

Socio Economic, Dietary Intake and Malnutrition among Pregnant Women in Tenggara Sub-region of Indonesia

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Abstract Background: Chronic Energy Deficiency (CED) is caused by unbalanced food intake during pregnancy, especially for the lack of energy and protein intake. Chronic Energy Deficiency in pregnant women is still a problem in Indonesia. This might due to lack of energy and protein intake, and socio economic. Malnutrition on pregnant women can affect fetal growth and maternal health. **Aim:** This study aimed to explore the association between economic status and nutrient intake (energy and protein) in Loa Ipuh pregnant women, Tenggara District, East Kalimantan. **Methods:** This study was a case and control study on June-July 2021. The case group was all pregnant women who are in CED and the control group was healthy pregnant women with a ratio of 1:1, which was 28 pregnant women. This research used matching age, gender and residence area of the respondent. Food reported in the 24-h recalls was collected using household measurements or pictures of portion sizes for each selected item. Data Collected by questionnaire and statistical tests used Chi-Square Test. **Results:** The results of the analysis showed that there was a significant relationship between economic status, nutrient intake (energy and protein), and the incidence of Chronic Energy Deficiency (CED) in pregnant women. **Conclusion:** Economic status and intake of energy and protein influence the incidence of CED in pregnant women. The requirement for government, community and family support during the pregnancy are needed for better health of mother and children. Larger studies need to be performed before the supporting program can be routinely recommended in pregnant women.

Keywords: tropical rain forest, chronic energy deficiency, East Kalimantan, energy and protein intake

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1. Introduction

Chronic energy deficiency (CED) is one of the nutritional problems, characterized by low body weight and low energy stores, due to lack of energy intake for long time [1,2]. CED often occurs in pregnant women and will lead to higher risk of infant morbidity and mortality [3,4], including the risk of low birth weight and causes intergenerational effects of malnutrition [5,6,7]. However, CED is still a major public health problem in low-and middle-income countries (LMIC) [8,9].

In Indonesia, CED in pregnant women measured by mid-upper arm circumference (MUAC) less than 23.5 is 17.3% [10], while in East Kalimantan, one of provinces in Indonesia, CED in pregnant women is 30% [10]. Determinant factors of CED are socioeconomic determinant (low household economic status, low education level, total number of living children, marital status and residence) and dietary intake [11,12,13]. In contrary, a study in working area of Baiturrahman Health Centre Banda Aceh, Indonesia found that family income

level was not associated with nutritional status of pregnant women [14]. A study in the District of Abidjan among 1600 women found that socioeconomic and demographic characteristics of pregnant women were not associated with the birth weight of baby [15]. Currently, there is no such study available in East Kalimantan, Indonesia.

A one-month preliminary study at Loa Ipuh Health Centre, Tenggara, East Kalimantan, Indonesia, we found 18 pregnant women who experienced CED. Therefore, the hypothesis was that higher socio economic and lower dietary intake would be likely associated with CED pregnant women. Knowing these determinants factors may inform effective and efficient nutrition prevention programs.

2. Material and Method

2.1. Study Population

This research is a case control study, conducted in Loa Ipuh Primary Health Centre in Tenggara, Kutai

Kartanegara, East Kalimantan, Indonesia. The respondents of this research were all CED in pregnant women who underwent Ante Natal Care (ANC) or who carried out pregnancy checks from January to May 2021 at Loa Ipuh Health Centre. Twenty eight CED in pregnant women were classified as a case group, while the control group were pregnant women without CED and selected from medical records in Loa Ipuh Health Centre (n=28). The control group was matched by age, age of pregnancy, and residence with the case group. The study protocol was permitted by the ethics committee of Faculty of Medicine, Universitas Mulawarman (No. 71/KEPK-FK/VIII/2021) and written informed consent was retrieved from all participants.

2.2. Demographic and Anthropometry Measurements

Data on age and socio-economic status were recorded by a standardized questionnaire. Socio-economic status was examined by monthly income of the house hold and was classified into two categories: low (below the provincial minimum wage) and high (more than the provincial minimum wage). Education of mother was defined as one of four levels (low education, secondary high education, high education, and university education). Age of pregnancy was considered as first trimester, second trimester, and third trimester. Occupation of pregnant women was classified as housewives, entrepreneur and honorary. CED in pregnant women was screened by measuring mid-upper arm circumference.

2.3. Dietary Assessment

Using the food model picture, dietary data (energy and protein intake) were assessed from a 24-h recall on 2 non-consecutive days. Dietary intake was not collected for Saturdays and Sundays as no interviews were conducted in the weekend. The recall questionnaire was validated in previous research. Dietary data were categorized: low (below 76.9%) and enough (more than 77%). The nutrient composition of the diet (mean of 2 days) was calculated with the Nutri Survey.

2.4. Data Quality Control

Pre-testing was done within 30 respondents at a health centre where the actual data collection was not conducted. Enumerators were trained for 1 day. Calibration of instruments was applied before measurement by using standard instrument. The overall data collection process was controlled by the principal. All questionnaires was validated.

2.5. Statistical Analyses

The outcome variable was dichotomized into 1=case and 0=controls. Data were presented as percentages. The association between socioeconomic, dietary intake and CED were tested using *Chi-Square* and *Odds Ratio*. All data analysis was conducted using SPSS version 23 and the level of significance was set at two-sided $p < 0.05$.

