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Nutritional status and food patterns of indigenous people in the Arfak Mountains Papua

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ABSTRACT

The traditional community was vulnerable to food insecurity and undernutrition due to limited access to health services, infrastructure, and socioeconomic status. Therefore this study tried to assess the nutritional status and diet patterns of people in the Arfak Mountains Manokwari West Papua Province. This research was done using a cross-sectional method. Assessment of nutritional status was based on body mass index for age (BMI/A). The type and frequency of food were obtained through interviews using the Food Frequency Questionnaire with modification. The association of food patterns and nutritional status were analysed using the Pearson chi-square test. The age of respondents for children ranged from 6-18 years, and adults ranged from 19-60 years with the total subjects 225 people. The results showed that the overnutrition of children (10.49% obesity and 12.35% overweight) was higher than undernutrition (7.41% thinness). In adults, we also found that overnutrition (12.70% overweight and 33.33% obese) was higher than undernutrition (3.17% wasting). Based on the type and frequency of food, rice (25.55%) and tuber (41.62%) were the most nutritious source of carbohydrates, 66.54% of animal protein, and 70.97% of vegetable protein. Chayote leaves, watercress, dutch eggplant, and passion fruit were the more often consumed vegetables and fruits. Based on diet patterns, 56.89% of the community has a poor diet and only 43.11% have a good diet. The pattern of food consumption of Arfak people did not show a significant effect on their nutritional status (p-value < 0.05). Although most people in the Arfak mountains tend to be over nutrition, their diet pattern shows food insecurity because of the low food frequency.

Keywords: Arfak mountains, food frequency, nutritional status, children, adult, adaptive response

1 INTRODUCTION

People in Papua face the double burden of malnutrition that is under nutrition and over nutrition. A study by Kemenkes (2023) showed that the cases of stunting, wasting, overweight and obesity were relatively high in the Papuan compared to the Indonesian people.

One of the main factors that influence cases of malnutrition is related to food or nutrition intake. Data from Food Security and Vulnerability Atlas (FSVA) reveals that Papua is one of the regions with the highest level of food insecurity in Indonesia (FSVA, 2023), so it is predicted that the Arfak people who live in isolated areas such as the Arfak Mountains are also at the risk of experiencing food insecurity.

The human body needs nutrition as an energy in the process of growth, development and reproduction. Food consumed must contain optimal nutrients in the form of carbohydrates, proteins, fats, vitamins, minerals and water (Kusmiyati, 2012). The more varied or diverse the food consumed, quality, and the more fulfilled the adequacy of nutrients which can then have an impact on nutritional status and health (Azrimaidaliza & Purnakarya, 2011).

Previous research revealed that environmental stress such as disease and malnutrition can impact people's physical growth and development (Walker et al., 2006). A Malaria is an endemic disease and can be deadly in Papua and the percentage of stunting in children aged 0-5 years in all regencies of Papua was higher than in Indonesian children (Kemenkes, 2023). It is reflects environmental pressure conditions. Under these conditions, more energy is allocated to maximize the potential of the most beneficial biological traits as acceleration of growth rate and younger age of sexual maturation to maximize fitness, as an adaptation process to face environmental pressures (Stearns, 1989; Walker et al., 2006; Kawulur et al. 2012; Kawulur et al. 2013; Bolund, 2020). In the long term, a lack of optimal growth and development that occurs early in life will have an impact on later life in adulthood such as the emergence of degenerative diseases, premature aging, short life expectancy and reduced quality of life (Lemaître et al., 2015; Hayward et al. 2015; Maklakov & Chapman, 2019).

The Arfak tribe, an indigenous tribe that lives in this conservation area, has a livelihood as farmers using a shifting cultivation system. The Arfak commonly refers to a tribe consists of 4 sub-tribes, namely Hattam, Sougb, Meyah and Moile tribes. The main supply of community food security comes from planted garden products such as tubers as staple food and horticultural crops,

while food sources of protein are rarely obtained and more often come from wild animals in the surrounding forests (Kawulur et al, 2023).

