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Menyingkap Nutrisi Buruk Prakonsepsi: Kurangnya Asupan Makronutrien Mendorong Risiko Gizi Kurang pada Wanita Berpenghasilan Rendah di Takalar, Indonesia

Unveiling Preconception Malnutrition: Inadequate Macronutrient Intake Drives Underweight Risk Among Low-Socioeconomic Women in Takalar, Indonesia

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Abstract: *Preconception maternal underweight status negatively affects maternal and neonatal health, yet dietary data among vulnerable women in rural Indonesia remain limited. This study evaluated underweight prevalence and macronutrient intake adequacy among low-income preconception women in Takalar District. This cross-sectional study (October–December 2021) involved 130 preconception women (18–30 years). Nutritional status was measured via anthropometry, while dietary intake was assessed using multi-pass 24-hour recalls against Indonesian RDAs. Chi-square tests analyzed associations between variables. Most participants were aged 20–30 years (80.8%) and had inadequate intakes (<80% RDA) for energy, protein, carbohydrates, and fat. Maternal age under 20 years was significantly associated with underweight status. Lower education ($p = 0.043$), non-formal occupation ($p < 0.05$), and lower family income ($p = 0.019$ for protein) were significantly linked to macronutrient inadequacy. Targeted nutritional interventions paired with socioeconomic support are urgently needed to address macronutrient deficits among preconception women in Takalar.*
Keyword: *Macronutrients Intake, Preconception Women, Underweight, Socioeconomic*

Abstrak: Status gizi kurang (underweight) pada ibu hamil masa prakonsepsi berdampak buruk bagi kesehatan ibu dan bayi. Namun, data asupan gizi wanita rentan di pedesaan Indonesia masih terbatas. Penelitian ini mengevaluasi prevalensi gizi kurang dan kecukupan asupan makronutrien pada wanita prakonsepsi berpenghasilan rendah di Kabupaten Takalar. Studi cross-sectional (Oktober–Desember 2021) ini melibatkan 130 wanita prakonsepsi (18–30 tahun). Status gizi diukur melalui antropometri, sedangkan asupan gizi dinilai via multi-pass 24-hour recall berdasarkan AKG Indonesia. Uji Chi-square digunakan untuk menganalisis hubungan antarvariabel. Mayoritas responden berusia 20–30 tahun (80.8%) dan memiliki asupan energi, protein, karbohidrat, serta lemak yang kurang (<80% AKG). Usia ibu <20 tahun berhubungan signifikan dengan gizi kurang. Pendidikan rendah ($p = 0{,}043$), pekerjaan nonformal ($p < 0{,}05$), dan pendapatan rendah ($p = 0{,}019$ untuk protein) berhubungan signifikan dengan ketidakcukupan makronutrien. Intervensi gizi terarah dan dukungan sosioekonomi sangat penting untuk mengatasi defisit makronutrien pada wanita prakonsepsi di Takalar.
Kata kunci : Asupan gizi makro, wanita prakonsepsi, underweight, sosial-ekonomi.

1. INTRODUCTION

The preconception stage is a critical period for creating a healthy life, specifically for couples who are planning to build a household. This phase requires special attention in terms of the adequacy of energy and other nutritional needs (Parisi et al., 2018). A healthy lifestyle during conception is very important because it improves maternal and child health and also reduces the burden of non-communicable diseases (Stephenson et al., 2018).

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Inadequate nutritional intake during the preconception period will affect the nutritional status of mothers, leading to low body weight, and followed by chronic energy deficiency. This will affect fertility, implantation, fetal organogenesis, placentation, and the early stages of pregnancy (Cetin et al., 2009). It also creates a low quality of human resources when the nutritional intake is inadequate and poor.

In 2017, the data from the Indonesian Ministry of Health showed that the prevalence of underweight in women aged >18 years was 5.0% which is lower compared to the thin women in South Sulawesi, namely 5.8% (Kemenkes RI, 2017). Meanwhile, the 26.1% reported in Takalar District ranked third after Pangkep (30.9%) and Gowa (28.8%) (Dinas Kesehatan, 2019). These data show that low nutritional status still occurs among women, including preconception women in South Sulawesi, specifically in Takalar District.

