Prevalence of anemia and factors associated with pregnant women in West Sumatra, Indonesia: Findings from VDPM Cohort Study

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ABSTRAK

Latar belakang: Anemia kehamilan masih menjadi masalah kesehatan masyarakat di negara berkembang yang berkontribusi terhadap risiko tinggi komplikasi kehamilan. Indonesia sebagai negara berkembang memiliki risiko anemia yang lebih tinggi yang bisa disebabkan oleh kekurangan asupan zat gizi mikro, infeksi, atau faktor sosial-demografis lainnya.

Tujuan: Identifikasi prevalensi dan faktor risiko anemia pada ibu hamil yang tinggal di Sumatera Barat, Indonesia.

Metode: Penelitian ini adalah analisis data sekunder dari studi kohort prospektif yaitu ""Vitamin D Pregnant Mother (VDPM) di Sumatera Barat". Subyek ibu hamil trimester diperoleh dari Puskesmas di Provinsi Sumatera Barat. Waktu penelitian dilakukan pada Januari-Maret 2017. Data demografi, sosial ekonomi, antropometri, dan Riwayat kesehatan ibu diteliti. Regresi logistik biner multivariatdigunakan untuk menentukan faktor-faktor terkait anemia. Dalam semua kasus, nilai p kurang dari 0,05 dianggap signifikan secara statistik.

Hasil: 176 ibu hamil yang memenuhi kriteria inklusi diambil dalam penelitian ini. Prevalensi anemia ditemukan sebesar 61,90%. Rerata konsentrasi hemoglobin adalah 10,56 ± 1,41 g / dL. Prevalensi anemia sedang dan ringan masing-masing adalah 34% dan 27%. Status anemia ibu hamil trimester ketiga berhubungan dengan wanita yang memiliki <upah minimum/bulan (AOR: 5.15; 95% CI: 1.30-20.47), pengetahuan gizi ibu yang rendah (AOR: 15.88; 95% CI: 3.82- 66.02), IMT sebelum kehamilan <25 kg/m^2 (AOR: 11.82; 95% CI: 2.70-51.69), dan tidak patuh konsumsi suplemen zat besi (AOR: 29.69; 95% CI: 6.58-133.91).

Kesimpulan: Terdapat masih tingginya prevalensi anemia pada wanita hamil di Sumatera Barat. Oleh karena itu, meningkatkan kesadaran akan suplementasi zat besi dan kesehatan yang berkaitan dengan nutrisi selama kehamilan perlu dipertimbangkan untuk meningkatkan status kesehatan ibu untuk mengurangi anemia. Namun, penelitian lebih lanjut diperlukan dengan ukuran sampel yang besar untuk mengkonfirmasi temuan ini.

KATA KUNCI: *anemia; faktor risiko; kehamilan; trimester ketiga; Sumatra Barat*

ABSTRACT

Background: Anemia during pregnancy remain to be a public health problem in developing countries which contributes to the high risk of adverse pregnancy outcomes. Indonesia as developing country has a higher risk of anemia that could be due to high of deficiencies of micronutrients intake, infection, or other socio-demographic factors.

Objectives: The aim of this study was to determine the prevalence and risk factors anemia among pregnant women living in West Sumatra, Indonesia.

Methods: The study is a secondary data analysis of prospective cohort study named "Vitamin D Pregnant Mother (VDPM) study in West Sumatra". The third trimester pregnant women were enrolled from the

public health centers in West Sumatra Province from January to March 2017. Structured questionnaires were used to collect data of demographic, socio-economic, anthropometry, and maternal health from all the study subjects. A multivariate binary logistic regression had been used to determine the associated factors of anemia. In all cases, P value less than 0.05 was considered statistically significant.