Topographic conditions in mountain areas with an altitude of around 1200-2000 meters above sea level create environmental challenges that make it difficult to obtain nutritious food. Difficult and expensive transportation access to and from the urban area of Manowakri causes the people of Arfakto live quite isolated lifes with very limited to healthcare services, education and other basic infrastructure. These conditions directly affects the growth and nutritional status majority of the Arfak people. Therefore, this study aims to assess the relationship between food patterns and the nutritional status of the traditional population aged 6-60 years in the Arfak Mountains.

METHODS

This study was conducted from March to May 2024 in the Arfak Mountains areas, consisting of three locations: Anggi District, Menyambouw Village, and Kwau Village, West Papua Province. A cross-sectional method was applied to the children and adults aged 6-60 years with the total subjects 225 people. Assessment of nutritional status was based on the measurement of body mass index for age (BMI/U) for children and adults based on the Kemenkes (2020; 2023) category. The type and frequency of food consumed were obtained through interviews using the Food Frequency Questionnaire with modification. The types of food consumed by the Arfak Mountains community consist of 59 types which are classified into four nutritional components, namely carbohydrates consisting of eight types, protein (animal and vegetable) 19 types, vitamins and minerals (vegetables and fruits) 33 types.

Data collection used a purposive sampling technique with inclusion criteria subjects signing a consent statement. The association of food patterns and nutritional status were analysed using the Pearson chi-square test. Eating patterns are categorized as good and poor. Poor category if the results of a total point are less than an average point, and conversely good category if the total points are more than the average.

RESULTS AND DISCUSSION

The nutritional status of children aged between 6-18 years and the nutritional status of adults aged between 19-60 years in the Arfak Mountains based on body mass index for age (BMI/A) can be seen in Figure 1 and Figure 2.

