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Profile of Double of Undernutrition Problem, Coexistence with Anemia among Pregnant Women Indonesia 2018: A Cross Sectional Survey

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Abstract

BACKGROUND: Anemia is the most common type of malnutrition in pregnant women, and when combined with another nutritional problem, it would increase the risk of adverse pregnancy outcomes.

AIM: This study aims to analyze the risk of double undernutrition in pregnant women with anemia.

MATERIALS AND METHODS: We used secondary data from the 2018 National Basic Health Survey as well as biomedical anemia samples. Anthropometric measurements were maternal body height, middle–upper circumference (MUAC) for chronic energy malnutrition (CEM); anemia was predicted using hemoglobin levels. The number of samples is 484, considering the minimum sample size for each undernutrition proportion.

RESULTS: Anemia in pregnant women is not a single malnutrition issue. Almost one–third of pregnant women with anemia also had another form of undenutrition. In this study, the prevalence of anemia among pregnant women (%) is 35.7; stunted is 35.9, and CEM is 16.7. The malnutrition was identified as double nutritional problems coexistence to anemia, such as prevalence stunted–anemia (%) 12.5; anemia–CEM 9.2; and anemia–stunted–CEM 4.4. Overall, CEM is associated with anemia with $p < 0.05$ and AOR 2.25 (CI; 1.38–3.66), adjusted to height and type of residence, education, and occupation. Urban areas have a similar risk to rural areas with AOR for CEM to anemia, 2.29 (CI; 1.12–4.69); rural areas 2.23 (CI; 1.14–4.33), respectively. Moreover, women with double of undernutrition stunted–CEM in rural areas have a risk of anemia with AOR 2.75 (1.14–6.65).

CONCLUSION: The risk of anemia in pregnant women with chronic energy malnutrition has increased more than twice in rural and urban areas.

Introduction

Anemia is still a major cause of pregnancy malnutrition worldwide, and it is a major public health concern [1]. In 2019, the global prevalence of anemia in pregnant women was 36.5%. Southeast Asia had the highest prevalence of anemia in pregnant women, with nearly 48%, followed by Africa with 45.8% and the Eastern Mediterranean with 36.5% [2]. In pregnancy, anemia has an impact on pregnancy outcomes. The longitudinal studies showed an association of anemia during pregnancy to low birth weight in her baby [3]. Malnutrition also can impair growth and lead to several congenital abnormalities [4]. Inadequate micronutrients can interfere with the growth, production, and vital organs optimum duties.

As well as pregnancy is a critical period in the first 1000 days of human life [5], [6]. Balanced nutritional intake of both macronutrients and micronutrients is important to meet pregnancy increased requirements [7], [8]. In the meantime, undernutrition during pregnancy will adversely affect the mother and fetus [9]. A previous research reported low birth weight, preterm birth, infant mortality, and morbidity are increased as a risk of malnutrition during pregnancy [4], [10]. Another study reveals malnutrition in the first 1000 days of life may disturb growth, development, and potential health concerns in adult growth such as obesity and metabolic disorders [11], [12]. A report in Africa showed the effect on mothers where 23.5% of malnourished pregnant women are at risk of pregnancy complications [13], [14]. Another study found an adverse effect on the mother [14] and the fetus born in growth and development [4], [15].

The prevalence of malnutrition during pregnancy is demonstrated globally in developed countries, including anemia, stunted, and chronic energy malnutrition. Anemia is the common type of pregnancy malnutrition. Anemia was predicted as a determinant factor of maternal mortality rate in pregnant women due to abnormal delivery bleeding or postpartum hemorrhage. In Indonesia, anemia among pregnant women increases to 48.9% in 2018 from

37.1% in 2013. Another issue of malnutrition was the prevalence of CEM, which in 2013 amounted to 24.2% and 17.3% in 2018. Stunted in pregnant women was reported 31,3% in 2013 and 30.5% in 2018, based on the Basic Health Research Survey [16], [17].