Results: *176 pregnant women who fulfilled the inclusion criteria were enrolled this study. The prevalence of anemia was 61.90%. The mean of hemoglobin concentration was 10.56±1.41 g/dL. Moderate and mild anemia prevalence were 34% and 27%, respectively. The third trimester of pregnant women anemia status were associated with women who had <minimum wage/month (AOR: 5.15; 95%CI: 1.30-20.47), low-moderate maternal nutrition knowledge (AOR: 15.88; 95%CI: 3.82-66.02), pre-pregnancy BMI <25 kg/m2 (AOR: 11.82; 95%CI: 2.70-51.69), and no adherence iron supplement intake status (AOR: 29.69; 95%CI: 6.58-133.91).*

Conclusions: *There was a high prevalence of anemia status in the third pregnant women in West Sumatra. Therefore, raise awareness of iron supplementation and health related to nutrition during pregnancy need to be considered to improve maternal health status to reduce anemia. However, further studies required with large sample size to confirm this finding.*

INTRODUCTION

Anemia is one of the most common health problems which spread in the worldwide and affect almost two-thirds of pregnant women in the developing countries, included in Indonesia (1,2). The prevalence of anemia would be the best indicator to monitor pregnant women health and prevent pregnancy complication. Anemia case rates continuously increase in recent times from 37,10% (2013) to 48,90% (2018) in Indonesia's pregnant women population (3,4). Anemia during pregnancy is a serious problem due to can increase maternal mortality rate and adverse pregnancy outcomes such as low birth weight, small-gestational for age (SGA), hypertensive disorders, and preterm birth (5–7).

According to the WHO, anemia in pregnancy defined as pregnant women had low haemoglobin concentration <11 g/dl (8). Low haemoglobin concentration could be affected by biological and non-biological factors while biological risk factors such as infections, chronic diseases, and specific dietary deficiencies related to micronutrient deficiency. Non-biological risk factors of anemia during pregnancy were gestational age, maternal socio-demographic characteristics, poor diet, low adherence of iron tablet supplementations, and nutritional status presented by the body mass index (BMI) (9,10).

Hence, this study was carried out with the aims to identify the prevalence of anemia and among pregnant women who is attending in the public health centres in West Sumatra, Indonesia.

MATERIALS AND METHODS

Study design and population

This was nested within "**V**itamin **D P**regnant **M**other (VDPM) study in West Sumatra" *(*VDPM Cohort Study). The VDPM study aimed to investigate the effect of genetics and non-genetic factors to maternal vitamin D status and to identify its association with newborn anthropometry outcomes (11–17)maternal vitamin D intake and the vitamin D status of pregnant women. Methods and Study designs: The sample of the cross-sectional study was 203 third trimester pregnant women in September-November 2016 in four different districts of West Sumatra, Indonesia. Questionnaire was used to assess lifestyles, dietary intake, anthropometry, maternal characteristics, demography and socioeconomic data. The Vitamin D serum level was measured by the ELISA method and the data were analyzed using descriptive statistics, chi-squared tests, Pearson's correlation and logistic regression. Results: 160 blood serum samples of pregnant women were collected. The means of 25-hydroxyvitamin D and maternal

vitamin D intake were 29.06±11.39 ng/mL and 7.92±5.26 μg/day respectively. The prevalence of vitamin D deficiency- insufficiency was 61.25%, and more than 85% of the women had inadequate vitamin D intake. We found that living in mountainous areas (p=0.03. The study was carried out at public health centers in Padang Pariaman, Lima Puluh Kota, Payakumbuh, and Pariaman in West Sumatra Province. Data were collected for a study period from July 2017 to April 2018. The number of subjects from baseline to end line of the study were 176 pregnant women.

Inclusion criteria of the study subjects included women above more than equal 18 years, having gestational age more than equal 28 weeks, healthy, and without any major obstetrical complication. While the exclusion criteria followed if subjects have twin pregnancy, have the chronic diseases history, and women and their husbands who do not agree to provide consent.

Data collection

We designed a structured questionnaire to collect the socio-demographic, maternal health and their medical history, and anthropometric data.This study measured the third trimester of haemoglobin (Hb) concentration. There was physiologically changing in plasma levels of Hb concentration which was around 25-80% from pre-pregnancy volumes to the second trimester. Considering the physiological changes in plasma volume, we decided to collect blood sample of pregnant women in the third trimester to analyze Hb concentration to assess the prevalence of anemia (10). We presented the current status of anemia during pregnancy in West Sumatra from prevalence of anemia and its associated risk factors.

Anemia definition and hemoglobin measurement

Based on WHO criteria, anemia status was defined based on the Hb concentration less than 11.00 g/dl during pregnancy and the categorization is performed using Hb levels. Pregnant women who had <7.00 g/dl for severe anemia status, 7.00-9.99 g/dl for moderate anemia status, and 10.00-10.99 g/dl for mild anemia (8). Subjects Hb concentration was determined from capillary blood from a finger-pricked (EasyTouch® GCHB) by healthcare workers in the public health centers where all subjects did their antenatal visits (18)Indonesia, and to explore whether the anemia was due to iron deficiency (IDA.