Several data have been obtained on low nutrition among adolescents and prevention efforts were also carried out made, but underweight and wasting still occur with various factors. It was discovered that there are limited data on malnutrition in preconception women in Indonesia. Therefore, this study aims to examine the relationship between socioeconomic, nutritional intake, and underweight status in preconception women in North Polongbangkeng Sub-district, Takalar District, South Sulawesi Province, Indonesia.

2. METHODS

2.1. Study Design and Population

This study employed a cross-sectional design. The sampling frame was obtained from the registration records of prospective brides at the local Religious Affairs Office (KUA) in North Polongbangkeng Sub-district, Takalar District. A total of 200 prospective brides who had been registered within the three months preceding data collection were initially identified. Participants were screened according to the eligibility criteria. Seventy women were excluded because the registered marriage was not their first marriage. Consequently, 130 eligible preconception women aged 18–30 years who were entering their first marriage were included in the study. All eligible women were recruited using a total sampling approach. The study was conducted in North Polongbangkeng Sub-district, Takalar District, South Sulawesi Province, Indonesia.

2.2. Data Collection

Data were collected using a questionnaire and 24-hour recall. The respondents were interviewed with several questions such as mothers' age, occupation, and education, fathers' occupation and education, as well as family income. A 24-hour recall was carried out with an interview on the respondents' breakfast, lunch, and dinner to determine their food intake during the last 24 hours *against Indonesian RDAs* (Ministry of Health of the Republic of Indenesia, 2019). Furthermore, macronutrient intake such as energy, carbohydrates, protein, and fat is also among the variables determined.

2.3. Anthropometry Measurement

The anthropometric measurements were also carried out to determine the nutritional status of deficient mothers by measuring weight using a digital scale, height with a Microtoise Staturmeter, and body mass index (BMI) with the formula BMI = (weight, kg)/(Height, m)^2. Based on WHO classification, the BMI standard of <18.5, 18.5-24.9, 25-29.9, and >30 indicates underweight, normal, overweight, and obesity, respectively (WHO, 2022).

2.4. Statistical Analysis

The grouping of nutritional intake was calculated based on the 2019 nutritional adequacy rate. Food intake was analyzed using the nutrisurvey application. All data and variables were evaluated using the SPSS program with chi-square analysis that can show the relationship between the independent and the dependent variables.

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3. RESULTS AND DISCUSSION

Based on the frequency of nutritional status in preconception women as shown in Figure 1, that 95 (73.1) are normal and 35 (26.9%) are thin. Furthermore, Table 1 shows that most of the women aged 20-30 years, namely 105 (80.8%) people. The average occupation of the father as an entrepreneur is 61 (46.9%) and 93 (71.5%) mothers work as a housewife. There are 37 (28.5%) working mothers and 31 (23.8%) farmers, 32 (24.6%) civil servants, and 6 (4.6%) unemployed. A total of 112 (86.2%) mothers and 100 (76.9%) fathers have average education levels. The highest family income is above 1 million, with 73 (56.2%), while 57 (43.8%) people earn lower.

