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RESEARCH **Open Access**

Comparison of Macronutrient and Micronutrient Adequacy Among Pregnant Women in Urban and Rural Areas

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Abstract

Adequate macronutrients and micronutrients during pregnancy can support optimal fetal growth and development in addition to meeting the needs of the mother to ensure a healthy pregnancy. The region of residence is one of the factors that contribute to determining how nutrition is fulfilled in groups of pregnant women. This study aims to compare the adequacy of macronutrients and micronutrients between pregnant women in urban and rural areas. This study involved 50 pregnant women, 25 in urban areas and 25 in rural areas. Nutritional information was obtained using a food recall questionnaire that was assessed for 3 days, namely on 2 working days (not consecutive) and 1 day off and also using a food frequency questioner (FFQ). Data was analyzed using Chi Square and Results showed a difference in carbohydrate (p=0.049) and protein (p=0.045) consumption between urban and rural pregnant women, while energy (p=0.053) and fat (p=0.056) showed no difference in adequacy. For micronutrients, Vitamin A (p=0.043) and B12 (p=0.042) consumption showed differences between urban and rural pregnant women, while for vitamin C (p=0.065), vitamin B1 (p=0.078), vitamin B2 (p=0.084), B3 (p=0.056), B6 (p=0.075), E (p=0.088), Iron (p=0.052), Folic acid (p=0.067), Calcium (p=0.054), Phosphorus (p=0.055), fiber (p=0.079), showed no difference in consumption between urban and rural pregnant women. The consumption of micronutrients and macronutrients of pregnant women in rural and urban areas showed less intake than recommended. Nutrition education needs to be improved not only focusing on pregnant women but also on adolescent groups, pre-conception period so that early on good consumption patterns have been formed which will always be applied throughout life.

Keywords: Macronutrients, Micronutrients, Pregnant Women Rural, Urban.

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1. INTRODUCTION

During pregnancy, physiological changes occur in the mother's body as a process of adaptation to the results of conception. This condition requires adequate nutrient intake to support fetal growth and development and fulfill the metabolic needs of the mother's body (Keats et al., 2019). The macro and micronutrient intake of pregnant women in developing countries is generally still below recommendations. Poor dietary intake or deficiencies in key macronutrients and micronutrients have a major impact on pregnancy outcomes and neonate health (Blumfield et al., 2013). Evidence suggests that the effects of fetal nutrition impact into adulthood and even intergenerationally (Mousa et al., 2019). Some conditions that can occur as a result of malnutrition in pregnant women are disruption of the fetal growth process, miscarriage, abortion, preeclampsia, infection, premature birth, low birth weight and stunting. In addition, malnutrition also increases the risk of maternal and neonatal mortality (Grieger et al., 2014; Sudfeld & Smith, 2019).

Many nutritional problems experienced by pregnant women are Chronic Energy Deficiency (CED) and anemia. The incidence of CED among pregnant women in Indonesia in 2020 was 9.7%. Based on the results of the primary health research (2018), as many as 49.5% of pregnant women consumed protein below 80% of their needs during pregnancy, and 44.8% of pregnant women also received less energy intake in total, which was still below 70% of their needs, while the incidence of anemia reached 48.9% with the consumption pattern of blood supplement tablets given in general not spent up to 90 tablets (Kementerian Kesehatan Republik Indonesia, 2018). Research by Quansah and Boateng (2020), shows that the quality of food consumption that is not diverse is the cause of anemia during pregnancy which has an impact on preterm labor and low birth weight < 2500 grams (Quansah & Boateng, 2020). Nutritional adequacy can be obtained through additional intakes of macro and micronutrients from food and supplements taken. Women who eat less than 3 main meals and 2 snacks daily have been shown to have a 30% higher risk of preterm birth compared to women who eat more frequent meals (Paknahad et al., 2019).

Accurate assessment of the adequacy of food intake is the basis for providing nutrition interventions during pregnancy because inadequate or excessive nutrition can have adverse effects on the mother and fetus (Paknahad et al., 2019). In Indonesia, several methods are used to determine the nutritional status of pregnant women, namely monitoring weight gain, measuring upper arm circumference (LILA), and measuring hemoglobin levels and other micronutrients. However, assessment of food intake and the adequacy of macro and micronutrients is not routinely carried out (Royani et al., 2021). The use of valid dietary assessment tools is essential to compare dietary intake with current nutritional recommendations and to measure the impact of diet on health. Indeed to assess its adequacy, a new approach is used that is simple and non-invasive but can accurately assess nutritional deficiencies or excesses through quantitative and qualitative measurement of individual food consumption, namely by using the *24-hour food recall* method. All methods used to assess daily dietary intake have some limitations in terms of accuracy of portion size estimation. To overcome this, a *food frequency questioneer (FFQ) was* added (Faber et al., 2016; Hardinsyah, & Supariasa, 2016).

Data from the Palopo Health Office, in 2022 the most cases were pregnant women with CED 277 people (7.9%) and anemia as many as 60 people (1.71%) (Asmar, 2022). Currently, the working area of Health center Mungkajang is one of the concerns of the local government because the number of pregnancies in this area is quite high, reaching 279 pregnant women and pregnant women with CED until May 2023 reached 35 people (12.5%). Based on the results of interviews with village midwives, it was stated that the assessment of the nutritional status of pregnant women was only based on the results of weighing their weight and if there was a fixed weight, pregnant women were only advised to increase their food intake or consume foods that

were high in calories such as ice cream and if the weight increased even if it was only 0.2-0.5 kg / month there was no further intervention given. Even though the addition is included in the category of low weight gain for pregnant women, especially in the 2nd and 3rd trimester of pregnancy.

