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# Predictors of household food insecurity among pregnant women: a cross sectional study using Household Food Insecurity Access Scale (HFIAS)

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## ABSTRACT

**Objective:** Pregnant women is prone to experience food insecurity which could jeopardize the pregnancy outcomes, including low birth weight and birth defects. However, it was rarely studied among pregnant women. This study aimed to examine the predictors of household food insecurity among pregnant women.

**Methods:** This was a cross-sectional study involving 120 pregnant women in 3rd trimester which were recruited from local health centre. The study was conducted from July to November 2024. Food security was measured using standardized questionnaires called Household Food Insecurity Access Scale (HFIAS). Structured questionnaire was used to gather demographic, economic and characteristic data. Pearson correlation was employed to analyse the correlation between several variables with food security, while multivariable linear regression was performed to assess the predictors of household food insecurity among pregnant women after considering the collinearity and residual to fit the model.

**Results:** The study found that 20% of pregnant women experienced food insecurity, with 16.7% of them were mild food insecure. The variables that were found to be significant correlated were women's dietary diversity (B: -0.298, P-value: 0.008), maternal education (B: -0.222; P-value: 0.019), BMI prepregnancy (B:0.107; P-value: 0.020) and recipient of cash transfer program (B: 0.368; P-value: 0.002). The $R^2$ of the analysis was 0.417.

**Conclusion:** Social economic was shown to be a significant predictors of household food insecurity among pregnant women. Thus, immediate actions are required to prevent the complications occurred on pregnancy outcomes.

## KEYWORDS

Food security, dietary diversity, pregnant women, maternal education, cash transfer program.

## INTRODUCTION

Food is a fundamental needs for life to be more productive and healthier. Meeting the food demands is crucial for both nation and individuals in terms of availability, accessibility and stability, which is called as food security[1]. Currently, food security is a major issue for health and economic development as it is stated on Sustainable Development Goals (SDGs) goal number 2, which is to eradicate hunger and to increase food accessibility for all households in the world by 2030[2]. Food insecurity is indirect cause of nutrition problem making households with food insecurity have limited access to nutritious foods. This often leads to an intergenerational cycle, in which households are experiencing nutritional challenges[3].

In 2023, the prevalence of food insecurity among global population was estimated about 28.9% that made Africa as a region having largest proportion of people facing hunger[4]. Meanwhile, according to the data from Global Hunger Index (GHI), Indo-

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nesia ranked 77 out of 125 countries that face moderate hunger. This condition was caused by the fluctuation of food prices which affect household purchasing power[5].

Furthermore, pregnant women is a vulnerable group to suffer food insecurity as they have more complex nutritional needs that made them do not have access to safe and nutritious foods. A study explained that pregnant women tended to prioritize their partner's and children nutritional need than themselves. Food insecurity during pregnancy causes inadequate dietary intake that exacerbate maternal health outcomes, such as birth defects, low birth weight and gestational diabetes[6–9].

Additionally, a number of factors had been found to link with food insecurity, such as maternal education, family size, occupation and total income[10,11]. A study has shown that low income and educational attainment were the prominent factors of food insecurity[12]. This condition lead them to be difficult to afford nutritious foods. A few studies in Indonesia have reported factors associated with food insecurity. However, this correlation has not been done extensively among pregnant women in Indonesia. Prevalence of food insecurity among pregnant women is also remained unknown. Therefore, in this present study, we were aimed to understand the factors correlated with food insecurity among pregnant women in Yogyakarta City, Indonesia.

## METHODS

### *Study Setting and Population*

A cross sectional study was conducted in Yogyakarta. Pregnant women who attended antenatal care (ANC) in Ngampilan Health Centre, Jetis Health Centre, Gondokusuman Health Centre, and Kotagede 2 Health Centre were recruited in this study. This study were done from August to December 2024.

### *Sample Size and Procedure*

Sample size was obtained using a single proportion of formula (95% confidence level and 5% margin of error) with a total of 126 pregnant women involved in this study. However, only 120 pregnant women were participated due to absence during data collection. The samples were selected based on several inclusion and exclusion criteria. The inclusion criteria of this study were pregnant women aged 19-35 years old; gestational age 26-35 weeks; registered in Health Centre or Rahmi Mother and Child Hospital; and not smoking. The samples were selected using purposive sampling from each Health Centres depends on the total of pregnant women from each Health Centres.

