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Monthly household income and intake of nutrients among adolescent females in a rural setting of Indonesia

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***Abstract*---**Adolescents are a vulnerable age group when it comes to nutrition. Some adolescents receive insufficient daily intake, particularly in rural areas with low household incomes. Moreover, suppose adolescents' nutritional intake is insufficient and is not addressed immediately until the preconception period; therefore, it will adversely influence the failure of the first 1000 days of life. This study aimed to examine the association between monthly household income and intake of macro-micro nutrients among adolescent females in a rural setting. This cross-sectional study included 100 adolescent girls aged 15-19 years old in Gunung kidul District, Special Region of Yogyakarta Province, Indonesia. For three days, intakes of macro-micro nutrients were obtained using the 24-hour dietary recall method. Pearson correlation was used to examine the relationship between monthly household income and macro-micro nutrient intake. Adolescent females had low dietary intakes with mean as follows, energy 1514.4 kcal, protein 55.7 g, fat 52.7 g, carbohydrate

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219.6 g, iron 6.7 mg, zinc 5.1 mg, and vit A 742.2 µg. Monthly household income was found to have a significant relationship with energy intake (p=0.000, r=0.817), protein (p=0.000, r=0.614), fat (p=0.000, r=0.486), carbohydrate (p=0.000, r=0.692), iron (p=0.000, r=0.373), zinc (p=0.000, r=0.511), and vitamin A (p=0.027, r=0.221). Adolescent girls' intake is deficient, with fewer macronutrients (energy, carbohydrate, protein, and fat), iron, and zinc. However, a high intake of vitamin A. Adolescent females in rural areas with low monthly household incomes have low intakes of macro-micro nutrients. Investing in adolescent females is thus the wisest use of resources for the youth's progress and future generations.

***Keywords*---**adolescent, female, nutrient, rural, low income.

Introduction

Nutrition is essential in the growth of adolescent girls. Adolescent girls are a group that is vulnerable to nutritional problems. Poor food intake is a common cause of nutritional problems in adolescents (Sparrow et al., 2021).

Nutritional problems in adolescent girls are a classic problem but have received very little attention in developing countries because of their low impact on morbidity and mortality. More than 1.2 billion adolescents worldwide, and 90% of them live in developing countries. Nearly 16 million teenagers have given birth every year (Ramachandran, 2017; Sivagurunathan et al., 2015).

Recently, researchers have shown increasing interest in adolescent nutrition because it is a trigger for deficient birth weight babies and even death for both mother and baby. One of the obstacles faced by these teenagers is low income. In 2019, there were three billion people who could not afford food. This is a severe health problem in low-income countries, including Indonesia (Kotlar et al., 2021; Rahman et al., 2016).

Micronutrient deficiencies such as vitamin and mineral deficiencies can result from diet and serious illnesses. High food prices and low incomes create diversity in the fulfilment of nutrition for every young woman. Maintaining adequate nutrition for every young woman is a challenge for those from low-income families who live in suburban areas (Chen et al., 2020; Gernand et al., 2016).

Recent evidence shows that young women from low-income families tend to have a monotonous nutritional pattern, especially during lean seasons or periods of food shortages. Due to low incomes, high food prices, and lack of information and knowledge, young women in disadvantaged households have low-nutrition diets, which silently cause hunger (Gelli et al., 2020; Gibson et al., 2021).

The government often campaigns to fulfil balanced nutrition for young women but does not provide solutions for those on the poverty line. Intake of iron, iodine, and calcium is vital for young women to prepare their bodies during pregnancy and for the development of the brain and nerves of future offspring. Iodine is essential for

brain development. Adequate iodine intake in pregnancy is essential, as a deficiency in utero can have lifelong consequences for the offspring (Darnton-Hill & Mkparu, 2015; Das et al., 2018).

A much-debated question is whether family income can affect nutritional intake for adolescent girls. Several studies have shown that even if they live in a low-income country, families can meet a variety of nutrients. Fulfilment is obtained from family habits in gardening(Bai et al., 2021; Casey et al., 2001; French et al., 2019; Singh et al., 2021).

So far, too little attention has been paid to the effect of low family income on the nutrition of adolescent girls. So that the influence of low family income on the nutritional status of adolescent girls is still speculative, this paper tries to show that the relationship between family income and nutritional status of adolescent girls deserves further investigation to produce a quality generation and prevent maternal and infant mortality (Akhter & Sondhya, 2013; Madjdian et al., 2018).