The working area of Mungkajang Community Health Center is also divided into rural areas around the mountains and urban areas around the cross Sulawesi track. This geographical condition determines the food consumption patterns of the people, namely those who live in rural areas consume local foods in addition to other types of food every day and those who live in urban areas have a diversity of foods consumed. So it is necessary to accurately assess the nutritional status of vulnerable populations who live in different areas to assess the adequacy of their intake. This study aims to compare the adequacy of macronutrients and micronutrients between pregnant women in urban and rural areas.

2. RESEARCH METHOD

The research methods used in this study are descriptive, correlation and comparison with a cross sectional design. The initial stages of the study began with the preparation stage, followed by visiting prospective respondents who had agreed to participate in the study for interviews about their food consumption using a 24-hour *food recall* questionnaire. On the day of the interview, the height and weight and upper arm circumference (LILA) of the respondents will be measured. The *food recall* assessment time is carried out for 3 days, namely 2 days on weekdays (Monday-Friday range) and 1 day off. At the time of the interview, respondents will be shown a food table booklet containing food types and portion sizes ranging from large, medium, small portions and household sizes used such as spoons, plates or bowls. After the assessment for 3 days is carried out, followed by giving the FFQ questionnaire to assess the respondent's food intake 1 month earlier, this is done for 1 day. This study will be assisted by research assistants who have previously conducted perceptual similarities on how to conduct 24-hour food recall interviews and FFQ filling. The data obtained from the 3×24 hour *food recall* and FFQ were then analyzed using the Nutrisurvey application. Data analysis using the *chi-square test*.

The population of this study was 279 pregnant women who would be selected by *purposive sampling* method so that the number of samples was 25 mothers in rural areas and 25 mothers in urban areas with inclusion criteria, namely pregnant women in all trimesters, domiciled in the Mungkajang health center working area, able to read and write. The exclusion criteria are pregnant women with health problems, do not want to participate. This study was carried out while adhering to the principles of research ethics and health protocols. This study is an preliminary studies in assessing the nutritional status of pregnant women specifically on the adequacy of macronutrients and micronutrients become the basis in nutrition education for pregnant women

3. RESULTS AND DISCUSSION

The results of this study are described in several tables, namely the table of respondent characteristics, macronutrient intake, adequacy level of macronutrient intake, micronutrient intake, adequacy level of micronutrient intake and frequency of food intake in pregnant women in urban and rural areas. Data on the characteristics of respondents are described in the following table:

Table 1. Distribution of Respondents Based on Characteristics (n=50).

Characteristics	Urban		Rural	
	f	%	f	%
Age				
Reproductively healthy	17	68	16	64
Reproductively unhealthy	8	32	9	36
Education				
High	18	72	14	56
Low	7	28	11	44
Jobs				
Salaried	20	80	4	16
No salary	5	20	21	84
Gravida				
Primigravida	8	32	10	40
Multigravida	17	68	15	60
Economic Status				
income low minimum wage	9	36	15	60
income higher or same minimum wage	16	64	10	40
LILA				
Normal	20	80	18	72
Less	5	20	7	28
Weight gain during pregnancy				
Less	2	8	2	8
Medium	18	72	21	84
High	5	20	2	8
Pregnancy Age				
1st Trimester	5	20	8	32
Trimester 2	19	76	16	64
Trimester 3	1	4	1	4
Hemoglobin levels				
< 11 mg/dl	10	40	13	52
≥ 11 mg/dl	15	60	12	48
Total	25	100	25	100

Table 1 shows that respondents in this study both in rural and urban areas were dominated by pregnant women in healthy reproductive age (age > 20 years) with a high level of education (high school to college), gravida status is multigravida (more than 1 child). There are differences in employment between pregnant women in urban areas, which are dominated by salaried jobs as much as 80%, while pregnant women in rural areas are more unpaid (IRT), namely 84%. There are differences in the economic status of pregnant women, namely in urban areas, family income is more than or equal to the regional minimum wage (UMR) as much as 64%, while in rural areas it is dominated by family economic status with income less than UMR by 60%. The upper arm circumference (LILA) of pregnant women in normal conditions in urban areas is 80% and in rural areas is 72%. The weight gain of pregnant women in both environments showed a moderate increase (0.29-0.44 kg / week), namely in urban areas by 72% and in rural areas by 84%, with gestational age dominated in the second trimester both in urban areas by 76% and in rural areas by 64%.

Table 2. Macronutrient Intake of Pregnant Women in Urban and Rural Areas.

Nutrients	Region		p-value
	Urban	Rural	
	Mean±SD	Mean±SD	
Energy (kcal)	1918.07±431.52	1815.33±402.22	0.053
Carbohydrate (g)	403.62±68.89	400.28±112.45	0.049
Protein (g)	88.25±23.84	86.76±21.67	0.045
Fat (g)	54.27±21.54	52.93±19.65	0.056

The table 2 shows that there is no difference in the intake of macronutrients between pregnant women in urban and rural areas, especially for energy (p=0.053) and fat (p=0.056), although the intake of other substances shows a difference, namely carbohydrates (p=0.049) and protein (p=0.045). The mean intake of macronutrients is still below the recommended amount for pregnant women based on their gestational age.