Anthropometric measurements

Height, weight, and mid-upper arm circumference (MUAC) of the dominant hand were recorded using measuring tape, body height and weight scales. Maternal weight was measured during pregnancy with an electronic weighing scale (Seca 803, Seca GmbH. Co. kg, Hamburg, Germany) which was placed on a flat and hard surface. Mothers were weighed in a light cotton gown, and their weight was recorded to the nearest 0.1 kg. PP BMI was calculated and classified according to the World Health Organization guidelines for Asian populations (underweight, <18.5 kg/m^2 Underweight; normal, 18.5-23.49 kg/m^2; overweight, 23.5-24.99 kg/m^2; Pre-obese, 25-29.99 kg/m^2; Obese, ≥30 kg/m^2) (19).

Factors associated with anemia status during pregnancy

The questionnaire has been created to identify any related factors to anemia during pregnancy. The questionnaire will be consisting of socio-demographic and maternal health (age, parity status, educational level, working status, socio-economic status, place of residence, number of children, maternal nutrition knowledge status, adherence iron supplement intake status, miscarriage history and gestational age) of subjects, anthropometric measurements (weight, height, MUAC, pre-pregnancy BMI), and blood pressure status.

Ethics approval and consent to participate

This study was conducted in accordance with the declaration of Helsinki. All procedures involving human subjects were approved by the Ethics Committee of Faculty of Medicine, University

of Andalas (No. 262/KEP/FK/2016). All subjects provided written consent for their participation in this study (12–17)maternal vitamin D intake and the vitamin D status of pregnant women. Methods and Study designs: The sample of the cross-sectional study was 203 third trimester pregnant women in September-November 2016 in four different districts of West Sumatra, Indonesia. Questionnaire was used to assess lifestyles, dietary intake, anthropometry, maternal characteristics, demography and socioeconomic data. The Vitamin D serum level was measured by the ELISA method and the data were analyzed using descriptive statistics, chi-squared tests, Pearson's correlation and logistic regression. Results: 160 blood serum samples of pregnant women were collected. The means of 25-hydroxyvitamin D and maternal vitamin D intake were 29.06±11.39 ng/mL and 7.92±5.26 μg/day respectively. The prevalence of vitamin D deficiency- insufficiency was 61.25%, and more than 85% of the women had inadequate vitamin D intake. We found that living in mountainous areas (p=0.03.

Statistical analyses

This study analysis was performed using SPSS (version 23; SPSS Inc., Chicago, IL, USA). Univariate analysis was used to present as means ± standard deviations (SD) for continuous variables and as percentages for categorical variables of socio-demographic variables, maternal health history, anthropometric data, and other factors related to anemia during pregnancy. The appropriate test for example chi-square will be used to assess the association between variables. Multicollinearity between independent variables will be assessed. The variables for which p-value turns out to be less than equal to 0.25 will be included in the multivariable analysis. A binary logistic regression was performed to analyses the association between related risk factors and anemia status. Linear regression was used to identify the potential association between potential risk factors and maternal Hb concentration and potential confounders had considered in this analysis (age, educational levels, and nutritional

status). All the association will be considered as significant association when a P-value has less than 0.05.

RESULTS

Prevalence of anemia pregnant women

Total 176 subjects in our study were included. Women with anemia and non-anemia status was 109 (61.90%) and 67 (38.10%), respectively. We carried out hemoglobin concentration in the third trimester of pregnant women with the average gestational age was 30.27±3.02 weeks. Most of study subjects had more than 25 years old with the mean of age was 30.27±3.02 years. The average of hemoglobin concentration was 10.56±1.41 g/dL which means that the majority of study subjects had low hemoglobin concentration than the recommendation (11 g/dL) during pregnancy. Pregnant women socio-demographic, maternal health history, anthropometric, and blood pressure are shown in **Table 1**. Sorted to the severity of anemia, we found that the prevalence anemia considered non-anemia, mild, and moderate anemia was 39%, 34%, and 27%, respectively (**Figure 1**). There were no pregnant women with severe anemia status in the study, however most of subjects mild and moderate anemia status.