This study aimed to determine the effect of family income on the nutritional fulfilment of adolescent girls. The data for this study were collected using a survey in the suburbs of the provincial capital city of Yogyakarta, Indonesia. Understanding the influence of income and nutrition on adolescents will help contribute to the government, especially relevant ministries such as the Ministry of Health, Ministry of Social Affairs, and Ministry of Finance as regulators in Indonesia

Materials and Methods

Study design and settings

In this survey, we enrolled 100 adolescent females participants aged 15-19 years from rural settings in Gunungkidul District, Special Region of Yogyakarta Province, Indonesia. Adolescent females were interviewed after obtaining appropriate and informed written consent. This study does not require guardianship because the participants are adolescents who can read, write, and make their own decisions.

Data collection

A 24-hour dietary recall method was used to assess food intake after giving pre-instructions to adolescent females to write a daily intake. In this study, the intake of adolescent females on a three-day notebook includes a diet of two weekdays and one day off. Data were collected and analyzed using Nutrisurvey software by nutritionists with a bachelor's degree in nutrition who was referred to as enumerators in identifying the amount. The intake of food proportions and various macronutrients and micronutrients was compared with the Recommended Dietary Allowance (RDA) proposed by the Ministry of Health of the Republic of Indonesia (Dewiasty et al., 2022). The Research Ethics Committee approved this Faculty of Health Science study, Universitas Respati Yogyakarta Indonesia.

Statistical analysis

Descriptive analysis was conducted to report the participants' age and socioeconomic information. The mean of macro and micronutrition adequacy rates were assessed into 2 categories (energy: <2125 kcal and >2125 kcal; protein: <59 g and >59 g; fat: <71 g and >71 g; carbohydrates: <292 g and >292 g; vitamin A: <600 and >600; iron: <26 mg and >26 mg; zinc: <14 mg and >14 mg) (14). Pearson correlation was applied to analyze the association between household income and food intake, and p-value < 0.05 was considered statistically significant.

Results and Discussions

Results

In this study, it was found that there was no high disparity in household incomes, but it tends to be low income, and most of them were below the minimum wage. The mean of household income is IDR 1,854,800 per month (1 USD = around IDR 14,000; $132.48). The lowest household income is IDR 900,000 (≈$64.28), and the highest is IDR 3,000,000 (≈$214.28) per month. Table 1 shows that the mean of macro and micronutrients intake in rural adolescent females is below the sufficient level, but only vitamin A is above the adequacy level. This can be seen from energy intake: <2125 kcal; protein: <59 g; fat: <71 g; carbohydrates: <292 g; iron: <26 mg; zinc : <14 mg; vitamin A: >600. The high disparity in intake of macro and micronutrients can be seen from the lowest and highest intake.
Association between variables in this study can be seen in Table 2. Intake of energy (p=0.000, r=0.817), protein (p=0.000, r=0.614), fat (p=0.000, r=0.486), carbohydrate (p=0.000, r=0.692), iron (p=0.000,w r=0.373), zinc (p=0.000, r=0.511), and vitamin A (p=0.027, r=0.221) are positively correlated.

Table 1 Descriptive analysis of age, monthly household income, and macro-micronutrient intakes
(n=100)

Variables	Min-max	Median	Mean(SD)
Age	15 – 19	16	16.6 (1.57)
Monthly household income (IDR)	900,000 – 3,000,000	1,770,000	1,854,800 (604,839.87)
Macronutrient intakes			
Energy (kcal)	575.8 – 3206.7	1362.2	1514.4 (651.56)
Carbohydrate (g)	67.8 – 552.0	168.8	219.6 (125.98)
Protein (g)	15.5 – 155.9	49.9	55.7 (26.57)
Fat (g)	9.7 – 158.0	31.2	52.7 (31.25)
Micronutrient intakes			
Iron (mg)	2.1 – 34.8	5.6	6.7 (5.09)
Zinc (mg)	1.2 – 17.7	4.2	5.08 (3.23)
Vitamin A	20.0 – 3586.7	470.1	742.2 (783.02)

Table 2 Correlation between monthly household income and macro-micronutrient intakes (n=100)

Variables	r	p
Macronutrient intakes		
Energy (kcal)	0.817	0.000*
Carbohydrate (g)	0.692	0.000*
Protein (g)	0.614	0.000*
Fat (g)	0.486	0.000*
Micronutrient intakes		
Iron (mg)	0.373	0.000*
Zinc (mg)	0.511	0.027**
Vitamin A	0.221	0.000*