Table 3. Macronutrient Adequacy Levels of Pregnant Women in Urban and Rural Areas.

Nutrients	Nutrition Adequacy Level						p- value
	More		Normal		Less		
	Urban	Rural	Urban	Rural	Urban	Rural	
	f (%)		f (%)		f (%)		
Energy (kcal)	3 (12)	3 (12)	6 (24)	2 (8)	16 (64)	20 (80)	0.063
Carbohydrate (g)	0 (0)	2 (8)	12 (48)	11 (44)	13 (52)	12 (48)	0.055
Protein (g)	3 (12)	4 (16)	10 (40)	8(32)	12 (48)	13 (52)	0.058
Fat (g)	4 (16)	7 (28)	5 (20)	8 (32)	16 (64)	10 (40)	0.071
Total	10	16	33	29	57	55=200 (n)	

The table 3 shows that there is no difference in nutritional adequacy levels for macronutrients between pregnant women in urban and rural areas with p>α=0.05. Macronutrient adequacy levels were dominated by undernutrition (70-79%) for energy, carbohydrates, protein and fat.

Table 4. Micronutrient Intake Of Pregnant Women In Urban And Rural Areas.

Micronutrients	Region		p-value
	Urban	Rural	
	Mean±SD	Mean±SD	
Vitamin A (mcg)	962.58±601.894	948.34±567.899	0.043
Vitamin C (mg)	67.15±11.55	66.45±10.98	0.065
Vitamin B1 (mg)	1.21±0.58	0.98±0.45	0.078
Vitamin B2 (mg)	0.49±0.03	0.37±0.34	0.084
Vitamin B3 (mg)	12.77±1.34	11.89±0.89	0.056
Vitamin B6 (mg)	0.95±0.13	0.87±0.11	0.075
Vitamin B12 (mg)	4.82±3.49	4.55±3.16	0.042
Vitamin E (mg)	12.44±0.16	12.10±0.08	0.088
Iron (mg)	13.12±13.43	12.13±12.99	0.052
Folic acid (mcg)	476.10±226.11	469.20±201.13	0.067

Calcium (mg)	1130.73±888.19	1056.78±783.34	0.054
Phosphorus (mg)	601.43±342.11	597.55±310.78	0.055
Fiber (gr)	15.77±4.06	14.89±3.98	0.079

The table 4 shows that there is no difference in the amount of micronutrient intake among pregnant women in urban and rural areas with p>α=0.05 for vitamin C, B1, B2, B3, B6, E, iron, folic acid, calcium, phosphorus and fiber, but there is a difference in the amount of consumption for Vitamin A (p=0.043) and Vitamin B12 (0.042). For the level of nutritional adequacy, there was a difference in the adequacy of vitamin A (p=0.024) and vitamin B12 (p=0.048) consumption among pregnant women in urban and rural areas, for other types of micronutrients, there was no difference in the adequacy of consumption with a value of p>α=0.05.

Table 5. Adequacy Level of Micronutrients of Pregnant Women in Urban and Rural Areas.

Nutrients	Nutrition Adequacy Level						p-value
	More		Normal		Less		
	Urban	Rural	Urban	Rural	Urban	Rural	
	f	(%)	f	(%)	f	(%)	
Vitamin A (mcg)	12 (48)	7	12	15	1	3	0.024
Vitamin C (mg)	4 (16)	2	8	9	13	14	0.077
Vitamin B1 (mg)	2 (8)	1	10	11	13	13	0.056
Vitamin B2 (mg)	0 (0)	2	12	9	13	14	0.067
Vitamin B3 (mg)	2 (8)	2	8	10	15	13	0.068
Vitamin B6 (mg)	5 (20)	1	7	13	13	11	0.089
Vitamin B12 (mg)	2 (8)	0	14	15	9	10	0.048
Vitamin E (mg)	3 (12)	1	9	16	13	8	0.058
Iron (mg)	5 (20)	4	8	11	12	10	0.067
Folic acid (mcg)	4 (16)	5	6	8	15	12	0.098
Calcium (mg)	6 (24)	4	7	8	12	13	0.078
Phosphorus (mg)	4 (16)	4	6	8	15	13	0.088
Fiber (gr)	8 (32)	7	7	10	10	13	0.053

Based on the table 5 above, the level of fulfillment of micronutrient intake is dominated by the level of less fulfillment (70-79%) both in urban and rural pregnant women.

Table 6. Frequency Table of Food Substance Intake in Pregnant Women in Urban and Rural Areas.

