Association between Household Food Security and Anemia among Pregnant Women in Rural Area in Indonesia

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Abstract

BACKGROUND: The increase of high anemia prevalence among pregnant women in Indonesia can reflect the raise of anemia potential in pregnancy. Food insecurity might influence the ability of households to meet the nutritional needs of pregnant women.

AIM: This research aimed to find out the relationship between household food security status and anemia in pregnant women in Bektiharjo Village, Semanding District, Tuban Regency.

METHODS: This was a cross-sectional study involving 50 pregnant women who lived in a typical rural area in Indonesia, namely Bektiharjo Village Semanding Sub-District Tuban District. The United States Household Food Security Survey Module questionnaire was used as the instrument for household food security status, while the level of hemoglobin was measured by the Easy Touch GCHb digital device. The Pearson Correlation test was used as a statistical test for this study.

RESULTS: most respondents were of healthy reproductive age (76%). The prevalence of anemia was 32% affecting mostly women aged 20–35. Forty-six percent of households were experiencing food insecurity. There was a significant relationship between household food security status with anemia among pregnant women (p = 0.019; OR = −0.331).

CONCLUSIONS: Pregnant women with food-insecure household status are more at risk of experiencing anemia, especially iron-deficiency anemia. Increasing consumption of affordable foods that contain non-heme iron and iron enhancers is recommended for pregnant women living in food-insecure households.

Introduction

Food is one of the main human needs in life competition. Fulfilling the needs of food is important for the country to the individual level, which is then called food security and has been regulated in Law Number 18 of 2012 concerning food [1]. Food security is also an important part of the country's development, because it has been listed in several points on the Sustainable Development Goals agreed by the United Nations Development Program in 2015 related to eradicating hunger [2]. Food security cannot be separated from the ability to access food.

Food access can affect the achievement of food security, especially in terms of economic or welfare, which includes income, employment opportunities, and food prices [3]. The economic capacity of rural populations is lower than in cities. Judging from BPS data, the number of poor people in East Java in March 2018 reached 4,332.59 thousand people, with the proportion of poor people in rural areas doubling more than urban areas [4].

The research location in Tuban District refers to BPS data, which shows the poverty rate reached 196,100 people or around 16.87% in March 2017 [5]. This figure occupies the fifth position in the category of districts, with the largest number of poor people in East Java during that period. In terms of poverty data, Tuban residents have the potential to experience the tendency of limited access to food, especially animal food groups. This is because animal food prices tend to be more expensive compared to other food ingredients [6]. The level of animal food consumption in rural areas is also considered being lower than in urban areas [7]. Animal food is a nutrient-rich food group, one of which is a good source of Fe [8]. Iron or Fe is closely related to the problem of anemia. Potential anemia problems increase during pregnancy. This can be seen through the increase in the proportion of anemia of pregnant women in Indonesia in 2013 by 37.1–48.9% in 2018 [9]. This pregnancy anemia problem is also still found in Bektiharjo Village, Semanding District.

Based on the background of the researcher, this research is to find out the relationship between household food security status and anemia in pregnant women in Bektiharjo Village, Semanding District, Tuban Regency.

Materials and Methods

This research was an observational study with a cross-sectional design [10]. The target population in this study was pregnant women who lived in Bektiharjo Village in Semanding District, Tuban Regency. The sample was selected based on the data from the Semanding Health Center until April 2019. The total sample analyzed in this study was 50 pregnant women were living in the village of Bektiharjo.

Primary data were obtained from interviews using a questionnaire, while secondary data were obtained from the Semanding Health Center. Determination of household food security status using the United States Household Food Security Survey Module (US-HFSSM) questionnaire as an instrument (Figure 1), while anemia status was determined using a digital measuring instrument (Easy Touch GCHb). The analysis uses the Pearson correlation statistic test to determine the significance of the relationship between the two variables with a value of $\alpha = 0.05$. This study has been declared ethical passes with number 421/HRECC.FODM/VII/2019 from the ethics committee of the Faculty of Dentistry, Universitas Airlangga, and carried out between 10 August until 8 September 2019.

Results

Characteristics of respondents

Characteristics of respondents could be seen through Table 1 which contains several variables namely the age of pregnant women, gestational age, household income, hemoglobin levels, and household food security status. Based on age, it was known that the majority of respondents were at healthy reproductive age (76%), the other group age was >35 years old (18%), and the rest were ≤19 years old (8%). Gestational age was dominated by trimester three pregnancies (44%), and the rest were by trimester 1 (20%) and 2 (36%).