### *Study Variables*

### *Dependent Variable*

Household food security data was collected using Household Food Insecurity Access Scale (HFIAS). Subjects were asked to answer the question, which reflected the condition in the past 1 month. This tool consisted of 9 questions with score ranging from 0 to 27. Those with scores from 0 to 1 classified as food security, 2 to 7 as mild food insecurity, 8 to 14 considered as moderate food insecurity and 15 to 27 categorized as severe food insecurity[13]. Meanwhile, numeric data were used to analyse data using correlation and linear regression. Moreover, numerical data helped researcher to understand the relationship with other variables using numerical data, including income, dietary diversity, and BMI.

### *Independent Variables*

### *Dietary Diversity*

Dietary diversity was measured using questionnaire Women's Dietary Diversity Scores (WDDDS) which consisted of 10 food groups, including starchy staple foods (grains, rice, tubers), pulses (beans and peas), nuts and seeds, dairy products (milk, yoghurt, and cheese), meat/poultry/fish, eggs, green leafy vegetables, vitamin A-rich fruits and vegetables, other vegetables (lettuce, cabbage, celery, cucumber, tomato), and other fruits[14]. The data were obtained through 1x24 hour recall and was considered as one food group, if it was consumed with a minimum 10 gram. Subjects who consumed less than 5 food groups were classified to less diverse`, while subjects consuming more than 5 food groups were categorized to more diverse since the 5 food groups often promoted in dietary guidelines.

### *Demographic, socioeconomic and characteristic of pregnant women*

Self-reported demographic, socioeconomic and characteristic were used to obtain the data, including age, parity, gestational age, education, occupation, type of family, and income. Household income were divided into quartiles from quartile 1 to quartile 3. Cash transfer program was classified as yes if the household received cash transfer from Indonesia social safety net program.

### *Subjects' nutritional status*

Anthropometric measurement was conducted to obtain data related chronic energy deficiency (CED) by using Mid-Upper Arm Circumference (MUAC), which is an indicator to determine pregnant women' nutritional status. If the value was below than 23.5 cm, it was considered as CED and if the value was above equal to 23.5 cm, it was considered as normal. Body Mass Index (BMI) pre-pregnancy were calculated using self-reported weight and height before pregnant.

### *Ethical Consideration*

This study was approved by the Health Research Ethics Committee of Ministry of Health Indonesia with registration number DP.04.03/2-KEPK.2/709/2024. All respondents were

asked to sign the inform consent as a confirmation for voluntary participation.

### *Statistical Analysis*

Data analysis was performed using software Statistical Package for the Social Sciences (SPSS) version 27 with 95% of confidence interval. Univariate analysis was done through descriptive statistics using mean, standard deviations, frequency and percentage to summarize the data. To examine the association between independent and dependent variables, pearson/ spearman correlation test was used. It depends on the normality of the data which was analysed using Kolmogorov-Smirnov. If the data were normally distributed, pearson correlation was employed. If the data were not normally distributed, non-parametric spearman correlation was done.

Multivariate analysis was analysed using linear regression to analyse the predictors of household food insecurity among pregnant women after adjusted by several variables. All variables were included in the analysis using Enter method. Variables with VIF < 10 were excluded from the model to prevent high collinearity with food security. We checked model residuals for fit. Statistical significance was determined at $P < 0.05$ for all analysis with two-sided test.

## RESULTS

A total of 120 pregnant women were participated in this study. Table 1 presents characteristics, demographic and nutritional status of pregnant women. The mean age was 28.81±3.8 with gestational age 30.19 ± 2.8. A greater proportion of women had secondary education (48.3%) and not working (54.2%). Around 83.3% of pregnant women lived in nuclear family. What is more, there were 65% of pregnant women received cash transfers. Most of the subjects' income were in Quartile 2 (50%).

In terms of nutritional status, most of pregnant women had normal BMI before pregnancy (53.3%) and 88.3% of pregnant women presented a normal nutritional status according to MUAC. Moreover, there was 20% of pregnant women experiencing food insecurity and 18.3% of them had less diverse foods.