The risk factors of anemia among the third trimester of pregnant women

Table 2 shows that the result of bivariate analysis between subject's characteristics of anemia and non-anemia status group among pregnant women. In this study, we showed that the differences in maternal age groups, educational levels, locations, place of resident, socio-economic status, maternal nutrition knowledge status, pre-pregnancy BMI, and adherence of iron supplement intake were significant between the group of anemia and non-anemia pregnant women (p<0.05).

We created a logistic regression model to investigate the predictors variable that affecting anemia status during pregnancy. Variables from **Table 2** which had significant value less than equal to 0.25 will included in the multivariate analysis with

Table 1. Sociodemographic and characteristics of pregnant women (n=177)

Variables	N (%)	Mean ± SD	Min-Max
Age, years		30.27±3.02	18-44
Age groups			
≤25	62 (35.20)		
>25	114 (64.80)		
Educational level			
Primary	63 (35.80)		
Secondary	61 (34.70)		
Tertiary	52 (28.50)		
Working status			
Housewife	121 (68.80)		
Non-housewife	55 (31.30)		
Family monthly income, IDR		2,689±2,363	1,512-20,000
Socio-economic status			
<Minimum wage	60 (34.10)		
≥Minimum wage	116 (65.90)		
Cities			
Padang Pariaman	38 (21.50)		
Payakumbuh	45 (25.60)		
Lima Puluh Kota	58 (33.00)		
Pariaman	35 (19.90)		
Place of residence			
Urban	90 (51.10)		
Rural	86 (48.90)		
Maternal nutrition knowledge status			
High	68 (38.60)		
Low-moderate	108 (61.40)		
Parity status			
Nulliparous	42 (23.90)		
Multiparous	134 (76.10)		
Parity number			
≥4	40 (22.70)		
1-3	93 (52.80)		
0	43 (24.40)		
Miscarriage history			
Yes	22 (12.50)		
No	154 (87.50)		
Adherence iron/folic acid supplement intake status			
No	114 (64.80)		
Yes	62 (35.20)		
Gestational age TM3, weeks		30.27±3.02	27-39
Pregnancy body weight, kg		63.84±11.16	42.60-98.80
Height, cm		154.34±6.24	140-176
Pre-pregnancy BMI, kg/m^2		22.76±3.82	14.10-34.80
Pre-pregnancy BMI status			
Underweight	21 (11.90)		
Normal	78 (44.30)		
Overweight	22 (12.50)		
Pre-obese	34 (19.30)		
Obese	21 (11.90)		
MUAC, cm		27.74±3.79	21-37
Systolic blood pressure, mmHg		111.42±10.29	90-140
Diastolic blood pressure, mmHg		76.37±7.76	60-100
Hemoglobin concentration, g/dL		10.56±1.41	7-14.40
Hemoglobin status			
Non-anemia	67 (38.10)		
Anemia	109 (61.90)		

Table 2. Bivariate analysis between associated factors of anemia and status of anemia among pregnant women (n=176)