Along with a change in the epidemiological trend, malnutrition can establish dietary issues simultaneously [18]. The double burden indicates that overnutrition has increased while undernutrition remains [19]. These can occur at the individual, family, and population levels [20]. Otherwise, double of undernutrition macronutrient and micronutrient deficiencies also was shown. Anemia was a major malnutrition issue in pregnant women, and it may be more severe if it occurs in combined with another undernutrition problem [10]. This study aims to describe the double undernutrition in pregnant women with anemia and investigate the correlation between another undernutrition and anemia. It was necessary to describe the entire nutritional problem in pregnant women, which could result in a double burden of malnutrition during the pregnancy period.

Methods

Study design

This study uses secondary data from the Indonesia Ministry of Health's Basic Health National Survey (Riskesdas) in 2018. The national cross–sectional study used a multi–stage cluster sampling method. It divided it into two categories: A sample for public health indicators and biomedical indicators. It collected overall risk blood samples from 2.500 census blocks chosen as a systemically selected cluster for each district/city, including rural and urban areas. The Probablity Proportional Size (PPS) technique uses a block census, with the number of households revised from the 2010 population census.The next step is to pick ten census buildings as a household sample systematically. In 26 provinces, sub–samples are rendered to define the national level [17].

Inclusion and exclusion criteria

Women who were pregnant at the time the basic health research survey was conducted were eligible for inclusion. The exclusion criteria were pregnant women who lacked data on anthropometric measurements and hemoglobin tests for anemia.

Sample

Based on the Lemeshow method [21], a minimum sample size of 95% Confidence Interval (CI) is required for this study with absolute precision: Anemia 48.9%, the minimum sample sizes are 381; CEM with 17.1%, the minimum sample size is 222. We used the highest number calculation, 381, for the minimum sample size for this study. Considering the effect design and dropout anticipation due to minimum criteria, we add 150 samples for backup. The number of samples used for the study was 484; consider inclusion and exclusion criteria for the appropriate sample sizes.

Variables

The anthropometric scale was determined by maternal body height instrument and middle upper arm circumference (MUAC). The maternal body height instrument was used to determine the anthropometric scale, which had a precision of 0.1 cm. If a pregnant woman's height was <150.1 cm, she was considered stunted. If the MUAC is <23.5 cm, this indicates chronic energy malnutrition. A rapid test kit for anemia is used to diagnose anemia using hemoglobin (the cyanmethemoglobin). According to the World Health Organization (WHO) guidelines, anemia was defined as a hemoglobin level of 11.0 g/dl. Maternal education level was classified into three categories, low (length of education lower than 9.1 years), middle (length of education between 9.1 until 12 years), and high (length of education more than 12 years).

Statistically method

The profile of double undernutrition in pregnant women has been described using univariate data analysis in complex samples, considering the weight for anemia sample in pregnant women. Rural and urban living areas were used for stratification. Then, multivariate analysis with logistic regression was used to investigate the risk of another nutrition problem associated with anemia in rural and urban areas. The licensed SPSS version 21 was used for data analysis.

Ethical number

The study was approved by the National Institute of Health Research and Development, Indonesia, Ministry of Health Ethical Committee with the number of ethics LB.02.01/2/KE.024/2018. All participants were agreed and assign informed consent.

Results

The number of sub–samples from the 2018 Riskesdas survey was 484, with 239 in rural areas and 245 in urban areas. The findings of the descriptive

study suggest that the average age of the mother was around 27 ± 6 years at the last pregnancy and that the mother's age was about 21 ± 4 years at the first pregnancy.

Macronutrient deficiencies can be predicted by Body Mass Index (BMI), which evaluates nutrient status in adults and middle–upper arm circumference (MUAC) for pregnant women [22], [23]. BMI cannot be used due to physiological changes in pregnancy, such as increasing body weight. Another indicator for evaluating nutritional status in pregnant women is maternal weight gain and maternal weight for gestational age, as this study cannot provide. The middle arm circumference below 23.5 cm in women with pregnancy indicates malnutrition due to lower energy and protein by forecasting sub–cutaneous fat and muscle volumes [22] that was classified as CEM.