Based on the history of formal education they have, the highest percentage was in pregnant women graduating from junior high school (48%) and primary school (28%). Only 24% of them graduated from high school and no respondent graduated from university. Meanwhile, in terms of total household income was categorized into five quintiles, most respondents (40%) were in quintile two, namely the income category between IDR 1,680,000 to IDR 2,160,000. Few respondents were having a household income of more than IDR 3,000,000, that is, Q4 (14%) and Q5 (2%).

Table 1: Distribution of characteristics of pregnant women in Bektiharjo village in 2019

Variable	n	%
Age of respondents		
≤19 years old	3	6
20–35 years old	38	76
>35 years old	9	18
Age of pregnancy		
Trimester 1	10	20
Trimester 2	18	36
Trimester 3	22	44
Household income		
Quintile 1	12	24
Quintile 2	20	40
Quintile 3	10	20
Quintile 4	7	14
Quintile 5	1	2
Educational background		
Primary school	14	28
Junior high school	24	48
Senior high school	12	24
Hemoglobin levels		
<11 g/dl	16	32
≥11 g/dl	34	68
Household food security status		
Food secure	27	54
Food insecure without hunger	19	38
Food insecure with moderate hunger	4	8
Food insecure with severe hunger	0	0

Hemoglobin levels and household food security status

The digital measuring instrument tested respondents' hemoglobin levels. Averagely, respondents have ≥11 g/dl of hemoglobin level (68%). However, pregnant women with anemia were still found (32%). According to the result of the US-HFSSM Questionnaire, four categories have been defined to simplify the food security scale into a small set of categories, each one representing a meaningful range of severity: food secure, food insecure without hunger, food insecure with moderate hunger, and food insecure with severe hunger [11]. Most of the respondents were classified into food-secure households (54%). The others were counted as food insecure households, either without starvation (38%) or with moderate hunger (8%). Despite 46% of them still in food-insecure condition, there was no household with severe hunger founded.

As seen in Table 2, it was known that of the total pregnant women who have anemia, 13 of them were in food insecure conditions. Most pregnant women who did not have anemia were coming from food-secured households. This showed that there was a tendency that pregnant women who were food-insecure had a higher risk for anemia compared to those in the food-secure household. The Pearson product-moment test showed p = 0.019 (<0.005) with a large correlation of −0.331.

Table 2: Cross tabulation of household food security status with anemia status of pregnant women in Bektiharjo village in 2019

Household food security status	Anemia status of pregnant women				Total		p-value
	Anemia		No anemia		n	%	
	n	%	n	%			
Food security	3	11.1	24	88.9	27	100	0.019
Food insecurity without starvation	10	52.6	9	47.4	19	100	
Food insecurity with moderate hunger	3	75	1	25	4	100	
Food insecurity with severe hunger	0	0	0	0	0	0	

The results showed that most respondents were food secure. This was based on Table 1 which stated that more than half of the respondents have food security status (54%). However, 46% of the households were living in some type of food security. There were no households that experienced food insecurity with severe hunger. The food security of a household can be influenced by several factors, especially food access, which is influenced by income. This was related to the proportion of expenditure for food from total income owned [12]. Most of the respondents were having relatively low income, with only a small portion having a household income between quintiles four and five. Household income was related to the ability to access food to meet nutritional needs [13]. Especially for certain foodstuffs that have a relatively high economic value, such as animal protein [14]. Apart from the economic aspect, daily consumption patterns can also be influenced by insight or knowledge [15].

Discussion

The education level of pregnant women can be used as an indicator to determine the acceptability of nutritional information that is possible to get during pregnancy [16]. Only a small proportion of respondents graduated from high school (24%), while the rest were elementary and junior high school graduates. Therefore, income and education can be taken into consideration in choosing the type of food to consume. Food sources of both heme and non-heme iron were needed to meet the increased need for iron during pregnancy. Besides, foods that contain lots of Vitamin C were also good for pregnant women to consume, because they can be classified as enhancers of iron absorption [17]. Other types of food that need to be considered by pregnant women were foods or drinks that contain tannins such as tea and coffee because it acts as an iron inhibitor or inhibitor [18].