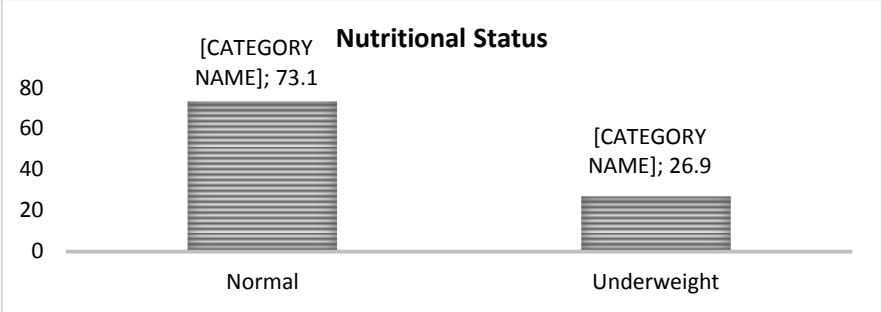

Figure 1. Nutritional Status of Preconception women

Table 1. Characteristics of Respondents

Characteristics	Preconception Women (n=130)	
	n	%
Age		
< 20 years	25	19.2
20-30 years	105	80.8
Mother's Occupation		
Work	37	28.5
Doesn't Work	93	71.5
Father's Occupation		
Self Employed	61	46.9
Farmer	31	23.8
Civil Servant	32	24.6
Doesn't Work	6	4.6
Mother's Education		
Low	18	13.8
High	112	86.2
Father's Education		
Low	30	23.1
High	100	76.9
Family Income		
< 1 million	57	43.8
> 1 million	73	56.2

Source: *Primary Data, 2021.*

The relationship between respondent characteristics and nutritional status in preconception women is presented in Table 2. It was discovered that age influences undernutrition status in preconception women with a p-value = 0.008 (p <0.05). Mothers' education also affects the nutritional status but is included in the significant borderline, where p = 0.071. Meanwhile, mothers' occupation and family income were not related to the nutritional status (p>0.05). The relationship between nutritional intake and status in preconception women is shown in Table 3. The results indicate that carbohydrate intake is correlated with the maternal nutritional status with p = 0.098 in the borderline significant category, while energy, protein, and fat had no relationship (p>0.05).

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Table 2. The Relationship between Characteristics and Nutritional Status of Preconception Mothers.

Category	Underweight	Normal	*P-Value*[a]
	n(%)	n(%)	
Age			
< 20 years	12(48.0)	13(52.0)	0.008*
20-30 years	23(21.9)	82(78.1)	
Mothers' Education			
Low	8(44.4)	10(55.6)	0.071**
High	27(24.1)	85(75.9)	
Mothers' Occupational			
Work	8(21.6)	29(78.4)	0.390
Doesn't Work	27(29.0)	66(71.0)	
Family Income			
< 1 million	18(31.6)	39(68.4)	0.290
≥ 1 million	17(23.3)	56(76.7)	

[a] *Chi-Square Test,* [*] *Significant (P<0,05),* [**] *Borderline Significant*

Table 3. Relationship between Macronutrient Intake and Nutritional Status of Preconception Mothers

Nutrients	Underweight	Normal	*P-Value*
	n=35 (%)	n=95 (%)	
Energy			
< 80% RDA	30(30.0)	70(70.0)	0.149
≥ 80% RDA	5(16.7)	25(83.3)	
Protein			
< 80% RDA	18(31.0)	40(69.0)	0.343
≥ 80% RDA	17(23.6)	55(76.4)	
Fat			
< 80% RDA	28(27.2)	75(72.8)	0.896
≥ 80% RDA	7(25.9)	20(74.1)	
Carbohydrate			
< 80% RDA	32(29.9)	75(72.8)	0.098**
≥ 80% RDA	3(13.0)	20(74.1)	

[a] *Chi-Square Test,* [**] *Borderline Significant*

The relationship between maternal characteristics and nutritional intake are presented in Table 4. The results showed that there is a correlation between maternal work, energy, protein, and carbohydrate intake with p values of 0.012, 0.003, and 0.023 (p< 0.05), respectively, while there is no relationship with fat intake, where p = 0.743 (p>0.05). Mothers' education is only related to protein intake with p = 0.043 (p<0.05), and other intakes such as energy, carbohydrates, and fat did not have a significant relationship (p>0.05). There is also a relationship between family income and protein intake with a value of p = 0.019 (p <0.05) and energy is at a significant borderline, with p = 0.081. Meanwhile, carbohydrate and fat intake had no relationship with maternal family income (p>0.05).