Products	Frequency of intake	Living location		p-value
		Urban	Rural	
Staple food	1-2 servings a day	12	0	0.063
	> 2 servings a day	88	100	
	Never	0	0	
Fish and its products	1-2 servings a day	8	0	0.072
	> 2 servings a day	92	100	
	Never	0	0	
Meat and its preparations	1-2 servings a day	0	0	0.067
	> 2 servings a day	0	0	
	Never	4	88	
	1 x a month	96	12	
Chicken and its preparations	1-2 servings a day	72	4	0.045

	> 2 servings a day	8	0	
	Never	0	0	
	1 x a month	20	96	
Vegetables	1-2 servings a day	76	21	0.043
	> 2 servings a day	20	79	
	Never	4	0	
Nuts and their preparations	1-2 servings a day	92	76	0.055
	> 2 servings a day	8	0	
	Never	0	20	
	1 x a month	0	4	
Fruits	1-2 servings a day	60	76	0.067
	> 2 servings a day	20	24	
	1 x a month	20	0	
Milk and its preparations	1-2 servings a day	44	72	0.066
	> 2 servings a day	44	28	
	Never	0	0	
	1 x a month	12	0	
Snack Food	1-2 servings a day	8	16	0.055
	> 2 servings a day	88	76	
	Never	0	0	
	1 x a month	4	8	

Based on Table 6 show that the food consumption frequency, there is a difference in the frequency of consumption of vegetables (p=0.043) with pregnant women in rural areas showing the frequency of consumption of vegetables more than women in urban areas, as well as for the type of chicken and its preparations (p=0.045) with women in urban areas showing more frequent consumption when compared to women in rural areas. As for staple foods (p=0.063), fish and its products (p=0.072), meat and its products (p=0.067), nuts (p=0.055), fruits (p=0.067), milk and its products (p=0.066), snacks (p=0.055) showed no difference in consumption frequency.

DISCUSSION

The dietary nutrient intake of the study sample showed that only carbohydrate, protein, vitamin A and vitamin B12 intake met the nutritional adequacy value (RDA) of more than 400 g, 70 g, 900 mg/day and 4.5 mcg. Other nutrients such as energy, fat, calcium, iron, folic acid, vitamins C, B1, B2, B6, E from the diet did not meet the RDA values. The average carbohydrate intake of the study sample exceeded the RDA. Carbohydrates contain 60-70% of the total energy required by the body (Stråvik et al., 2019). This need was met by the research sample by consuming rice, bread, sago, processed flour, cassava and corn equivalent to 5 servings a day in accordance with the recommended intake. The average protein intake was also higher than the RDA value. Fulfillment of protein intake of research samples by consuming more animal protein sources such as fish with its preparations, and less vegetable protein such as nuts with their preparations. In accordance with the recommended protein sources (Retni et al., 2016). Another finding was that vitamin A consumption exceeded the RDA. The high consumption of vitamin A and B12 may be due to the intake of green leafy vegetables and animal foods that are high in vitamin A and B12.

The results showed no difference in the fulfillment of adequate nutritional intake of pregnant women in rural and urban areas for macronutrients, namely energy and fat. The energy intake of pregnant women should increase by about 300 kcal/day during pregnancy from the total age-appropriate needs of 2430 kcal-2550 kcal/day (WHO, 2018). However, in this study, the average intake consumed by the study sample was 1918.07±431.52 for urban areas and 1815.33±402.22 for rural areas. These results indicate that the intake of macronutrients still does not meet the recommended daily needs for women in pregnancy. Although energy needs are generally the same between non-pregnant women and pregnant women in the first trimester, they will increase in the second and third trimesters (Ariyani & Erawati, 2023; Kementerian Kesehatan Republik Indonesia, 2013). In addition, pregnant women require additional protein for the formation of early pregnancy-related tissues and maintaining new tissues (Grenier et al., 2021; Kementerian Kesehatan Republik Indonesia, 2013). In this study, there was no difference in the protein intake of pregnant women in urban and rural areas.

Adequate nutritional intake during pregnancy is very important to support normal fetal growth and development, meet the mother's own nutritional needs without depleting food reserves and damaging maternal tissues and have a positive impact on future fetal life until adulthood (Ariyani & Erawati, 2023; Mousa et al., 2019; Qureshi & Khan, 2015). During pregnancy, a mother must increase the amount and type of food eaten to meet the needs of fetal growth by consuming a variety of foods in a balanced amount and proportion according to what has been determined (Suliga, 2015; Yosephin, 2018). Various research results suggest that many pregnant women still have poor nutritional status, including Chronic Energy Deficiency (CED) and anemia. One of the causes is because her food intake during pregnancy is insufficient for her own needs, let alone for the needs of her baby (Nugrahini et al., 2014; Permatasari et al., 2021). As a result, the fetus does not get the nutrients it needs, thus disrupting its growth and development (Cannon et al., 2020; Suliga, 2015; Yosephin, 2018).

Poor fetal growth results not only from protein and energy deficiencies, but also from inadequate intake of micronutrients that are essential during pregnancy (Mousa et al., 2019; WHO, 2018). The results showed a deficiency in micronutrient intake in the form of iron, vitamins C, E and folic acid which play an important role in the formation and defense of hemoglobin. The iron needs of pregnant women are higher than the average intake of iron that can be absorbed from food so that when the consumption of iron-containing foods decreases, the body will meet the needs of the fetus by taking maternal iron reserves, potentially causing iron deficiency anemia. The prevalence of anemia in developing countries is around 56% (Abay et al., 2017; WHO, 2018). Folic acid plays a role in the metabolism of amino acids needed in the formation of red blood cells (Sendeku et al., 2020). Folic acid is the synthesized form of vitamin B. Food sources rich in folate are oranges, dark green vegetables, beans and liver. The need for folate increases during pregnancy to support the rapid cell division associated with fetal growth. In particular, folic acid supplements (400-800 µg/day) are taken before conception to reduce the occurrence of fetal neural tube defects (Argyridis, 2019). However, none of the respondents in this study consumed folic acid before pregnancy, only consumed folic acid supplements during pregnancy, and even then only by pregnant women in urban areas. This finding is different from Suliga's study, which found that the dominant pregnant women in urban areas had consumed folic acid long before marriage (Suliga, 2015). In fact, to reduce the risk of neural tube defects in the fetus, folic acid consumption is not only recommended through supplements but also from foods that contain folic acid. Based on the results of the respondent's food recall, it shows that folate intake has met the recommended nutritional adequacy rate, which is around 600 mcg (WHO, 2018). Vitamin E helps in the formation of cell membranes which will have an impact on the stability of red blood cell membranes. So if vitamin E deficiency occurs, it can cause the state of red blood cells to be weak and abnormal (Cave et al., 2018; WHO, 2018). This condition causes the hemoglobin levels of pregnant women to