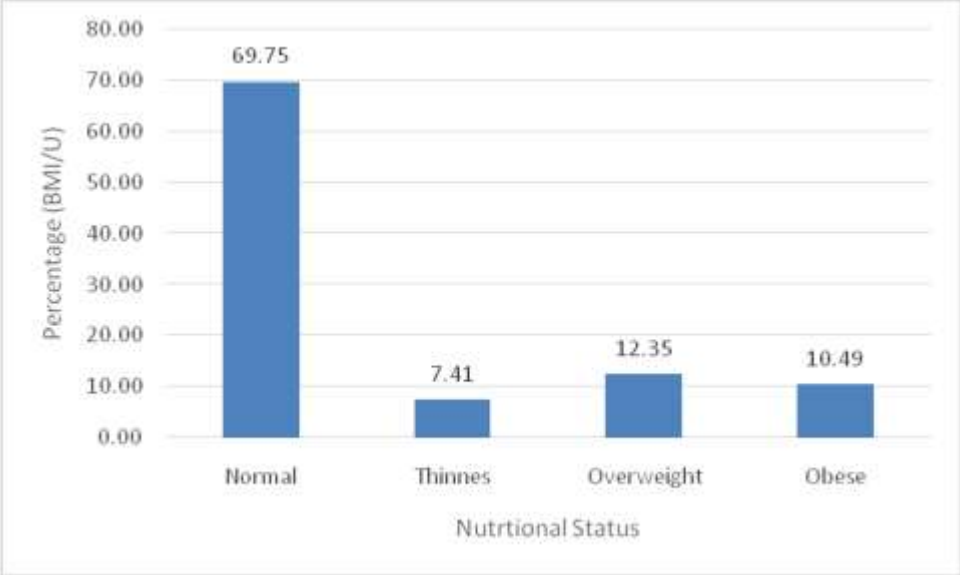

Figure 1. Category of Nutritional Status of Children BMI/U Arfak Mountains

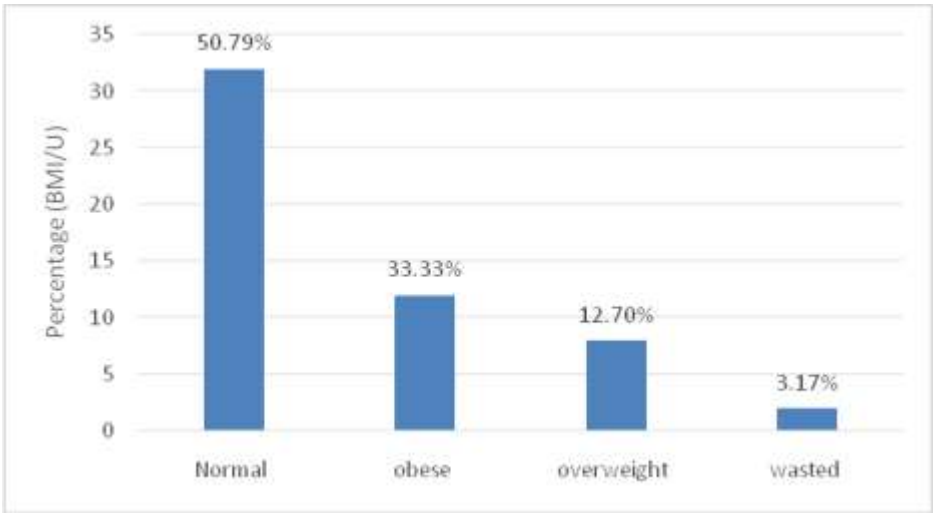

Figure 2.Category of Adult Nutritional Status (BMI/U) in the Arfak Mountain

The nutritional status of children with body mass index for age (BMI/A) in the Arfak Mountains was 7, 41% (12 respondents) for the thinnes category. The status of overweight children was 12% (20 respondents), while obese children have a percentage of 10% (17

respondents). These results revealed that the case of undernutrition was lower than the case of over nutrition. In adults, the nutritional status has a percentage of obesity of 33.33% (21 respondents), the overweight has a percentage of 12.70% (8 respondents), and the wasting category has a percentage of 3.17% (2 respondents). These results also indicated that the cases of over nutrition in adults were relatively high.

The category of thinness in children and wasting in adults was lower when compared to Indonesian nutritional status based on Kemenkes (2023). The prevalence of obesity in children also tends to be lower compared to Indonesian children, and other studies by Suryamulyana and Arimbawa in Bali (2019); Pratiwi in South Manokwari (2023). An interesting fact on the obesity of adults which was showed higher when compared to the Indonesian standard.

Cases of obesity in people living in rural areas are quite an interesting phenomenon because obesity tends to occur in urban communities with good socio-economic conditions. The high prevalence of obesity in adults is also found in other provinces of the Papua region. There are four provinces which showed it, namely West Papua (29.3%), Southwest Papua (29.3%), Papua (31.3%), and Central Papua (26.9%). All of these percentages are higher than Indonesian adults with a percentage of 23.4%.

Obesity can occur due to environmental and genetic factors, such as lifestyle, activity, socio-economic, eating behaviour and early overfeeding (Heird, 2002). The study of Parengkuan et al. (2013) showed that there is an influence between high parental income and obesity.

Parental education and knowledge play a role in understanding the importance of children's nutrition, especially regarding nutrition itself. The better the level of education and knowledge of parents, the better the level of understanding of good nutrition for children's growth and development (Hasrul, 2020). Our results found that most parents have a low level of formal education, namely elementary school (44.34%). Study of Dary (2021) showed that the low socio-economic status of the family, for example, low income from the head of the family, inhibits the growth and nutritional status of children. Our study showed that many of the parents' income as farmers was considered low. However, the nutritional status of their children was commonly good. This happened might be because most of the community were farmers (81.88%). As subsistence farmers, the nutritional intake of carbohydrate sources commonly comes from planted taro, cassava, pumpkin, potatoes and bananas, while vitamin and mineral sources are from horticultural

plants (vegetables and fruits). These all foods which were available in their daily foods described they consume good nutrition.