Table 4. Characteristics Relationship with Nutritional Intake of Preconception Mothers

Characteristics	Nutrients Intake (<80% RDA)							
	Energi (%)	*P-value*[a]	Protein (%)	*P-value*[a]	Karbo (%)	*P-value*[a]	Lemak (%)	*P-*value[a]
Age								
< 20 year	84.0	0.350	60.0	0.085**	88.0	0.407	72.0	0.321
20-30 year	75.2		40.0		81.0		81.0	
Mothers' Education								
Low	83.3	0.487	66.7	0.043*	94.4	0.146	66.7	0.157
High	75.9		41.1		80.4		41.1	
Mothers' Occupational								
Work	62.2	0.012*	24.3	0.003*	70.3	0.023	81.1	0.743
Doesn't Work	82.8		52.7		87.1	*	78.5	

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Family Income								
Low	84.2	0.081**	56.1	0.019*	82.5		78.9	0.944
High	71.2		35.6		82.2	0.969	79.5	

[a] Chi-Square Test, [*] Significant (P<0,05), [**] Borderline Significant

Most of the preconception women have good nutritional status, but 26.9% are still underweight. This condition indicates that pre-pregnancy macronutrient intake (protein, carbohydrates, and fat) plays a crucial role in supporting optimal nutritional status. Several studies have shown that adequate macronutrient intake before pregnancy is associated with infant birth weight, especially in women with a low pre-pregnancy body mass index (BMI). Pre-conception nutritional supplementation, both macro and micronutrients, can significantly reduce the risk of maternal anemia, improve intrauterine growth, and increase fertility in pre-conception women (Salavati et al., 2020; Ali et al., 2025; Stocker et al., 2025). Furthermore, this study shows that women under 20 years of age are more likely to be underweight than those in the 20–30 age group due to inadequate nutritional intake. Early marriage is a contributing factor to poor nutritional quality, as women who marry early tend to have limited nutritional knowledge and inadequate food access, putting them at risk of anemia during pregnancy. This finding aligns with research by Damara (2024) which explains that young pre-conception age (<20 years) is associated with the risk of malnutrition due to inadequate nutrient consumption and a lack of awareness of the importance of nutrition during the pre-conception period (Damara et al., 2024). Overall, pre-conception women with undernourished nutritional status also have macronutrient intakes (energy, protein, carbohydrates, and fat) below 80% of the recommended dietary allowance (RDA).

The results indicate that young people are very vulnerable to being underweight. This is in line with the previous study by Anjana Rai in 2019 in Nepal which showed that the risk of wasting was significantly higher at the age of 15-19 years and 20-29 years compared to those aged over 30 years (Rai et al., 2019). Paudel et al. (2025) also stated that young Nepali women aged 15-24 years were 2.7 times more prone to being underweight (Paudel et al., 2025) . Similarly, Sumy et al (2024) discovered that younger women are more likely to be thin (wasting) (Sumy et al., 2024) because they do not have enough knowledge and usually ignore nutritional problems. It was discovered that awareness is still being ignored about nutritional status and is a relevant determinant among women of reproductive age who are undernourished or overweight (Song et al., 2020). In addition, body metabolism, biological processes, and changes in body composition are known to have a close relationship with increasing age (Sumy et al., 2024; Hashan, et al., 2020). Furthermore, a study in Sierra Leone also showed that a high prevalence of underweight was associated with low education levels, young age, and low household income (Ikoona et al., 2023). These findings are consistent with the results of this study, which showed that women under 20 with little education and from low-income families were at higher risk of malnutrition.

Mothers' education also plays a role in nutritional adequacy; this is shown in this study where low maternal education affected nutritional status and low protein intake. This is because mothers with low education have not been able to distinguish foods that meet nutritional adequacy from being full. According to Carlos de Mistral (2017), a woman with low education will consume less protein, fiber, and carotenoids (De Mestral et al., 2017). Based on the study by Fatimah Barich (2020) on mothers aged 19-49 years in Morocco, it was discovered that the education level affects energy, carbohydrate, protein, and fat intake (Barich et al., 2020). Low levels of education are also associated with a higher prevalence of nutritional problems including being underweight or overweight (M'bobda et al., 2020; Ahmed et al., 2020; Biswas et al., 2019). This is because women with higher education have greater nutrition knowledge and can consume better food. Furthermore, it was reported that educated women and partners have extensive knowledge about healthy lifestyles, balanced eating habits, health problems, and the prevention of BMI problems (Fasola et al., 2018).