3. Results

Demographic characteristics of two groups are shown in Table 1. The majority respondents are in the second trimester, housewives, having higher education (senior high school), and 19-26 years. The case and control groups were matched by age, age of pregnancy, residence and working or not working pregnant women.

Table 1. Characteristic of Respondents

	CED		Non CED	
	n	%	n	%
Age				
19-<27 years	18	64	18	64
27-34 years	10	36	10	36
Education				
Low	3	11	2	9
Secondary higher	6	21	5	20
Higher	17	61	19	63
University	2	7	2	7
Age of pregnancy				
First trimester	3	11	3	11
Second trimester	18	64	18	64
Third trimester	7	25	7	25
Occupation				
Housewives	23	82	23	82
Entrepreneur	4	14	2	7
Permanent jobs	1	4	3	11

There were significant associations between socioeconomic, dietary intake and CED in pregnant women. Low socioeconomic, low energy intake and low protein intake were significantly associated with higher CED (Table 2). Low socioeconomic had 11 times greater risk of CED when compared to pregnant women with high socioeconomic.

Table 2. Chronic Energy Deficiency (CED) according socioeconomic and dietary intake

	CED		Non CED		P-value	OR 95% CI
Socioeconomic					<0.0001	11.00 (3.172-38.149)
Low	21	75	6	21		
High	7	25	22	79		
Energy Intake					<0.0001	16.867 (4.492-63.325)
Low	22	79	5	18		
Enough	6	21	23	82		
Protein Intake					0.005	5.308 (1.568-17.967)
Low	15	53	5	18		
Enough	13	47	23	82		

Data are presented as percentages. Bold: statistical significance when $p < 0.05$. χ^2 test was used in this analysis.

4. Discussion

The consistent findings were significant association between socioeconomic, dietary intake and CED in pregnant women, which is in agreement with the results from Bangladesh, Indian, Indonesia and African pregnant women [11,12,13,16]. It should be considered that dietary intake of several nutrients by pregnant women in

Indonesia is below the Estimated Average Requirement (EAR) [17] and the ability of family to buy foods depends on family income [18].

In agreement with this study, pregnant women in Aceh and Palu, Indonesia, who have an income below Provincial Minimum Wage are more at risk of experiencing Chronic Energy Deficiency than pregnant women who have an income above Provincial Minimum Wage [18,19]. Nevertheless, the number of risk of having CED varied in previous studies. In contrary, in the same region but different characteristics, a study in Aceh, Indonesia, found that family income level was not related with nutritional status of pregnant women [14]. Therefore, the characteristics of respondents are very important to consider in planning promotive and preventive programs.

Dietary diversity and quantity are important for pregnant women. Most of the pregnant women in Madura and Bogor, Indonesia had low adequate level of energy and macro- and micronutrients [20,21]. Linear association was found also between socioeconomic and dietary intake in Madura pregnant women [21]. Poor consumption of balanced diet could lead to CED during pregnancy, increasing the risk of premature delivery, low birth weight and birth defects [22].

Tenggarong is not the capital city of East Kalimantan, so access to healthy foods might also influence the food choice. Interestingly, less acknowledgement about affordable cost nutrient-rich food, high cost of quality-food, sufficient to varieties foodstuff at neighborhood shop prevents them from making correct food choices, that can make a barrier for accessing healthy foods [23]. However, online food shopping is very easy to do, including in Tenggarong. The previous study in China found that online food shopping increased dietary diversity by 7.34% [24].

Improving nutrition knowledge for the healthy local foods are recommend to increase the dietary intake of pregnant women. Implementation of education package about selected aspects of postnatal and newborn care are effective to improve the knowledge of pregnant women [25]. In addition, increasing opportunity for work and entrepreneurship and easy access to healthy food must also carried out. For example: food vouchers programme in England improve nutrition and reduce inequalities in low-mothers and young children [26].

To best our knowledge, this is the first study investigating detailed associations of socioeconomic, dietary intake and CED in Loa Ipuh pregnant women during the COVID-19 pandemic. As the pregnant women had lower dietary intake and socioeconomic, and higher risk of CED, testing agreement with previous studies at other place is relevant. Nevertheless, our study has limitations. As the prevalence of CED was very low, the statistical power was reduced. Other limitations, some missing details in 24-h recall as dietary data was collected within 1 month. Consequently, the measurement of biomarkers could have added value in exploring health effects [27].

5. Conclusion

In conclusion, low socioeconomic, low energy intake and low protein intake have significant associations with CED in pregnant women. Nevertheless, the sample size

was small. These findings suggest the importance of socioeconomic improvement so pregnant women may access for better foods. The integrated and sustainable nutrition improvement programs since pre-conception and during gestation period should be performed. Future studies using longitudinal data and using biomarkers are needed to explore the CED determinant.

Ethics Approval and Consent to Participate

Inform license obtained from Faculty of Medicine, Universitas Mulawarman, Indonesia and research subject.

Competing Interest

The authors declare that they have no conflict of interest.

Availability of Data and Materials

The CED data were from Loa Ipuh Primary Health Centre, while other data were from primary source (questionnaire).

Authors' Contribution

RWW formulated the research, helped setting up the database, analysed data, wrote article. ADL collected and analyzed the data. RWW, ADL and IK involved the project, have read the draft and agreed on the final version.

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