| Variables	Non-anemia	Anemia	χ^2	p-value
Subjects	67 (38.10)	109 (61.90)		
Age group			5.025	0.025
≤25	36 (53.70)	78 (71.60)		
>25	31 (46.30)	31 (28.40)		
Working status			0.737	0.391
Housewife	43 (64.20)	78 (71.60)		
Non-housewife	24 (35.80)	31 (28.40)		
Educational level			18.381	<0.001
Primary	12 (17.90)	51 (46.80)		
Secondary	25 (37.30)	36 (33.00)		
Tertiary	30 (44.80)	22 (20.20)		
Cities			48.200	<0.001
Padang Pariaman	15 (22.40)	23 (21.10)		
Payakumbuh	34 (50.70)	11 (10.10)		
Lima Puluh Kota	5 (7.50)	53 (48.60)		
Pariaman	13 (19.40)	22 (20.20)		
Place of residence			19.554	<0.001
Urban	49 (73.10)	41 (37.60)		
Rural	18 (26.90)	68 (62.40)		
Socio-economic status			33.448	<0.001
<Minimum wage	41 (61.20)	19 (17.40)		
≥Minimum wage	26 (38.80)	90 (82.60)		
Maternal nutrition knowledge status			35.218	<0.001
High	45 (67.20)	23 (21.10)		
Low-moderate	22 (32.80)	86 (78.90)		
Pre-pregnancy BMI status			28.608	<0.001
<25 kg/m^2	26 (38.80)	87 (79.80)		
≥25 kg/m^2	41 (61.20)	22 (20.20)		
Parity status			0.837	0.360
Nulliparous	19 (28.40)	23 (21.10)		
Multiparous	48 (71.60)	86 (78.90)		
Parity number			1.216	0.544
≥4	13 (19.40)	27 (24.80)		
1-3	35 (52.20)	58 (53.20)		
0	19 (28.40)	24 (22.00)		
Adherence iron/folic acid supplement intake status			55.376	<0.001
No	20 (29.90)	94 (86.20)		
Yes	47 (70.10)	15 (13.80)		
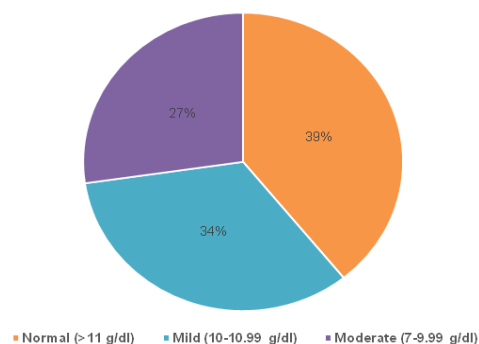
Figure 1. Illustrates the prevalence of the degree of anemia among pregnant women during their third trimester of pregnancy in West Sumatra, Indonesia

adjusting other variables. There were significant predictors to identify anemia status such as women who had <minimum wage/month (AOR: 5.15; 95%CI: 1.30-20.47), low-moderate maternal nutrition knowledge (AOR: 15.88; 95%CI: 3.82-66.02), pre-pregnancy BMI <25 kg/m^2 (AOR: 11.82; 95%CI: 2.70-51.69), and no adherence iron/folic acid supplement intake status (AOR: 29.69; 95%CI: 6.58-133.91) (**Table 3**).

DISCUSSION

The present study determined the prevalence of anemia and its associated risk factors among the third trimester of pregnancy who visited the public health centers in West Sumatra. This study results found that more than 60% of pregnant women during third trimester were anemic. The amount of the prevalence percentage of this study was higher than

the last national Indonesia basic health research in 2018 (48,90%) even though the study conducted earlier. Based on nutritional status monitoring survey report in 2016, West Sumatra province had 43,10% of the incidence of anemia among pregnant women (20).

Adverse pregnancy outcomes and pregnancy complications will be the most common health problems in the anemic pregnancy status. It has risen that anemia was a public health problem that mostly happened in developing countries. With 61,90% of anemia prevalence in this study, according to the WHO classification of the public health importance of anemia, this might show that it was a severe public health problem among pregnant women in our study and generally found in Indonesia regarding the last national data survey which was conducted in 2018 and reach to 48,90%. The higher prevalence of anemia among pregnant

Table 3. Possible risk factors of anemia among pregnant women (n=176)

Variables	COR	95%CI	p-value	AOR	95%CI	p-value
Age group						
≤25	0.46	0.24-0.87	0.017	1.37	0.08-1.70	0.203
>25	1.00			1.00		
Educational level						
Primary	5.80	2.51-13.36	<0.001	2.25	0.41-12.35	0.349
Secondary	1.96	0.93-4.16		1.48	0.31-7.01	0.623
Tertiary	1.00			1.00		
Cities						
Padang Pariaman	6.91	0.08-0.54	<0.001	2.57	0.13-50.24	0.534
Payakumbuh	1.10	2.25-21.28	<0.001	0.25	0.03-1.82	0.172
Lima Puluh Kota	0.84	0.43-2.84	0.838	20.28	0.65-628.79	0.086
Pariaman	1.00			1.00		
Place of residence						
Urban	1.00	2.32-8.78	<0.001	1.00	0.21-72.56	0.359
Rural	4.51			3.92		
Socio-economic status						
<Minimum wage	7.47	3.72-15.00	<0.001	5.146	1.30-20.47	0.020
≥Minimum wage	1.00			1.00		
Maternal nutrition knowledge status						
High	1.00	3.85-15.20	<0.001	1.00	3.82-66.02	<0.001
Low-moderate	7.65			15.88		
Pre-pregnancy BMI status						
<25 kg/m^2	6.24	3.16-12.29	<0.001	11.82	2.70-51.69	0.001
≥25 kg/m^2	1.00			1.00		
Adherence iron/folic acid supplement intake status						
No	14.73	6.92-31.35	<0.001	29.69	6.58-133.91	<0.001
Yes	1.00			1.00		