Table 1 shows pregnant women's nutritional status based on rural and urban features. The data show that anemia is the most common among pregnant women with the lowest education, work in household categories and young mothers under the age of 20 years. Stunted has been shown to be more prevalent in low–school pregnant women, household and maternal workers and in pregnant women who has >35 years of age. CEM was demonstrated in women with the lowest levels of education, work and maternal age <20 years.

Table 1: Proportion of pregnant women characteristics and nutrition status in rural and urban area

Demographic Characteristics	Type of residence		
	Rural	Urban	Both
	%	%	%
Anemia			
Mother education			
High	42.9	23.1	30.0
Middle	38.3	31.5	34.6
Low	38.0	41.2	39.2
Household occupation			
No work	33.3	31.9	32.7
Work	41.1	32.9	36.9
Maternal age			
<20 years	53.8	40.0	46.4
20–35 years	36.5	32.3	34.4
>35 years	43.2	31.7	37.2
Stunted			
Mother education			
High	42.9	19.2	27.5
Middle	43.6	23.8	32.6
Low	44.6	37.3	42.0
Household occupation			
No work	39.5	27.8	34.0
Work	46.2	25.4	35.3
Maternal age			
<20 years	23.1	26.7	25.0
20–35 years	46.6	24.3	35.4
>35 years	37.8	34.1	35.9
Chronic energy malnutrition (CEM)			
Mother education			
High	7.1	15.4	12.5
Middle	18.8	14.9	16.6
Low	19.6	15.7	18.2
Household occupation			
No work	13.6	15.3	14.4
Work	20.9	15.0	17.8
Maternal age			
<20 years	30.8	53.3	42.9
20–35 years	18.5	13.8	16.1
>35 years	13.5	7.3	10.3

This research shows the profile of pregnancy malnutrition. Figure 1 shows the overall major

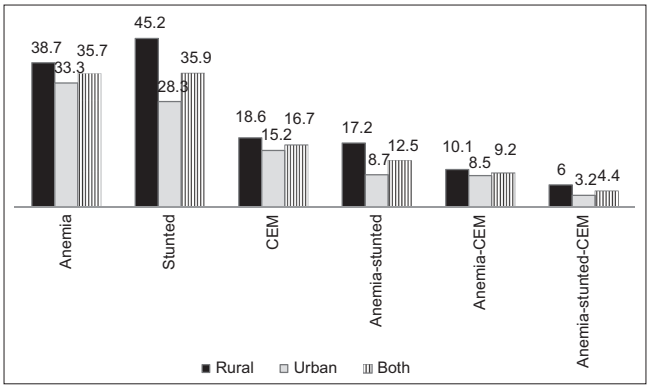

Figure 1: Type of malnutrition among pregnant women

malnutrition issue among pregnant women in this study is anemia and stunted. Anemia was obtained in 35.7% of pregnant women, stunted in 35.9%, and 16.7% CEM pregnant women. Anemia and stunted almost 12.5% and anemia–CEM, nearly 10% of pregnant. However, almost all undernutrition types higher prevalence in rural areas than in urban areas.

This study also revealed that pregnant women have not only a single malnutrition problem, but also a combination of undernutrition problems such as CEM and stunting. At least double undernutrition defined when pregnant women have anemia and the other undernutrition; anemia–stunting, anemia–CEM or in the triple undernutrition problems, and anemia–stunted – CEM. Overall, nearly 17.3% of pregnant women have double undernutrition combined with anemia issues, almost similar to single malnutrition anemia in 18.4%, but in rural area the results shows the most of pregnant woment have double under nutrition at least in two problem (Figure 2).