Table 2 revealed the correlation between several variables with food insecurity. It was found that cash transfer program (CTF) had moderate correlation with food insecurity among pregnant women (r: 0.455, p-value: 0.000) compared to other variables. Other variables also indicated that there were significant correlation between birth spacing, BMI pre-pregnancy, dietary diversity, maternal education, total income, maternal working status and family size towards household food insecurity among pregnant women (P-value < 0.05).

**Table 1.** Descriptive analysis of characteristic respondents and household food security among pregnant women

| Variable | Mean ± SD | n (%) |
|---|---|---|
| **Age in years, mean±SD** | **28.81±3.8** | |
| **Gestational age** | **30.19 ± 2.8** | |
| **Birth spacing, months ± SD** | **35.46 ± 42.7** | |
| **Maternal education status** | | |
| Primary education | - | 12 (10) |
| Secondary education | - | 58 (48.3) |
| Diploma and above | - | 50 (41.7) |
| **Maternal occupational status** | | |
| Working | - | 55 (45.8) |
| Not working | - | 65 (54.2) |
| **Family Size** | | |
| Nuclear family | - | 112 (83.3) |
| Extended Family | - | 8 (6.7) |
| **Cash Transfer Program** | | |
| Yes | - | 78 (65) |
| No | - | 42 (35) |
| **Income** | | |
| Quartile 1 | - | 30 (25) |
| Quartile 2 | - | 60 (50) |
| Quartile 3 | - | 30 (25) |
| **BMI pre pregnancy** | | |
| Underweight, n(%) | - | 23 (19.2) |
| Normal | - | 64 (53.3) |
| Overweight | - | 10 (8.3) |
| Obesity | - | 23 (19.2) |
| **MUAC** | | |
| < 23.5 cm | | 14 (11.7) |
| >= 23.5 cm | | 106 (88.3) |
| **Household Food Security** | | |
| Severe food insecure | - | 1 (0.8) |
| Moderate food insecure | - | 3 (2.5) |
| Mild food insecure | - | 20 (16.7) |
| Food secure | - | 96 (80) |
| **Women' Food Diversity** | | |
| Diverse | - | 98 (81.7) |
| Less Diverse | - | 22 (18.3) |

**Table 2.** Correlation between several variables with household food insecurity

| Variables | r | P-values |
|---|---|---|
| Parity | 0.237 | 0.005[a] |
| Birth spacing | 0.209 | 0.011[a] |
| BMI pre-pregnancy | 0.254 | 0.003[a] |
| Dietary diversity | -0.270 | 0.001[a] |
| Cash transfer program | 0.455 | 0.000[a] |
| Maternal education | -0.238 | 0.004[a] |
| Total income | -0.376 | 0.000[a] |
| Maternal working status | -0.261 | 0.002[a] |
| Family size | 0.279 | 0.001[a] |

[a] Significant correlation using pearson correlation.

### *Household Food Insecurity*

Correlation between several variables on household food insecurity was assessed through univariate, bivariate and multivariate analysis. Linear regression was used to determine the factors correlated with household food insecurity among pregnant women. In Table 3, we found that dietary diversity was significantly correlated with food security (B: -0.298, P-value: 0.008). Furthermore, cash transfer program showed a significant correlation with household food insecurity (B: -0.368; P-value: 0.002). This correlation also remained significant for maternal education (B: -0.222; P-value: 0.019) and BMI pre-pregnancy (B: 0.107; P-value: 0.020).

## DISCUSSION

In this study, we evaluated several factors, including dietary diversity, receiver of CTF, maternal education, family size, maternal nutritional status, income and birth spacing, towards food insecurity among pregnant women in Yogyakarta, which was mostly dominated with normal to overweight and obese using BMI pre-pregnancy. Our findings revealed that the proportion of food insecurity pregnant women was 20%, with 16.7% of them experiencing mild food insecurity. It was also indicated that dietary diversity, CTF, maternal education, and BMI pre-pregnancy were significant predictors of food insecurity among pregnant women.

Our study demonstrated that the prevalence of pregnant mothers who had less diverse foods was 18.3%, which also showed that dietary diversity and food security was inversely correlated. Decreasing of dietary diversity aligned with increasing food insecurity due to lack of consumption animal- source foods. This finding was supported by a study from Lo (2012) that food diversity and total expenditure can be indicators for household food security which is reflected by the increasing dietary diversity could decrease food insecurity and affected the food choices in a family[15].