decrease, although some have normal hemoglobin levels. In this study, the dominant sample showed hemoglobin values ≥ 11 gr/dl. This value is considered a normal Hb value. This may be due to the consumption of protein-rich foods that contain high amounts of iron, increased consumption of vitamin B12 which plays a role in the formation of red blood cells and regularity in taking iron supplements given.

Dietary diversity is used as a key indicator in assessing the quality of an individual's or household's diet, indicating adequate nutrient intake through food (Forbes et al., 2018; Sibhatu et al., 2015). The more varied the food, the more complementary nutrients are obtained (Sibhatu et al., 2015; Yeneabat et al., 2019). If the diet of pregnant women lacks variety, it will experience a lack of essential nutrients and as a result the fetus will not get the nutrients needed for healthy growth. The problem of micronutrient deficiencies is a double burden on pregnant women because pregnancy is characterized by increased demand for various types of micronutrients by fetoplacental tissue as well as changes in the metabolism of most low serum micronutrients during pregnancy which become severe as gestational age increases (Forbes et al., 2018; Kazma, 2020). Women's food behavior and intake during pregnancy is greatly influenced by different cultural practices, myths and taboos. Ethnic Indian women usually consume the most locally available, easily accessible and culturally acceptable foods (Kazma, 2020; Sibhatu et al., 2015). Although this study did not find any taboos or myths among pregnant women related to food during pregnancy. However, the provision of foodstuffs in rural women is more from gardening products such as vegetables and those brought by traveling sellers.

Another contributing factor to micronutrient deficiencies is when people do not have access to micronutrient-rich foods such as fruits, vegetables, animal products due to economic conditions, education and/or food shortages (Cannon et al., 2020; Saaka et al., 2021). In this study, the inadequate intake of micronutrients was due to changes in the mother's diet, which before pregnancy liked micronutrient source foods but during pregnancy did not like to consume them or consumption patterns that were monotonous, only liked one or two types of food, did not want to vary it even though they had enough income to buy it. Another factor is that pregnant women from adolescence do not like certain types of food that continue into their pregnancy. These results are in line with research conducted in Pakistan, Kenya and Western Ethiopia (Abay et al., 2017; Kiboi et al., 2017; Qureshi & Khan, 2015).

Varying and increasing the frequency of meals can increase the diversity of a woman's diet. Changing breakfast, lunch and dinner menus can be one way for pregnant women to get adequate nutrition from the diversity of foods consumed (Kiboi et al., 2017). However, in this study, pregnant women both in urban and rural areas have a diet with monotonous types of food and lack of variety in processing which is dominant in cooking clear or fried only for protein sources such as fish, tofu and tempeh, fruits are dominant bananas, vegetables such as spinach, long beans, and kale, while for carbohydrates are dominant white rice. It is known that every meal in one day, pregnant women consume one portion of staple food, generally rice and added with one type of side dish and vegetable, sometimes added fruit if available, even there are pregnant women who only consume staple food and one type of vegetable. To achieve balanced nutrient input is not only fulfilled by one type of food, but must consist of a variety of foodstuffs (Retni et al., 2016). In addition, all women during pregnancy require micronutrient supplements (Haider & Bhutta, 2017). Samples in this study received iron and calcium supplementation, but some samples did not regularly take it because they forgot or because they did not like the taste.

A comparison of the lifestyles of women in urban and rural areas in developing countries shows that the lifestyles of people in rural areas are less healthy, partly due to lack of access to antenatal and adolescent reproductive health services, lower awareness of the importance of

healthy nutrition and poor food quality when compared to urban women (Grenier et al., 2021; Nana & Zema, 2018). It has been shown that rural women have a higher risk of LBW than urban women (Adikari et al., 2016; Ali et al., 2014; Nana & Zema, 2018). However, technological advances, especially in the field of mass media, have penetrated into the lives of rural households and people have begun to imitate urban lifestyles. Rural life is no longer traditional in style, but practices and habits are becoming more similar to urban society. As in this study, consumption patterns, access to maternity services, education level and types of food ingredients and food processing methods were similar between rural and urban women. Although women in rural areas predominantly obtain food items such as vegetables from their farms, sources of protein, fat, carbohydrates are obtained from one source, namely from the central market and fish auction.