Many people in the Arfak Mountains tend to be obese, especially adults people. They tend to consume a large portion of rice and tubers as carbohydrate sources. The more energy intake obtained from the food will be stored as fat in the body. Their habits which are not eating regularly and eating large portions when the food is available can disturb the composition and abundance of micro biota in the digestation systems. The disturbance of the rhythm of the food consumed can affect the microbiota metabolism in digestion and influence body weight regulation in obesity (Canfora et al. 2017). Davis (2016) stated that gastrointestinal microbiota can influence both sides of the energy balance namely, as a factor influencing energy utilization from the diet and as a factor that influences host genes that regulate energy expenditure and storage. Genetic factors might be also the reason why people and many others in Papua are prone to obesity.

Food Patterns of Arfak Mountains Community

Based on carbohydrate food sources, five types of carbohydrate sources were most consumed by the Arfak community with the highest percentages seen in Figure 3. Rice has the highest percentage eaten by the Arfak people (22.55%), while the lowest percentage was pumpkin (7.09%) in the study sites. Many people prefer rice, although this staple is quite difficult to obtain.

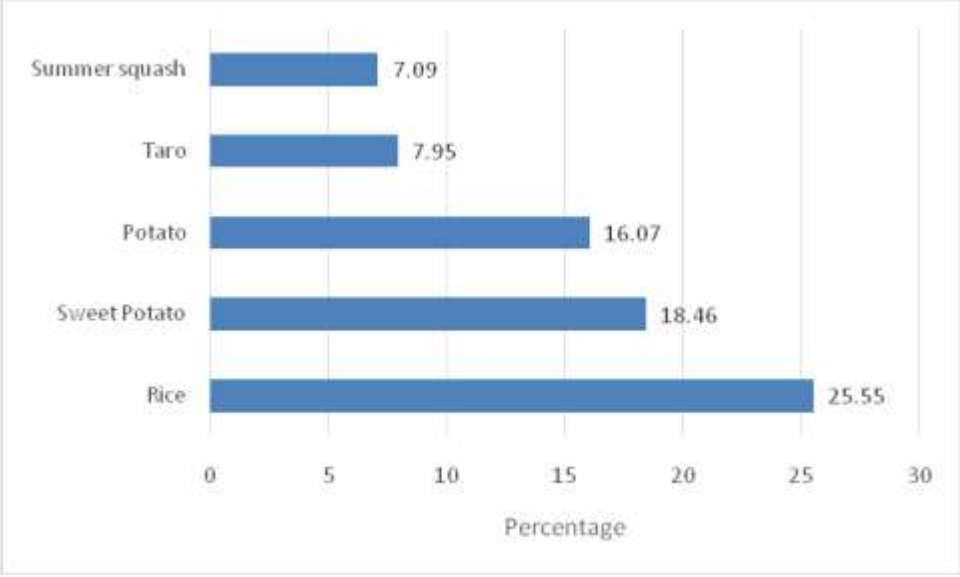

Figure 3. Types of carbohydrate foods consumed by the Arfak communit

Based on the types of animal protein consumed by the Arfak community, five types are most often consumed, namely chicken 16.65%, chicken eggs 14.48%, *wild animals* 13.17% and boar 8.39%. (Figure 4). *Arfak Mountains* were the native animal in Papua as *Cuscus* spp., birds, and Bandicoot. They usually hunted it in the nearby forests.