In Indonesia, cash transfer was given to the family which registered as poor family in social welfare data. This study showed that family who did not receive CTF were more likely to be food insecure. This finding was supported by other study that women who obtained cash transfer tended to allocated two third for multiple foods[16]. This finding aligned with other study that the beneficiaries of CTF were food secure since they stated that the availability of foods in their family were varied[17]. However, other study indicated that food assistance program might contribute to dysregulated eating since a monthly-distribution of CTF could cause monthly cycle of food abundance and scarcity[18].

**Table 3.** Linear regression on Household Food Security

| Variables | B | SE | 95% CI | P value |
|---|---|---|---|---|
| Pregnant women' dietary diversity | -0.298 | 0.111 | -0.354; 0.218 | 0.008[a] |
| Cash Transfer Program (CTF) | -0.368 | 0.118 | -0.134; 0.601 | 0.002[a] |
| Maternal education | -0.222 | 0.093 | -0.435; 0.037 | 0.019[a] |
| Family size | 0.026 | 0.079 | -0.131; 0.183 | 0.744 |
| BMI pre pregnancy | 0.107 | 0.045 | -0.197; 0.254 | 0.020[a] |
| Total income | -0.025 | 0.083 | -0.190; 0.140 | 0.762 |
| Birth spacing | 0.001 | 0.001 | -0.001; 0.004 | 0.280 |

Adjusted $R^2$: 0.471; Adjusted for age, parity, and maternal working status; [a] significant correlation; CI: Confidence interval.

In terms of education, maternal education is negatively correlated with food security. It was possible when women with low education had limited knowledge about nutrition and healthy eating that bring about household food insecurity[19]. What is more, poor maternal education which was mostly found in low economic households were considered as significant factors of food insecurity[20]. So that, enhancing education is an effective policy to address the increasing in economic inequality.

BMI pre-pregnancy was indicators. BMI pre-pregnancy was positively correlated with household food insecurity. Higher BMI was also followed by the increasing of HFIAS score that would lead to excessive gestational weight gain. This study had similar finding with other study using categorical data. It mentioned that higher pre-pregnancy body mass index was found among women with food insecurity[21]. Qualitative data indicated that food insecure women tended to consider cheaper foods which were dominated by sugar, fat and natrium content making them to be overweight and obese. This condition would increase the risk of gestational diabetes mellitus (GDM)[22].

## STRENGTH AND LIMITATIONS

To the best of our knowledge, this study was the first to determine its predictors of household food insecurity among pregnant women in Indonesia, particularly Yogyakarta. However, this study considered several limitations. First, the sample size was too small that make it could not generalize to all pregnant women in Yogyakarta. Second, cross sectional method used in this study could not generate causal relationship between predictors and household food insecurity. Furthermore, pregestational BMI could lead to bias since it was self-reported.

## CONCLUSION

In our study, we provided evidence of predictors for household food insecurity among pregnant women. This study highlights that dietary diversity, maternal education, recipient of CFT and BMI pre-pregnancy were prominent predictors of household food insecurity among pregnant women. Prioritizing issue on food security among pregnant women is pivotal for public health intervention to mitigate any nutrition problems, particularly targeting low socioeconomic family. Future research is required to measure the pregnancy outcomes among pregnant women with household food insecurity.