Several studies have reported that pregnancy in adolescence is strongly associated with various negative consequences of pregnancy (Čvorović, 2022; Fuada et al., 2020; Samsury et al., 2022). Although the sample was generally in the healthy reproductive age range, about 32% of respondents in urban areas and 36% of respondents in rural areas were less than 20 years old, which is characterized by the condition of reproductive organs that are not yet fully mature and the development of several body parts that require adequate nutritional intake. It is marked that all respondents in the unhealthy reproductive age range experienced chronic energy deficiency characterized by LILA values <23.5 cm and most were primigravida (first pregnancy). These results are in line with several studies that reveal that the pre-marital nutritional status of women who become pregnant before healthy reproductive age greatly affects their food consumption patterns during pregnancy and it was found that most of the deficient nutritional status before pregnancy will continue until pregnancy and even the end of pregnancy (Čvorović, 2022; Nigatu et al., 2018). Some literature shows that undernourished pregnancies (low BMI) and low weight gain during pregnancy can increase the risk of labor complications, maternal tissue depletion and Intra Uterine Growth Retardation (IUGR), stillbirth, and LBW in infants (Grenier et al., 2021; Downs, et al., 2014). In this study, the food consumption habits of pregnant women in both rural and urban areas are more likely to follow consumption patterns during adolescence, namely by choosing certain foods to be consumed, besides that there are those who experience changes in appetite, namely no longer consuming foods that were commonly consumed before pregnancy due to the emergence of dislike for these foods after pregnancy.

Analysis conducted on the frequency of food consumed shows that there is no difference in the consumption of staple foods between urban and rural pregnant women with a frequency of > 1x/day for white rice, sago (kapurung and dange) 4-6x/week, wheat flour (bread), corn and sweet potatoes 1-3x/week,. There is no difference in the consumption of fish, processed products and processing methods, namely boiled and fried in pregnant women in urban and rural areas with a frequency of consumption > 1x/day, eggs that are omelet and boiled 4-6x / week, fried chicken 1-3x / month. Types of legumes and their preparations consumed by pregnant women in urban and rural areas 1-3x / week include types of tofu, tempeh. There is no difference in vegetable consumption among pregnant women in rural and urban areas, in terms of types and processing methods, namely cooked and stir-fried. In general, every meal, pregnant women consume more than one type of vegetable together with a frequency of >1x/day. This finding is in contrast to some research results which show that pregnant women in urban areas consume more staple foods, fish, milk and vegetables, thus indicating that the food intake of pregnant women in rural areas is poor (Suliga, 2015).

4. CONCLUSION

The fulfillment of macronutrient and micronutrient intake of pregnant women in urban and rural areas in this study did not meet the recommended nutritional adequacy standards.

Eating patterns during adolescence that tend to be picky about food and like instant food persist into marriage and pregnancy, preference for only one or two types of food so that they do not want to vary their intake, changes in appetite after pregnancy are factors that cause inadequate intake of some macro and micronutrients of pregnant women in rural and urban areas. Improvements in nutritional status should begin when women are in adolescence. Nutritional patterns that have been well established since adolescence become the foundation in forming optimal nutritional habits in the next life cycle for women. Through proper nutrition education, adolescent girls can improve and increase food consumption patterns in accordance with the recommended recommendations. As for pregnant women, nutrition education during pregnancy can be provided not only using printed media but through accessible nutrition applications that contain the amount of macronutrients and micronutrients needed, food sources and substitutes, practical but still nutritious processing methods, equipped with a 24-hour helpdesk. So that independently, pregnant women can apply it in their daily lives.

REFERENCES

Abay, A., Yalew, H. W., Tariku, A., & Gebeye, E. (2017). Determinants of prenatal anemia in Ethiopia. *Archives of Public Health*, *75*(1), 1–10. https://doi.org/10.1186/s13690-017-0215-7

Adikari, A. M. N. T., Sivakanesan, R., Wijesinghe, D. G. N. G., & Liyanage, C. (2016). Assessment of *nutritional* status of pregnant women in a rural area in Sri Lanka. *Tropical Agricultural Research*, *27*(2), 203. https://doi.org/10.4038/tar.v27i2.8168

Ali, F., Thaver, I., & Khan, S. A. (2014). Original Article Assessment Of *Dietary* Diversity And Nutritional Status Of Pregnant Women In Islamabad , Pakistan Fatima Ali , Inayat Thaver , Shahzad Ali Khan. *J Ayub Med Coll Abbottabad*, *26*(4), 506–509.

Argyridis, S. (2019). Folic acid in pregnancy. *Obstetrics, Gynaecology and Reproductive Medicine*, *29*(4), 118–120. https://doi.org/10.1016/j.ogrm.2019.01.008

Ariyani, N. W., & Erawati, N. L. P. S. (2023). Assessment of nutrient intake and antenatal education method for pregnant women in Gianyar, Bali, Indonesia. *Bali Medical Journal*, *12*(1), 934–939. https://doi.org/10.15562/bmj.v12i1.4194

Asmar. (2022). *Hasil Analisis Data Pengukuran Stunting Tingkat Kota Palopo*. Ritmee. Retrieved from https://ritmee.co.id/hasil-analisis-data-pengukuran-stunting-tingkat-kota-palopo/. 2022

Astika, T., Permatasari, E., Rizqiya, F., Kusumaningati, W., Indraaryani, I., & Hermiwahyoeni, Z. (2021). *Pengaruh pendidikan gizi dan kesehatan reproduksi ibu hamil di Indonesia menggunakan studi eksperimental semu*. 1–15.

