in Low and Middle-Income Countries (LMICs), including countries in Southeast Asia.[26,27] The prevalence of low hemoglobin levels among pregnant women in Indonesia is among the world's highest. The

residences (village and city), and economic status (from the quartile 1: the poorest to the quartile 5: the richest). The predictive variable was the anemia status during the adolescent period, which obtained from the IFLS-II in 1997. The hemoglobin levels in all waves of IFLS were examined by the same method.

Gestational age at the date of data collection was counted and then classified into three categories (trimesters I, II or III). The subjects were classified as multiparous if they had ever given birth to more than one alive child, while the others were called primiparous. The consumption of iron-folate tablets and antenatal examination were categorized into dichotomous variables, with yes and no answer choices. The frequency of food consumption containing protein, iron, and vitamin C in the past seven days was also recorded. The subjects who had consumed poultry meat, fish or beef were included in the category of iron-source food consumption; and fruits such as mango, papaya and carrot were included in vitamin C-source food consumption.

Statistical Analysis

Univariate analysis was conducted to describe hemoglobin levels and maternal age. Education attainment, working status, economic status, marital status, residence locations, gestational age, parity, antenatal examination, iron supplement consumption, and types of food intake were shown in frequency distribution.

In bivariate analysis, we used the independent T-tests, one-way ANOVA, and Pearson Correlation tests, to determine the correlation between the independent variables with the hemoglobin levels during pregnancy. The independent variables with p values of <0.05 in the bivariate analysis and the ones considered as important variables were entered into the multivariate analysis. General Linear Models (GLMs) were run to find the best final model. All of the analysis were performed using Stata ver. 17 and IBM SPSS ver. 28.

RESULTS

Characteristics of the 210 subjects are shown in Table 1. Most of the subjects had a high school education (39.05%), did not

Table 1. Characteristics of participants (n=210).

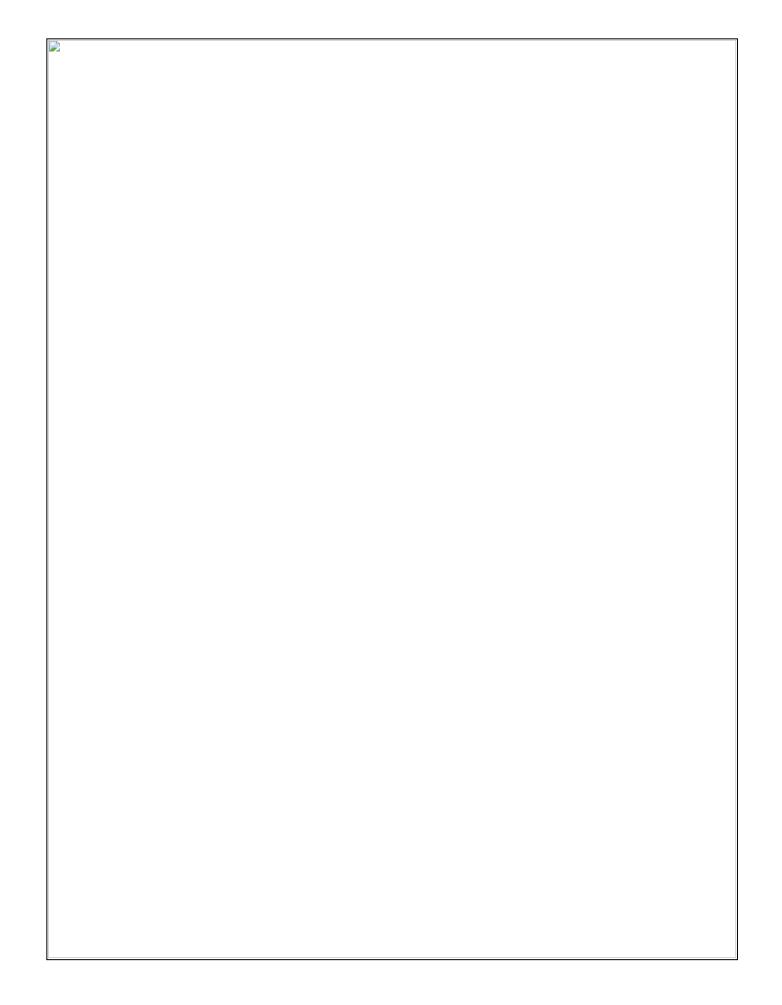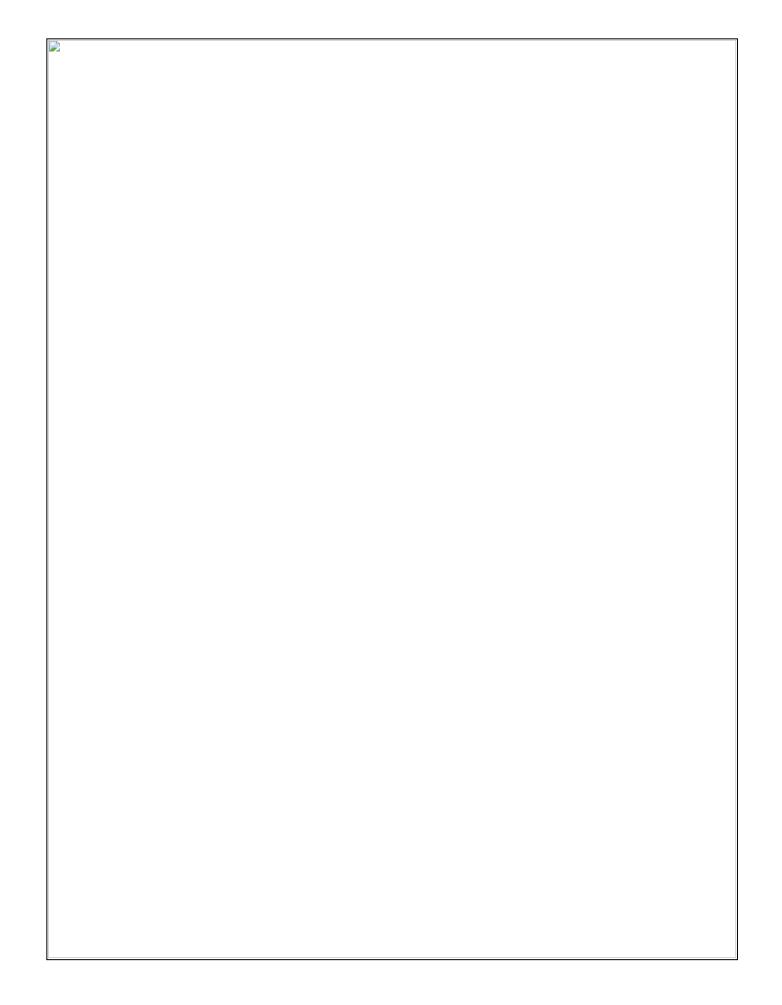| Variables		n	%
Level of education	No School	2	1.0
	Elementary school/MI	35	16.7
	Junior high school	54	25.7
	Senior high school	82	39.0
	Diploma/ College	37	17.6
Working Status	Not Working	127	60.5
	Work	83	39.5
Residence	Village	93	44.3
	City	117	55.7
Socio-Economic	Quantile 1	29	13.8
	Quantile 2	53	25.2
	Quantile 3	37	17.6
	Quantile 4	60	28.6
	Quantile 5	31	14.8
Gestational Age	1st Trimester	55	26.2
	2nd Trimester	77	36.7
	3rd Trimester	78	37.1
Parity	Primiparous	89	42.4
	Multiparous	121	57.6
Antenatal Check-up	No	16	7.6
	Yes	194	92.4
Consumption of iron tablets	No	71	33.8
	Yes	139	66.2
Teenage Anemia Status	Anemia	72	34.3
	Not Anemia	138	65.7
Teens Residence	Village	112	53.3
	City	98	46.7
Youth Socio-Economic	Quantile 1	60	28.6
	Quantile 2	39	18.6
	Quantile 3	46	21.9
	Quantile 4	50	23.8
	Quantile 5	15	7.14