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## REFERENCES

1. Pérez-Escamilla R. Food Security and the 2015-2030 Sustainable Development Goals: From Human to Planetary Health: Perspectives and Opinions. Curr Dev Nutr. 2017 Jul;1(7):e000513.
2. Assembly UG. Transforming our world: the 2030 Agenda for Sustainable Development. New York; 2015.
3. Ghattas H. Food Security and Nutrition in The Context of Nutrition Transition. Beirut; 2014.
4. FAO, IFAD, UNICEF, WFP, WHO. The State of Food Security and Nutrition in The World 2024- Financing to end hunger, food insecurity and malnutrition in all its forms. Rome; 2024.
5. World Food Programme. Indonesia. 2024.
6. Bronte-Tinkew J, Zaslow M, Capps R, Horowitz A, McNamara M. Food insecurity works through depression, parenting, and infant feeding to influence overweight and health in toddlers. J Nutr [Internet]. 2007;137(9):2160–5. Available from: https://doi.org/10.1093/jn/137.9.2160
7. Carmichael SL, Yang W, Herring A, Abrams B, Shaw GM. Maternal food insecurity is associated with increased risk of certain birth defects. J Nutr [Internet]. 2007;137(9):2087–92. Available from: https://doi.org/10.1093/jn/137.9.2087
8. Andreae G, Scott S, Nguyen G, Bell Z, Mehmood H, Sermin-Reed L, et al. Food insecurity among pregnant women living in high-income countries: a systematic review. Lancet (London, England) [Internet]. 2022;400:S17. Available from: http://dx.doi.org/10.1016/S0140-6736(22)02227-9
9. Mauludyani AVR, Khomsan A, Riyadi H, Nurhidayati VA, Fatchiya A. Determinants of children's nutritional status in rural and urban areas of West Java, Indonesia. Nutr Clin y Diet Hosp. 2025;45(2):20–6.
10. Baloch F, Baloch K, Alizai S. Livestock Development and Food Security Aspects for Poverty Alleviation in Balochistan. Pakistan J Int Aff. 2021;4(3).
11. Gebremichael MA, Belachew Lema T. Dietary Diversity, Nutritional Status, and Associated Factors Among Pregnant Women in Their First Trimester of Pregnancy in Ambo District, Western Ethiopia. Nutr Metab Insights. 2023;16:11786388231190516.
12. Drakoulidou P, Drayton B, Shepherd L, Mihrshahi S. Sociodemographic factors associated with food insecurity: Data from the 2003-2014 New South Wales Population Health Survey. Public Health Nutr. 2020;23(11):1857–67.
13. Coates J, Swindale A, Bilinsky P. Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide: Version 3. Washington DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development; 2007.
14. FAO F. 360. Minimum dietary diversity for women: a guide for measurement. Rome: FAO; 2016. 2017.
15. Lo YT, Chang YH, Lee MS, Wahlqvist ML. Dietary diversity and food expenditure as indicators of food security in older Taiwanese. Appetite [Internet]. 2012;58(1):180–7. Available

from: https://www.sciencedirect.com/science/article/pii/S0195666311005915

16. Harris-Fry H, Saville NM, Paudel P, Manandhar DS, Cortina-Borja M, Skordis J. Relative power: Explaining the effects of food and cash transfers on allocative behaviour in rural Nepalese households. J Dev Econ [Internet]. 2022;154:102784. Available from: https://www.sciencedirect.com/science/article/pii/S0304387821001425

17. Costa ROM, Poblacion A, Giudice CL, de Moura LCM, Lima AAR, Lima DB, et al. Factors associated with food insecurity among pregnant women assisted by Universal Health Care in Lavras-Minas Gerais State | Fatores associados à insegurança alimentar em gestantes atendidas na rede pública de saúde de Lavras - Minas Gerais. Rev Bras Saude Matern Infant. 2022;22(1):127–35.

18. Leung CW, Epel ES, Ritchie LD, Crawford PB, Laraia BA. Food insecurity is inversely associated with diet quality of lower-income adults. J Acad Nutr Diet. 2014 Dec;114(12):1943-53.e2.

19. Yong HY, Mohd Shariff Z, Mohd Yusof BN, Rejali Z, Tee YY, Bindels J, et al. Higher Parity, Pre-Pregnancy BMI and Rate of Gestational Weight Gain Are Associated with Gestational Diabetes Mellitus in Food Insecure Women. Vol. 18, International Journal of Environmental Research and Public Health. 2021.

20. Na M, Mehra S, Christian P, Ali H, Shaikh S, Shamim AA, et al. Maternal Dietary Diversity Decreases with Household Food Insecurity in Rural Bangladesh: A Longitudinal Analysis123. J Nutr [Internet]. 2016;146(10):2109–16. Available from: https://www.sciencedirect.com/science/article/pii/S0022316623007496

21. Cheu LA, Yee LM, Kominiarek MA. Food insecurity during pregnancy and gestational weight gain. Am J Obstet Gynecol MFM. 2020 Feb;2(1):100068.

22. Lim EJK, Ong C, Said Abdul Rashid NS, Lee JJM, Chew J, Chua MC. Food Accessibility and Nutritional Outcomes Among Food-Insecure Pregnant Women in Singapore. Nutr. 2025;17(5):1–17.