This study also shows that maternal work is closely related to low intake of energy, protein, and carbohydrates. This is because most of the mothers work as housewives and rely on income

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from their husbands, thereby reducing the purchasing power. Furthermore, low family income makes mothers minimize diet by reducing the quality and quantity of food and also prioritizing the needs of their husbands. Julie C Martin (2017) conducted a study in Australia involving women aged 18-50 years, it was discovered that those who do not work have a lower quality diet (Martin et al., 2017). Anajan Rai (2019) stated that women with manual work have a high risk compared to those with non-manual work (Rai et al., 2019). Moreover, women who work as employees have low physical activity compared to housewives. This is because women with occupations have the possibility of selecting a lifestyle and obtain energy-dense intakes (Ferdausi et al., 2022). This is in line with the report by Carlos de Mistral (2017) on women of childbearing age, where those with low jobs consumed more carbohydrates (De Mestral et al., 2017).

This study showed that other factors such as low family income influence protein intake. This is because when the income is less, it leads to a reduction in the family's ability to meet nutritional needs. A theory stated that a good source of protein, namely fish, eggs, and meats are included in groups that are difficult to be consumed by people with low incomes. Therefore, they make instant snacks such as starchy meatballs as a complete and inexpensive food. Anjana Rai (2019) also stated that low incomes were more prone to nutritional problems (Rai et al., 2019). Apart from economic factors, an individual's nutritional status is also influenced by lifestyle and people's purchasing power in meeting their nutritional needs (Hashan, Gupta, et al., 2020). A study in Nepal showed that even when families have sufficient income, food insecurity and household dynamics, such as relationships with husbands or in-laws, can limit access to nutritious food (Diamond-smith et al., 2020). This suggests that nutrition interventions need to focus not only on economic aspects but also consider the social and cultural factors that influence consumption behavior and food access.

This study shows that nutritional intake in preconception women is influenced by various factors, particularly socioeconomic conditions. Factors such as education level, type of employment, and family income have been shown to play a significant role in determining the quality and adequacy of macronutrient intake. Although the primary focus of some studies has been on nutritional supplementation, Reid's (2024) findings indicate that interventions during the preconception period can have long-term impacts, including on child weight, underscoring the importance of early maternal nutritional status (Lyons-Reid et al., 2024). Furthermore, other research also shows that multimicronutrient (MMN) consumption is significantly associated with the nutritional status of preconception women, supporting the finding that macronutrient intake plays a significant role in determining overall nutritional status (Fandir et al., 2024). Therefore, efforts to improve the nutritional status of preconception women need to focus not only on meeting macronutrient intake and supplementation but also consider socioeconomic factors, education, and access to nutritious food. A comprehensive approach from the preconception period is expected to break the chain of intergenerational nutritional problems and support successful pregnancies and optimal child growth.

This study has several limitations; First, the cross-sectional design limits the ability to establish causal relationships between socioeconomic factors, macronutrient intake, and nutritional status. Second, dietary intake was assessed using a 24-hour dietary recall, which may be subject to recall bias and may not fully represent participants' habitual dietary intake. Third, the study was conducted among preconception women in one sub-district of Takalar District; therefore, the findings should be generalized to other populations with caution. Future studies using longitudinal designs and repeated dietary assessments are recommended to provide a more comprehensive understanding of the determinants of nutritional status among preconception women.

4. CONCLUSION

The results of this study indicate that most preconception women still have macronutrient intakes below 80% of the Indonesian Recommended Dietary Allowance (RDA). This condition is closely related to socioeconomic factors, where work as a housewife, low education levels, and

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limited family income play a significant role in low energy and protein intake. These findings emphasize the importance of targeted preconception nutrition interventions, particularly through improving nutritional literacy and access to balanced, nutritious food sources. Moreover, further research is recommended to explore the use of natural supplements as an alternative strategy to improve the nutritional status of preconception women and prepare for a healthier pregnancy.

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