Animal-source foods contain good sources of nutrients and were needed by humans, including micronutrients such as iron (Fe) [8]. There was about 40% of heme iron derived from animal food, with good biological availability of around 23% [19], so that nutrients were more easily absorbed and used by the body. The content of iron in these foods was needed especially for pregnant women because during pregnancy the need for iron has increased. Iron was also mentioned as one of the important micronutrients in pregnancy which was listed in a special message of balanced nutrition [20]. This was related to the increase in red blood cell mass and plasma volume and preparation of iron loss during childbirth [7]. Therefore, pregnant women are included in the groups that have a high risk of anemia [21].

The anemia status data on respondents in this study were known through the results of measurements of hemoglobin levels in pregnant women. According to Table 1, 16 pregnant women (32%) were found to be anemic. This showed that the majority of respondents did not experience anemia during pregnancy. This can be influenced by gestational age. Most respondents were in the 1st and 2nd trimester of pregnancy (56%), which has a lower potential for anemia than in the 3rd trimester of pregnancy [21].

These results indicated that there was a significant relationship between household food security status and anemia among pregnant women. The correlation between the two variables was inversely related, since the value was negative. This indicated that the lower the US-HFSSM score, the higher the hemoglobin level. This could be interpreted that the more food secure household was the less potential for pregnant women to experience anemia.

The results of this study have similarities with several previous studies. Several similar studies have also been conducted to determine the relationship of food security with anemia, especially in women of childbearing age. One study conducted on women of childbearing age in Mexico showed the results that women who were of medium and severe food insecurity had a 33% and 36% greater risk of anemia from iron deficiency compared to those who were food resistant [22]. Other research also states that a positive relationship was found between food insecure households and anemia in women of childbearing age (15–49 years) in Bangladesh [23]. The study said that women who experience food insecurity are 1.6 times more likely to suffer anemia than those who are food resistant. A similar study conducted in Brazil concluded that the likelihood of developing anemia in pregnant women was significantly higher especially in food insecure situations, without prenatal care or iron supplementation, and multiparous or women who had given birth more than once [24]. This can be explained by a study conducted in Malaysia that food insecure respondents consume less iron-rich foods such as meat, fish, poultry, and legumes compared to those who are food insecure [25].

There were several limitations in this study including study design and limited samples size. Furthermore, there are not enough parameters to show the effect of education, age, and income on anemic patients. However, this study also has its strength especially related to the process of collecting primary data which includes questionnaire interviews and hemoglobin tests on respondents conducted door-to-door so that the implementation was more focused and conducive.

Conclusions

Pregnant women with food-insecure household status are more at risk of experiencing anemia, especially

iron-deficiency anemia. The better the household food security status, the lower the risk of anemia, especially iron deficiency anemia. Food sources of heme iron were good in animal source foods which were relatively more expensive than other types of food. Therefore, pregnant women should also be advised to consume non-heme iron source foods and food ingredients that can act as enhancers of iron absorption because they tend to be cheaper or affordable prices.

Data Availability

All the relevant data used to present the study are available; however, the corresponding author will supply the data on request.

Acknowledgments

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Supplement Figure 1

K. HOUSEHOLD FOOD SECURITY STATUS		

US- HFSSM

The next questions are about the state of the food in your home in the past 12 months, i.e., since (MONTH) last year until now, whether you can afford to buy food easily or not.

1	Which of the following statements best describes the food condition in your family in the past 12 months	K1 [ ]
	[1] The quantity is sufficient, and the type of food is what we wanted [Skip 1a and 1b]	
	[2] The quantity is sufficient, but the type is not always what we want [Skip 1a; ask 1b]	
	[3] sometimes there are not enough [ask 1a; Skip 1b]	
	[4] Often not enough [Ask 1a; Skip 1b]	

1a	[IF THE ANSWER TO QUESTION NO 1 IS[3] OR [4], ASK] whether it happened because of [READ ALL. PLEASE MARK APPROPRIATE RESPONDENT'S ANSWER]	1=Yes 0=No 66=TR
	1. Don't have enough money to buy food	
	2. Not having enough time to buy or cook food	
	3. It is too difficult to reach the grocery/market	
	4. On a diet	
	5. The stove is broken	
	6 Unable to cook or eat due to health problems	
		K1a1 [ ]
		K1a2 [ ]
		K1a3 [ ]
		K1a4 [ ]
		K1a5 [ ]
		K1a6 [ ]

1b	[IF THE ANSWER TO QUESTION NO. 1 IS [2], ASK] if it happened because of [READ ALL. PLEASE MARK APPROPRIATE RESPONDENT'S ANSWER]	1=Yes 0=No 66=TR
	1. Don't have enough money to buy food	
	2. The type of food you want is not available	
	3. Not having enough time to buy or cook food	
	4. It's too difficult to reach the shop	
	5. On a diet	
		K1b1 [ ]
		K1b2 [ ]
		K1b3 [ ]
		K1b4 [ ]
		K1b5 [ ]