Blumfield, M. L., Hure, A. J., MacDonald-Wicks, L., Smith, R., & Collins, C. E. (2013). A systematic review and meta-analysis of micronutrient intakes during pregnancy in developed countries. *Nutrition Reviews*, *71*(2), 118–132. https://doi.org/10.1111/nure.12003

Cannon, S., Lastella, M., Vincze, L., Vandelanotte, C., & Hayman, M. (2020). A review of pregnancy information on nutrition, physical activity and sleep websites. *Women and Birth*, *33*(1), 35–40. https://doi.org/10.1016/j.wombi.2018.12.007

Cave, C., Hanson, C., Schumacher, M., Lyden, E., Furtado, J., Obaro, S., Delair, S., Kocmich, N., Rezac, A., Izevbigie, N. I., Van nOrmer, M., Kamil, A., McGinn, E., Rilett, K., Elliott, E., Johnson, R., Weishaar, K., Olateju, E. K., Akaba, G. A., … Anderson-Berry, A. (2018). A comparison of vitamin E status and associated pregnancy outcomes in maternal–infant dyads between a Nigerian and a United States population. *Nutrients*, *10*(9), 1–14. https://doi.org/10.3390/nu10091300

Čvorović, J. (2022). Maternal age at marriage and child nutritional status and development:

evidence from Serbian Roma communities. *Public Health Nutrition*, *25*(5), 1183–1193. https://doi.org/10.1017/S1368980022000544

Downs, D. S., Savage, J. S., & Rauff, E. L.. (2014). Falling Short of Guidelines? Nutrition and Weight Gain Knowledge in Pregnancy. *Journal of Women's Health Care*, *03*(05). https://doi.org/10.4172/2167-0420.1000184

Faber, M., Kunneke, E., Wentzel-Viljoen, E., & Wenhold, F. (2016). *Dietary Intake Assessment 24-Hour Recall Compiled By: Dietary intake assessment 24-hour recall Dietary intake assessment: 24-hour recall*. http://www.cdc.gov/nchs/nhanes/measuring_guides_dri/measuringguides02.htm

Forbes, L. E., Graham, J. E., Berglund, C., & Bell, R. C. (2018). Dietary change during pregnancy and women's reasons for change. *Nutrients*, *10*(8), 1–10. https://doi.org/10.3390/nu10081032

Fuada, N., Latifah, L., Yunitawat, D., & Ashar, H. (2020). Assessment of nutritional status of children under-five in families of adolescent mothers in Indonesia 2013. *Journal of Nutritional Science and Vitaminology*, *66*(29), S425–S431. https://doi.org/10.3177/jnsv.66.S425

Grenier, L. N., Atkinson, S. A., Mottola, M. F., Wahoush, O., Thabane, L., Xie, F., Vickers-Manzin, J., Moore, C., Hutton, E. K., & Murray-Davis, B. (2021). Be Healthy in Pregnancy: Exploring factors that impact pregnant women's nutrition and exercise behaviours. *Maternal and Child Nutrition*, *17*(1), 1–9. https://doi.org/10.1111/mcn.13068

Grieger, J. A., Grzeskowiak, L. E., & Clifton, V. L. (2014). Preconception dietary patterns in human pregnancies are associated with preterm delivery. *Journal of Nutrition*, *144*(7), 1075–1080. https://doi.org/10.3945/jn.114.190686

Haider, B. A., & Bhutta, Z. A. (2017). Multiple-micronutrient supplementation for women during pregnancy (Review) Summary Of Findings For The Main Comparison. *Cochrane Database of Systematic Reviews*, *4*(4), CD004905. https://doi.org/10.1002/14651858.CD004905.pub5

Kazma, J. M., van den Anker, J., Allegaert, K., Dallmann, A., & Ahmadzia, H. K. (2020). Anatomical and physiological alterations of pregnancy. *Journal of pharmacokinetics and pharmacodynamics*, *47*(4), 271-285. https://doi.org/10.1007/s10928-020-09677-1

Keats, E. C., Haider, B. A., Tam, E., & Bhutta, Z. A. (2019). Multiple-micronutrient supplementation for women during pregnancy. *Cochrane Database of Systematic Reviews*, *2019*(3). https://doi.org/10.1002/14651858.CD004905.pub6

Kementerian Kesehatan Republik Indonesia. (2013). *Buku Saku Pelayanan Kesehatan Ibu Di Fasilitas Kesehatan Dasar Dan Rujukan*, Kementerian Kesehatan Republik Indonesia.

Kementerian Kesehatan Republik Indonesia. (2018). *Hasil Riset Kesehatan Dasar Tahun 2018*. Kementerian Kesehatan Republik Indonesia.

Kiboi, W., Kimiywe, J., & Chege, P. (2017). Determinants of dietary diversity among pregnant women in Laikipia County, Kenya: A cross-sectional study. *BMC Nutrition*, *3*(1), 1–8. https://doi.org/10.1186/s40795-017-0126-6

Hardinsyah, M., & Supariasa, I. D. N. (2016). *Ilmu gizi teori dan aplikasi*. Jakarta: Penerbit Buku Kedokteran EGC.