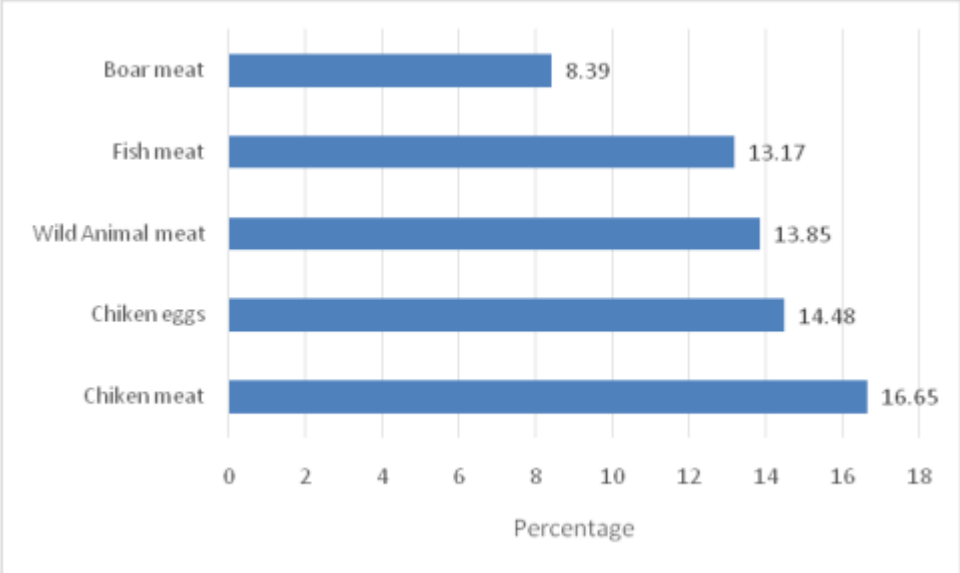

Figure 4. Types of animal protein sources consumed by the Arfak community

Figure 5 shows the five highest types of vegetable protein sources consumed by the Arfak Mountains community. Tofu (22.81%) and tempeh (22.14%) were the vegetable protein foods commonly consumed by the Arfak people.

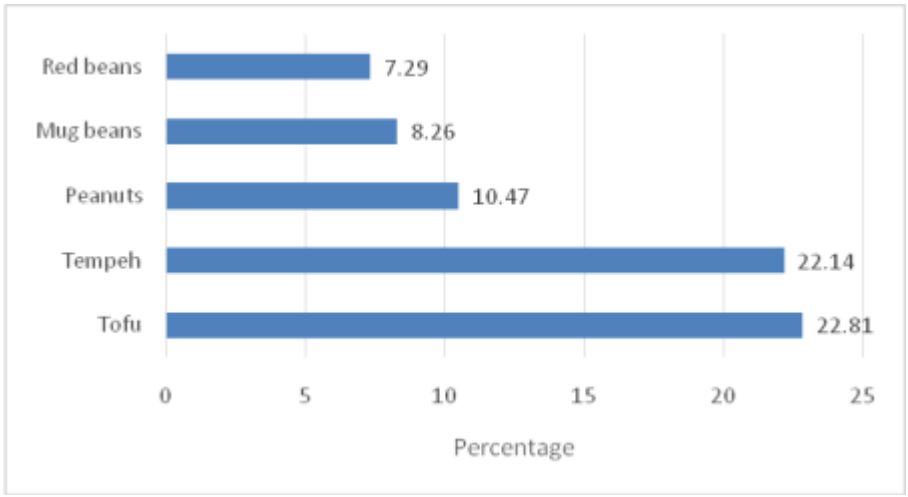

Figure 5. Types of vegetable protein sources consumed by the Arfak community

The result indicates there are five vegetables consumed by the community, namely chayote leaves (13.47%), cabbage (13.18%), water cress (9.14%), green mustards (6.76%) and spring onions (4.83%) (Figure 6). Five fruits were often consumed by the community, namely dutch eggplant 18.06%, passion fruit 16.13%, pineapple 11.92%, avocado 6.5% and bananas 5.92%. (Figure 8)