*significant at the 0.01 level
*significant at the 0.05 level

Discussion

Adolescent females' household income ranges from IDR 900,000 to IDR 3,000,000. Low income makes it difficult to obtain food fulfillment. In Gunungkidul, Yogyakarta Special Region, the median and mean household income is less than the minimum wage (Rp 1,770,000 (≈USD 126.4) - Rp 1,854,800 (≈USD 132.5)). Food availability is more likely to be met if a household's income exceeds the minimum wage. Table 1 shows that adolescents' dietary intake for macronutrients (energy, carbohydrate, protein, and fat) and micronutrients (zinc and iron) is below the RDA; only vitamin A above the RDA. Based on a referral from the Ministry of Health of the Republic of Indonesia, the RDA for adolescent females includes energy: 2125 kcal; Protein: 59 g; fat: 71 g; carbohydrates: 292 g; Iron: 26 mg; zinc: 14 mg; vitamin A: 600 (14).

We collected the types of food consumed over three days (two working days and one holiday) using 24-hour recall. The findings are pretty concerning because the mean intake of macronutrients (carbohydrates, protein, and fat) and micronutrients (iron and zinc) for adolescent females aged 15-19 years is substantially below the recommended RDA value. They eat more flour-based foods that lack protein and other micronutrients that adolescent females require during their growing period. It was done due to their low socioeconomic status (SES), making it difficult to obtain nutritious meals. Carbohydrates, proteins, and fat are three macronutrient components that provide calories or energy.

Adolescents require extra energy to keep up with their growth and activities. Inadequate calorie intake can lead to obesity, malnutrition, delayed puberty, nutritional growth retardation, and a lack of numerous nutrients, particularly iron. Iron deficiency is associated with preterm birth, impaired cognition, and reduced learning capacity of children, which cannot be reversed by administering iron at a later stage nor with zinc deficiency (Das et al., 2018; Soliman et al., 2014). Inadequate energy intake might be correlated to a rigorous diet and a low SES. Our finding is consistent with another study that children and adolescents with middle/high SES had a higher energy intake than those with low SES. It might be because the upper class has better access to high-energy and non-

affordable price foods like meat than the lower class (Gómez et al., 2021; Jodhun et al., 2016).

Table 2 shows the significant correlation between household income and macro-micronutrient intakes. It demonstrates that parents with higher monthly household incomes better fulfill their children's macro and micronutrient needs than those with lower incomes. SES can influence food quality, availability, and cost. People with lower SES consume less nutritious food than those with higher socioeconomic status (Jr et al., 2020; Ranjit et al., 2015). Women of reproductive age with lower levels of education might lack decision-making and bargaining power within the household and control over their food choices. These findings are consistent with previous research from low- and middle-income countries (LMICs) that found that women's education and decision-making power are connected to dietary diversity and food quality in their households (Bonis-Profumo et al., 2021). Higher monthly household income was strongly associated with improved foods quality. Higher monthly household income was strongly associated with improved foods quality. Higher monthly household incomes might have contributed to higher food quality by strengthening their food purchasing power, supported by research suggesting that people tend to vary their foods as their household incomes rise (Argaw et al., 2019). Poor dietary patterns in poor households result in micronutrient deficiencies, which have adverse effects during pregnancy and bad outcomes in birth (Mousa et al., 2019).

Another study found that low socioeconomic level, low household expenditure, low income, and low wealth score, all increased the likelihood of adolescent girls eating inadequately. Consumption of fruits and vegetables and animal-sourced meals rise with income in LMICs and other developing countries (Akter et al., 2021; Islam et al., 2020); impoverished households cannot afford to buy animal-sourced foods from the outset. Furthermore, disadvantaged household members prioritize fulfilling essential energy demands from staple foods in their food budget allocations. Hence, lower socioeconomic status is a risk factor for adolescent girls' insufficient nutritional food consumption (Vilar-Compte et al., 2021).

Conclusion

We found that adolescent females with low monthly household incomes in a rural setting had reduced macro-micronutrient intakes. They consume an inadequately wide range of foods. Our finding is that socioeconomic factors such as low household income correlate with adverse food insecurity. These findings have numerous operational and policy implications for encouraging adolescent food diversification in LMICs like Indonesia. Adolescent nutrition is critical for optimal growth and development and the prevention of numerous health issues. Investing in adolescent females is thus the wisest use of resources for the youth's progress and future generations.

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