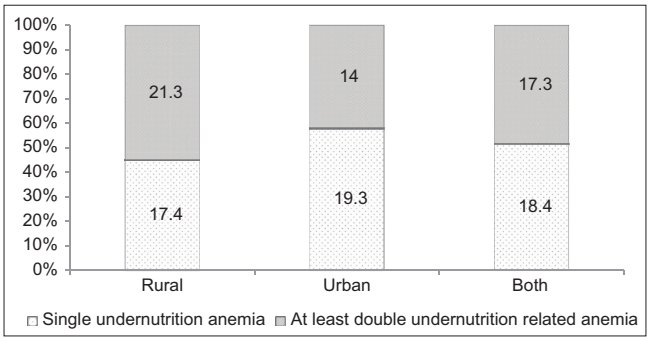

Figure 2: Double undernutrition combined with anemia in pregnant women

Chronic energy malnutrition was previously identified as a risk factor for anemia in pregnant women (Table 2). Table 2 compares the risk of anemia in pregnant women with CEM to pregnant women with another nutritional problem. Furthermore, women with CEM and stunting who live in rural areas are more likely to develop anemia than pregnant women who live in urban areas.

Table 2: Risk of undernutrition to anemia in pregnant women

Undernutrition status	Anemia		
	Rural	Urban	Both
	n (%)	n (%)	n (%)
Stunted			
Yes	42 (40.0)	19 (29.7)	61 (36.1)
No	50 (37.3)	61 (33.7)	111 (35.2)
AOR (95% CI)*[1]	1.06 (1.15–4.32)	0.77 (0.41–1.45)	0.93 (0.62–1.39)
CEM			
Yes	24 (54.5)	18 (48.6)	62 (51.9)
No	68 (34.9)	62 (29.8)	130 (32.3)
AOR (95% CI)*[1]	2.23 (1.14–4.33)	2.29 (1.12–4.69)	2.25 (1.38–3.66)
Stunted-CEM			
Yes	14 (60.9)	5 (38.5)	19 (52.8)
No	78 (36.1)	75 (32.3)	153 (34.2)
AOR (95% CI)*[1]	2.75 (1.14–6.65)	1.19 (0.37–3.84)	2.15 (1.09–4.27)

*[1]AOR: Adjusted odd ratio by type of residence (both), education, mother occupation, maternal age, p value. <0.05; CI: 95% Confidence Interval.

Discussion

Anemia remains a significant public health issue during pregnancy, and the major cause is iron deficiency anemia. According to the study's primary finding, more than one–third of pregnant women suffer from anemia, and nearly half of pregnant women who suffer from anemia also have another malnutrition problem in both areas. In addition, the risk of anemia is increased in pregnant women who are also currently facing chronic malnutrition. CEM and stunting are three times more likely to developing anemia in pregnant women living in rural areas.

A previous research in western Ethiopia indicates the main cause of anemia, including low socioeconomic status, a low daily dietary diversity, irregular iron tablet supplementation, and a MUAC <23 cm that predicted malnutrition, bleeding, and helminth infection[24]. Anemia during pregnancy also related to parasitic infection, mother's age, rural residence, food taboos, a history of heavy bleeding before pregnancy, and drinking tea or coffee immediately after a meal [25], [26], [27]. In addition, there are a link between anemia and macronutrient deficiency [28].

According to this study, nearly 36% of pregnant women had anemia. This pattern similar to another developing country. The prevalent also almost similar in low and middle countries that anemia occurs in one of the two pregnant women [29]. A previous research in India found that anemia affects nearly half of pregnant women, with 37.1% having mild anemia, 9.1% having moderate anemia, and 2.9% having severe anemia [30]. While, data from 2019 show that the lowest prevalence of anemia in pregnant women in development country, almost 19%, which was demonstrated in America regions. Moreover, the lowest prevalence was shown in the United States (11.5%) and Singapore for South East Asia, at 17.5% [2].