women worldwide was Sub-Saharan Africa (SSA) (57%), followed by pregnant women in Southeast Asia (48%), and the lowest prevalence (24.1%) was found among pregnant women in South America. Indonesia ranks 5th with the highest rate of anemia among pregnant women in Southeast Asia regions (21,22).

Pregnant women with fewer than 25 years more likely to have anemia status, however the result was not significant after adjusting other variables (AOR: 1.37; 95%CI: 0.08-1.70; p = 0.203). This finding was similar with the Indonesia basic health research in 2018 that most anemic pregnant women (84,60%) had 15-24 years, 33,70% was 25-34 years, 33,60% was 35-44, and 24% was 45-54 years (4). The younger age will be considered to have a high risk to become anemic due to pregnancy at the age of fewer than 20 years has pelvis and uterus that optimally have not grown. This will affecting and disrupting the safety and health of the fetus in the womb because it has to share red blood cells with the fetus conceived so that younger pregnant women will be more likely suffering from anemia (23).

High prevalence of anemic pregnant women was found for those who were not regularly consume iron tablet supplementation in this study. Based on RISKESDAS national health survey showed that the distribution of iron tablet supplementation coverage reaches 73,20% of the total population. This number still lower than the government target which was 90% (4). There were 64,80% of this study population had no adherence of consuming iron tablet supplementation and only 35,20% had regularly consumed the iron tablet supplementation during pregnancy. This result finding was similar with Ariyani et al., that 60% of anemic pregnant women did not consume iron tablet supplementation (24)\nincluding high death rate among pregnant women. The prevalence of anemia in\npregnant mothers in Sukoharjo was still high, which was 94.7%.\nObjective: The aim of research was to identify and analyze the factors that\ninfluence anemia among pregnant women at health care center of Mojolaban,\nSukoharjo.\nMethods: The research was a cross - sectional study. The number of subjects\nwas

45 respondents. Data on maternal age, parity and Antenatal Care (ANC. Then pregnant women who regularly consumed iron tablet supplementation also had hemoglobin concentration 11 g/dL (25).

We found that women with lower family income had five-fold increase the risk of anemia during pregnancy than higher one. The higher prevalence of anemia was also found among pregnant women not only who live in the rural than urban areas, but also for those who had lower education level seemed to have six times higher risk of anemia during pregnancy than the higher ones. The results of a study in Jakarta showed that the level of education (p = 0.022) and socio-economic (p = 0.018) are significantly correlated to anemia in pregnancy (26).

Our study also indicated that the pre-pregnancy BMI <25 kg/m² was a predictor anemia and increasing the risk about twelve times than women who had higher BMI. This condition may due to inadequate nutrition requirement during pregnancy. We also analyzed the association between maternal nutrition knowledge status and anemia. The finding showed that women who had low-moderate nutrition knowledge related to maternal health status more likely to have sixteen times to develop anemia status. This is likely related to lack of knowledge from beneficial health information about the importance of adequate nutrition during pregnancy, the inaccessibility of health care centers, and ability to provide nutritious and balance nutrition practice. Health interventions including health education which is providing the easiest health promotion media to improve understanding of pregnant women in nutrition and health may be help an iron supplement consumption during pregnancy (24,27–29)the prevalence of anemia in pregnant women in urban area is 36.4%. The treatment of anemia in pregnant women is conducted by administering 90 iron tablets during pregnancy. The majority of anemia in pregnant women is mostly caused by lacking of iron (Fe. This was challenging situation for health care workers, especially for those who work in the primary health care or public health centers to improve their knowledge of nutrition also their awareness of nutrition during pregnancy to avoid anemia.

CONCLUSION AND RECOMMENDATION

There was a high prevalence of anemia status in the third pregnant women in West Sumatra. Therefore, raise awareness of iron supplementation and health related to nutrition during pregnancy need to be considered to improve maternal health status to reduce anemia. However, further studies required with large sample size to confirm this finding.

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