Mousa, A., Naqash, A., & Lim, S. (2019). Macronutrient and micronutrient intake during pregnancy: An overview of recent evidence. *Nutrients*, *11*(2), 1–20. https://doi.org/10.3390/nu11020443

Nana, A., & Zema, T. (2018). Dietary practices and associated factors during pregnancy in northwestern Ethiopia. *BMC Pregnancy and Childbirth*, *18*(1), 1–8. https://doi.org/10.1186/s12884-018-1822-1

Nigatu, M., Gebrehiwot, T. T., & Gemeda, D. H. (2018). Household Food Insecurity, Low

Dietary Diversity, and Early Marriage Were Predictors for Undernutrition among Pregnant Women Residing in Gambella, Ethiopia. *Advances in Public Health*, *2018*, 1–10. https://doi.org/10.1155/2018/1350195

Nugrahini, E. Y., Effendi, J. S., Herawati, D. M. D., Idjradinata, P. S., Sutedja, E., Mose, J. C., & Syukriani, Y. F. (2014). Asupan Energi dan Protein Setelah Program Pemberian Makanan Tambahan Pemulihan Ibu Hamil Kurang Energi Kronik di. *IJEMC (Journal Of Education and Midwifery Care)*, *1*(1), 41–48.

Paknahad, Z., Fallah, A., & Moravejolahkami, A. R. (2019). Maternal Dietary Patterns and Their Association with Pregnancy Outcomes. *Clinical Nutrition Research*, *8*(1), 64. https://doi.org/10.7762/cnr.2019.8.1.64

Permatasari, T. A. E., Rizqiya, F., Kusumaningati, W., Suryaalamsah, I. I., & Hermiwahyoeni, Z. (2021). The effect of nutrition and reproductive health education of pregnant women in Indonesia using quasi experimental study. *BMC Pregnancy and Childbirth*, *21*(1), 1–15. https://doi.org/10.1186/s12884-021-03676-x

Quansah, D. Y., & Boateng, D. (2020). Maternal dietary diversity and pattern during pregnancy is associated with low infant birth weight in the Cape Coast metropolitan hospital, Ghana: A hospital based cross-sectional study. *Heliyon*, *6*(5), e03923. https://doi.org/10.1016/j.heliyon.2020.e03923

Qureshi, Z., & Khan, R. (2015). Diet Intake Trends Among Pregnant Women in Rural Area of Rawalpindi, Pakistan. *Journal of Ayub Medical College, Abbottabad : JAMC*, *27*(3), 684–688.

Retni, R., Margawati, A., & Widjanarko, B. (2016). Pengaruh status gizi & asupan gizi ibu terhadap berat bayi lahir rendah pada kehamilan usia remaja. *Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition)*, *5*(1), 14–19. https://doi.org/10.14710/jgi.5.1.14-19

Royani, I., Mappaware, N. A., Darma, S., Khalid, N., & Utami, D. F. (2021). The Relationship between Nutritional Status of Pregnant Women and Stunted Children. *Green Medical Journal*, *3*(1), 39–46. https://doi.org/10.33096/gmj.v3i1.80

Saaka, M., Mutaru, S., & Osman, S. M. (2021). Determinants of dietary diversity and its relationship with the nutritional status of pregnant women. *Journal of Nutritional Science*, 1–8. https://doi.org/10.1017/jns.2021.6

Samsury, S. F., Ismail, T. A. T., & Hassan, R. (2022). Low birth weight infant among teenage pregnancy in Terengganu, Malaysia: A cross-sectional study. *Malaysian Family Physician*, *17*(1), 44–51. https://doi.org/10.51866/oa.59

Sendeku, F. W., Azeze, G. G., & Fenta, S. L. (2020). Adherence to iron-folic acid supplementation among pregnant women in Ethiopia: A systematic review and meta-analysis. *BMC Pregnancy and Childbirth*, *20*(1), 1–9. https://doi.org/10.1186/s12884-020-2835-0

Sibhatu, K. T., Krishna, V. V., & Qaim, M. (2015). Production diversity and dietary diversity in smallholder farm households. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(34), 10657–10662. https://doi.org/10.1073/pnas.1510982112

Stråvik, M., Jonsson, K., Hartvigsson, O., Sandin, A., Wold, A. E., Sandberg, A. S., & Barman, M. (2019). Food and nutrient intake during pregnancy in relation to maternal characteristics: Results from the nice birth cohort in northern Sweden. *Nutrients*, *11*(7). https://doi.org/10.3390/nu11071680

Sudfeld, C. R., & Smith, E. R. (2019). New evidence should inform WHO guidelines on multiple micronutrient supplementation in pregnancy. *Journal of Nutrition*, *149*(3), 359–361. https://doi.org/10.1093/jn/nxy279

Suliga, E. (2015). Nutritional behaviours of pregnant women in rural and urban environments.

Annals of Agricultural and Environmental Medicine, *22*(3), 513–517. https://doi.org/10.5604/12321966.1167725

WHO. (2018). WHO Recommendation on Antenatal Care for a Positive Pregnancy Experience: Summary. *The Lancet*, *387*(10017), 1–10. https://doi.org/10.1186/1742-4755-10-19.5

Yeneabat, T., Adugna, H., Asmamaw, T., Wubetu, M., Admas, M., Hailu, G., Bedaso, A., & Amare, T. (2019). Maternal dietary diversity and micronutrient adequacy during pregnancy and related factors in East Gojjam Zone, Northwest Ethiopia, 2016. *BMC Pregnancy and Childbirth*, *19*(1), 1–9. https://doi.org/10.1186/s12884-019-2299-2

Yosephin, B. (2018). *Tuntunan Praktis Menghitung Kebutuhan Gizi*. Yogyakarta: Andi. Retrieved from https://pustaka.pekanbaru.go.id/inlislite3/opac/detail-opac?id=28395