The study reveals that almost one–five of pregnant women have not only single anemia as a single malnutrition problem, but they also have another type of undernutrition, such as CEM and stunting. At least two types of malnutrition (nearly 18%) occur concurrently in pregnant women with anemia according to this study. This results support to previous study in Ghana that showed a double burden of malnutrition among women with anemia, prevalence anemia and underweight in 13%; anemia and overweight in nearly 57% [31]. This study supported that malnutrition can be obtained simultaneously. According to this study, pregnant women have twice the amount of anemia caused by undernutrition. The study found that chronic energy malnutrition among pregnant women has a risk of anemia higher than other nutritional problems in rural and urban areas. The previous studies also show similar results in an association between CEM and Anemia in pregnant women with almost similar risk to this study (AOR 2.18) [32].

Physiological changes during pregnancy increase nutrient demand, including macronutrients and micronutrients. An adequate intake is critical to ensuring a healthy pregnancy and reducing the negative effects of fetal growth [33], [34]. Macronutrients such as carbohydrates, proteins, and fats are used in pregnant women to provide adequate calories. Meanwhile, protein is required for tissue growth and development, including brain development and micronutrients. Protein is required for a baby's blood supply [35], [36]. Furthermore, iron combines with potassium, sodium, and water to increase blood flow in mother and the baby [37].

A lack of macronutrients during pregnancy causes a chronic energy deficiency, which can lead to a deficiency of micronutrients. The optimal metabolism of the body's micronutrients needed adequate macronutrients. A sufficient intake of protein has also contributed to the absorption and metabolism of micronutrients [32]. In the biological process, hemoglobin was synthesized by sufficient energy and protein [32], [38]. Otherwise, CEM is a chronic energy deficiency associated with the maximum vitamins and minerals of iron, iodine and other absorption. Similar findings have been found in previous studies of many micronutrient deficiencies worldwide [4]. Whilst, hemoglobin is an oxygen–binding protein that transports oxygen to the tissues from the lungs [38]. If the levels of hemoglobin are lower than normal, anemia of iron deficit is indicated. In addition, an effective method of preventing anemia in pregnant women is iron supplementation [39]. Adequate intake of iron during pregnancy by iron supplementation will reduce the risk of maternal mortality because of the complications of pregnancy [40].

This study shows that chronic energy malnutrition and stunting combine to increase the risk of anemia in rural areas. Otherwise, chronic malnutrition also was predicted by a mother's body height of < 150.1 cm. By combining this indicator, rural areas are at greater risk of anemia than urban areas. Rural and urban disparities predict anemia at different risks due to nutrition history and sociodemography characteristics. It is also linked to rural and urban

health behavior with the consumption of iron tablets. National basic health research conducted in 2018 has demonstrated a low prevalence of regular iron supplementation. The coverage of iron tablets for consumption greater than 90 varies from rural to urban areas. In rural areas, iron tablets are consumed at a lower rate than in urban areas (20.6% vs. 26.5%), respectively [17]. There are many reasons for some pregnant women not taking iron tablets, such as taste, nausea and side effects [17]. In general, plagues of iron supplementation programs are irregular iron tablet consumption due to side effects [39].

According to this study, women with chronic energy malnutrition should ensure how much iron tablet supplementation they get and consume. Otherwise, pregnant women must also consume sufficient energy and protein by daily intake. Some complementary foods are also needed to boost adequate macronutrient requirements. In other words, adequate macro nutrition intake among pregnant women with CEM also is an important strategy for preventing anemia, besides iron tablets supplementations.The study's limitations are that it does not recognize pregnant women's dietary patterns and respondents' socioeconomic status information.

Conclusion

Anemia is a major cause of malnutrition among pregnant women in both rural and urban areas. Anemia is often associated with other forms of undernutrition, such as stunting and CEM. Pregnant women with CEM are at a higher risk of anemia in both areas. However, pregnant women with stunting and CEM are at the highest risk of anemia in rural areas. The significance of this study is to inform about double undernutrition issues related to anemia; in addition, an integrated control program combating malnutrition is required to prevent anemia in pregnant women.

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