n, number of participants

work (60.5%), and lived in urban areas (55.7%). At adolescent age, 34.3% of the subjects suffered from anemia, 53.3% lived in rural areas, and 28.6% were poor (in the 1st quintile). Table 2 shows the maternal hemoglobin levels, age, iron supplement consumption and food consumption frequencies. Those continuous data were normally distributed.
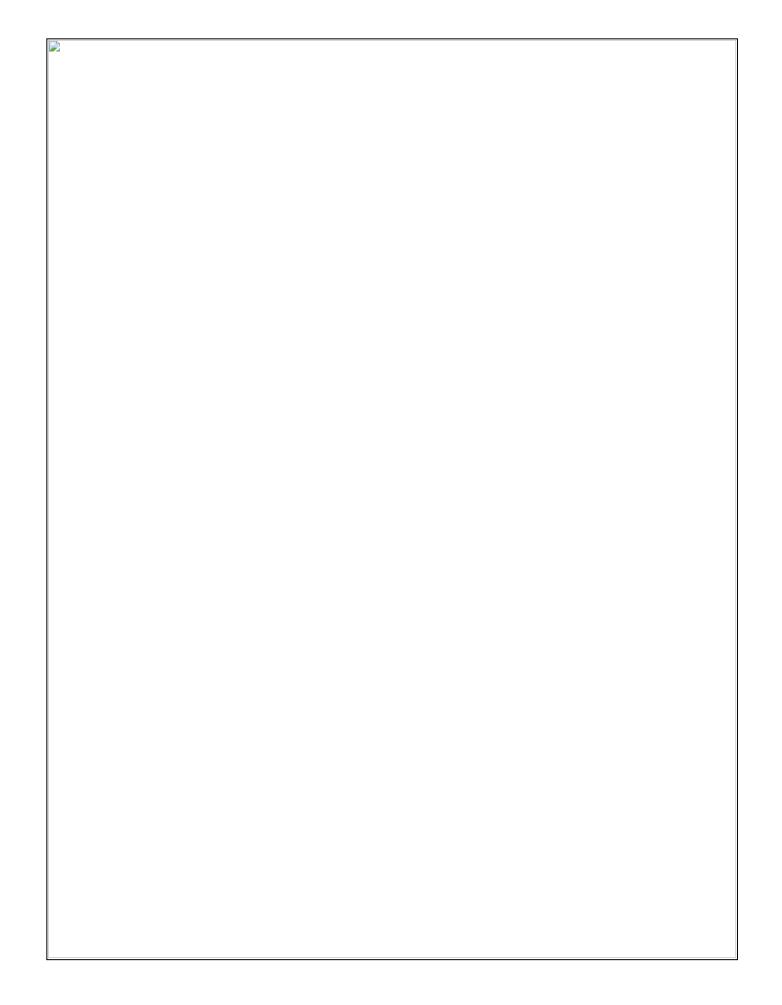
This study found significant differences in the average hemoglobin levels between pregnant women with and without anemia during adolescence period (p= 0.023) and between gestational ages (p= 0.001), which can be seen in Table 3. Table 3 also shows that there was no difference in the mean hemoglobin levels of pregnant women among the categories of these independent variables of education level (p= 0.480), employment status (p= 0.682),

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FINAL GRADE

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GENERAL COMMENTS

Instructor