Stage 1: Question 2-4

Now I will read to my mother some statements people have made about the food situation. For each statement please tell me whether the situation is true, sometimes true or not true with the condition of your mother's family during the past 12 months

1. Often true
2. Sometimes it's true
3. Not true
4. Don't know

2	"I'm worried that the food supply will run out before I have the money to buy more." In the past 12 months, was this statement often true, sometimes true, or not true for your family?	K2 [ ]
3	"The food that I bought has run out, and I don't have the money to buy any more." In the past 12 months, was this statement often true, sometimes true, or not true for your family?	K3 [ ]
4	"Mother cannot eat a balanced diet (rice with vegetables and side dishes) for the family." In the past 12 months, was this statement often true, sometimes true, or not true for your family?	K4 [ ]

Screening for stage 2: IF THERE IS A YES ANSWER to ONE of the questions 2-4 (eg "often true" or sometimes true") OR gives a response[3] or[4] to question 1, go to step 2; otherwise, stage 4 if there are children under the age of 18 in the family; if not, end the interview.

5	In the past 12 months, have you or other adults in your family reduced the amount of food you ate or did not eat because you didn't have enough money to buy food?	1. Yes, 0. No (Skip 8a) 88. ST/reject (Skip 8a)	K5 [ ]
5a	IF YES, How often does this happen – almost every month, in some months but not every month, or only in 1 or 2 months?	1. Almost every month 2. Several months, but not every month 3. 1 or 2 months 88. ST/refuse	K5a [ ]
6	In the past 12 months, have you ever eaten less than what you should (according to) eat because you don't have money to buy food?	1. Yes 0. No 88. ST/refuse	K6 [ ]
7	In the past 12 months, have you ever felt hungry but didn't eat because you didn't have money to buy food?	1. Yes 0. No 88. ST/refuse	K7 [ ]
8	In the past 12 months, have you lost weight because you don't have money to buy food?	1. Yes 0. No 88. ST/refuse	K8 [ ]

Second level filtering (Filter to go to Stage 3)

Screening for stage 3: IF THERE IS A "YES" ANSWER to ONE of questions 5-8, go to step 3; otherwise, proceed to stage 4 if there are children under the age of 18 in the family; if not, end the interview.

9	In the past 12 months, have you or any other adults in your family missed a full day's meal because of a lack of money to buy food?	1. Yes 0. No 88. ST/refuse	K9 [ ]
9a	IF YES, How often does this happen – almost every month, in some months but not every month, or only in 1 or 2 months?	1. Almost every month 2. Several months, but not every month 3. 1 or 2 months 88. ST/refuse	K9a [ ]

I will now read to you some of the statements that people have made about the food conditions associated with the children in your home. For each statement please tell me whether the situation is true, sometimes true or not true for your child/child living at your mother's house who is under 18 years old for the past 12 months.

1. Often true
2. Sometimes it's true
3. Not true
4. Don't know

10	"Mother only buys some kind of cheap food to feed the children because they often run out of money to buy food". In the past 12 months, was this statement often true, sometimes true, or not true for your family?	K10 [ ]
11	"Mother cannot feed her child with a balanced diet (consisting of rice, vegetable or animal side dishes, vegetables), because she cannot afford it." In the past 12 months, was this statement often true, sometimes true, or not true for your family?	K11 [ ]
12	"Your child can't get enough to eat because you can't buy enough food." In the past 12 months, was this statement often true, sometimes true, or not true for your family?	K12 [ ]
13	In the past 12 months, did you reduce your child's portion because you did not have enough money to buy food?	1. Yes 0. No 88. ST/refuse	K13 [ ]

14	In the past 12 months, have your children ever missed meals (e.g. one meal a day) due to no money to buy food?	1. Yes 0. No 88. ST/refuse	K14 [ ]
14a	IF YES. How often does this happen – almost every month, a few months but not every month, or just 1 or 2 months?	1. Almost every month 2. Several months but not every month 3. 1 or 2 months 88. ST/refuse	K14a [ ]
15	In the past 12 months, have your children ever felt hungry but were unable to afford food?	1. Yes 0. No 88. ST/refuse	K15 [ ]
16	In the past 12 months, have your children not eaten for a whole day because there is no money to buy food?	1. Yes 0. No 88. ST/refuse	K16 [ ]