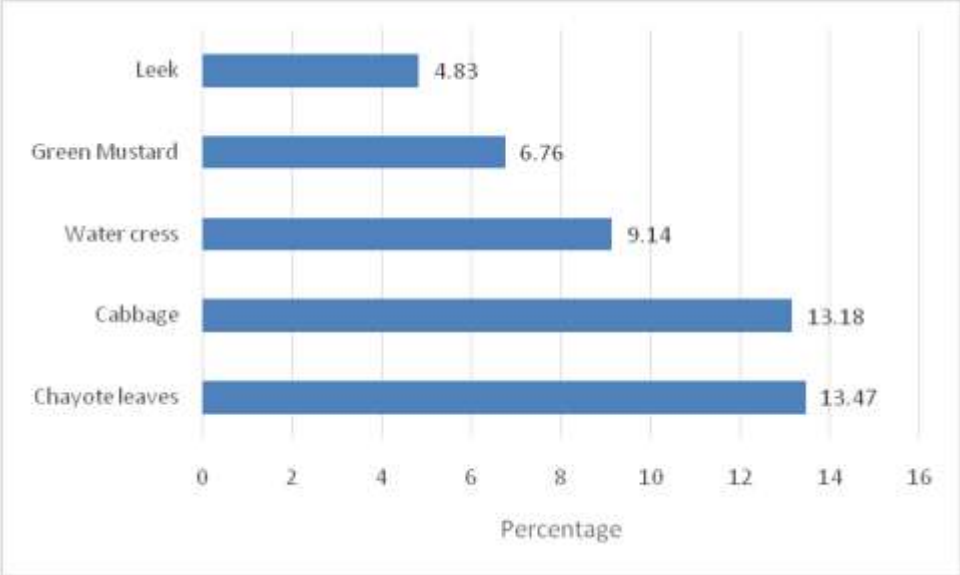

Figure 7. Types of vegetables food consumed by the Arfak community

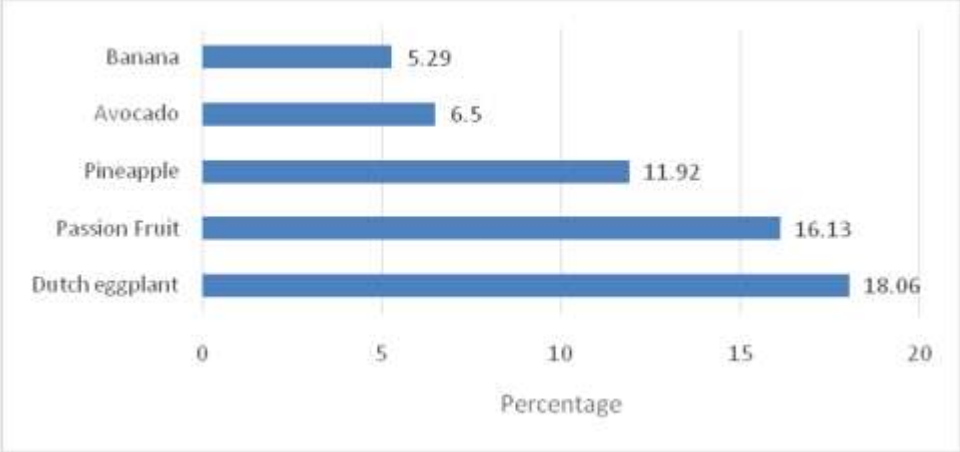

Figure 8. Types of fruits food consumed by the Arfak community

The eating patterns of the people in the Arfak Mountains can be seen from the type of staple food commonly consumed by the community, which was rice, while the least was pumpkin. From eight carbohydrate questions, five types of carbohydrates were taken that were most highly consumed by the people in the Arfak Mountains, namely rice, potatoes, taro and pumpkin. In the

type of carbohydrate, four types of carbohydrates were cultivated or planted by the community, namely sweet potatoes, potatoes, taro, and pumpkin, while rice is bought from the city. Although carbohydrate sources from tubers are commonly the main menu as staple food in Papuan people especially those living in mountain areas, the study showed that Arfak people prefer to consume rice. It's showed that there has been a shift in preference for consuming rice than tubers. The change in the preferences can create a threat of hunger or malnutrition, especially in children. According to Mokoginta et al. (2016), rice is the main food with a consumption frequency of more than 1 time a day. In addition to rice, staple foods can be obtained from non-rice foods such as corn and tubers.

The protein mostly comes from chicken and the least comes from boar. From 14 protein questions, 5 types of proteins were highly consumed, namely chicken, chicken eggs,wild animals, freshwater fish and boar. Chicken and chicken eggs were the types of animal protein that were highest because they were easiest for people to obtain, besides being bought from trader salesman from city, some chickens were reared by the people. Wild animals and *Tilapia* sp. are the animals that are commonly often consumed by people. The type of wild animals were consumed by the people when hunting and freshwater fish were often consumed by the people in Anggi District, because access to sea fish is quite difficult while the availability of freshwater fish was obtained by the people from Anggi Gida Lake and Anggi Giji Lake. Freshwater fish are usually sold by the people in the local traditional market 2 times/weeks.

Based on vegetable protein sources, types of food that were often consumed were tempeh and tofu 2-4 times per week. Both of these foods were obtained from motorbike traders from the city who sell basic necessities for the community. In addition, we found that respondents consumed red beans, green beans, and peanuts only 1 time/month. However, this frequency is lower when compared to the study of Mokoginta et al. (2016) where tofu is the most consumed by respondents it is generally consumed daily with an amount of > 1x per day, other sources of vegetable protein are tempeh, peanuts, and green beans. Tofu and tempeh are most consumed 1x per day, green beans are consumed 1-3 times per week.

Based on protein consumption, we found that people in Arfak mountains consume nutrient source from animal proteins (66.54%) were less than nutrient source from vegetable proteins (70.97%). People in the Arfak Mountains also tend to rarely consume protein intake in their daily meals.

Based on the vegetable food that respondents most consume was chayote leaves and the least consumed by respondents was leeks. Based on the frequency of eating vegetables that are often consumed are chayote leaves and watercress with a frequency of 1 time/ day. In addition, vegetables that are consumed such as cabbage, and mustard greens were consumed 2-3 times/week and the least consumed was leeks with a frequency of 1 time/week. Mokoginta et al. (2016) research in the North Bolaang Mongondow district showed that water spinach was the most consumed vegetable in 1 day; respondents consumed water spinach > 1x every day. While green mustard was consumed 1-3 times/month. The least frequently consumed vegetable was broccoli. Broccoli was consumed by a few teenagers only a few times in 1 month. Of the 5 types of vegetables often consumed by the Arfak community, they are plants planted in their gardens quite far from their homes, and planted by the community in their yards.

The fruits that were often consumed by the community were dutch eggplant and passion fruit with a frequency of 1 time/day. Of the 12 questions about the types of fruits taken, the five types that are most consumed by the community in the Arfak mountains were dutch eggplant, passion fruit, pineapple, avocado and banana. The types of food with a consumption frequency of 1-3/month were avocado, pineapple and banana. According to research by Prisylvia et al. (2022), adolescents most often consume fruit 3-6 times/week, namely goroho bananas, sepatu bananas, and apples. Papaya is most widely consumed 2 times/month. The fruits most consumed by respondents include langsat fruit, soursop, and dragon fruit.

Category of Community Eating Patterns

The frequency of eating patterns is categorized into two categories, namely good and poor. From the results of Table 1, it can be seen that out of 225 respondents, 56.89% (128 respondents) have poor eating patterns, which is greater than those who have good eating patterns, which is 43.11% (97% of respondents).

Table 1: The food patterns of the Arfak Mountains community

Diet Patterns	Frequency	Percentage
Good	97	43.11%
Poor	128	56.89%
Total	225	100%

Table 2. Association between Nutritional Status and Food Patterns

Nutritional status	Food patterns (children)		p-value	Nutritional status	Food pattern (adult)		p-value
	Good	Poor			Good	Poor	
Normal	57	56	0.94	Normal	15	17	0.28
Thinnes	7	5		Wasting	2	0	
Overweight	12	8		Overweight	6	2	
Obese	9	8		Obese	12	9	

The results indicate that most people have a poor diet (56.89%), in line with Kusuma et al study (2014) which showed that the poor diet of 53.8% was quite large. The pattern of food consumption of Arfak people did not show a significant effect on their nutritional status. It can be seen in Table 2 which showed a p-value of 0.94 for children and 0.28 for adults. Although most people in Arfak mountain tend to be over nutrition, their diet pattern shows food insecurity because of the low food frequency.

Conclusion

Overnutrition of children and adults in Arfak Mountain was higher than undernutrition. The effect food types and eating frequency on the nutritional status among people in Arfak mountain did not show a relation. Although many people in the Arfak Mountains tend to be over nutrition, their diet pattern shows food scarcity.

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