Risk Factors Analysis of Macronutrient Intakes and Obesity with Hypertension in Coastal Communities, Kapoiala District, Konawe Regency

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Abstract. Research related to correlation between consumption patterns of macronutrients as a risk factor for hypertension in coastal communities has been rarely studied. This study aimed to analyze the risk factors for intake of macronutrients (carbohydrates, fats, and proteins) and obesity with the incidence of hypertension in coastal communities in Kapoiala District, Konawe Regency, Southeast Sulawesi. This Case-Control study was conducted on 48 subjects who were all obese (24 case-group with hypertension and 24 control group without hypertension). Data collection to determine the level of nutrient intake according to the percentage of nutritional adequacy rate (RDA) was carried out using the Semi Quantitative-Food Frequency Questionnaire (SQ-FFQ) which has been validated for coastal communities. In the 48 subjects studied, excess carbohydrate intake was 66.7%, excess fat intake/risk was 72.9%, excess protein intake was 64.4%. In this study carbohydrate intake was not a risk factor for hypertension (p-value = 0.126; OR = 0.311), fat intake was also a risk factor (p-value = 0.009, OR = 9.3), and however it was different from protein intake, which in this study is not related as a risk factor (p-value = 0.227; OR = 2.5). In the obese coastal communities, it was found that high fat intake was a risk factor for hypertension while no relationship was found for carbohydrate intake and protein intake with the incidence of hypertension in the coastal communities of Kapoiala District, Konawe Regency. The findings suggest creating an educational program for coastal communities regarding healthy diet intake.

Keywords: Obesity, Macronutrients Intake, Coastal Communities.

1 Introduction

Coastal communities have unique characteristics related their living needs from the sea. Marine biological food was believed to be able to maintain health due to the antioxidants found in many marine biological sources. The Kapoiala coastal community is a community that lives in coastal areas, most of whom are fishermen, having different characteristics from other communities. This difference was due to the

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correlation with regional economic characteristics, cultural background and the availability of supporting facilities and infrastructure. Eating habits can be influenced by natural, environmental, and cultural factors. Consumption of excess nutrition will lead to overweight or obesity [1].

Obesity and hypertension are non-communicable diseases which are risk factors for cardiovascular disease, stroke, retinopathy and kidney disease and the biggest causes of adult death case. Hypertension was strongly affected by the pattern of nutrient intake. World Health Organization (WHO) stated that in 2019, as many as 1.13 billion people worldwide suffered from hypertension, most of whom lived in low and middle income countries [2]. Based on the results of Basic Health Research (Riskesdas) in 2018 the prevalence of hypertension in people aged > 18 years in Indonesia found 658,201 patients diagnosed with hypertension [3].

Based on data from the Southeast Sulawesi Provincial Health Service, the prevalence of hypertension in 2019 was second among the ten highest diseases in Southeast Sulawesi Province at 57,160 cases (17.67%) [4]. Data from the Konawe District Health Service states that hypertension is in 4th place out of the top 10 diseases. The prevalence of hypertension in Konawe Regency in 2018 reached 4,399 cases. During the last 5 (five) years, cases of hypertension have increased, especially in the treatment of hypertension sufferers [5].

Macronutrient consumption patterns (carbohydrates, proteins and fats) are associated with the emergence of various types of diseases in humans. Excessive macronutrient consumption was closely related to obesity. Obesity itself was related to the formation of atherosclerotic plaque which results in inelasticity of blood vessels, causing increased blood pressure [6]. The nutritional status in hilly areas is dominant for vegetables and plantation products, mostly rice farmers tend to consume food sources of vegetable protein while in coastal areas where most of them are fishermen tend to consume food sources of animal protein originating from the sea, coastal areas are dominant production of fish and marine products [1]. Research related correlation between consumption patterns of macronutrients as a risk factor for hypertension in coastal communities was still very rarely studied. Aim of this study was analyzed the risk factors for intake of macronutrients (carbohydrates, fats, and proteins) and obesity with the incidence of hypertension in coastal communities in Kapoiala District, Konawe Regency, Southeast Sulawesi.

2 Research Methods

This research includes observational analytic research with a Cases Control approach. This research was conducted in April-May 2023 in Kapoiala District, Konawe Regency. This Case-Control study was conducted on 48 subjects who were all obese (24 case-group with hypertension and 24 control group without hypertension). This study uses gender as a matching in the selection of research subjects in the case and control groups.

Data were collected using Semi Quantitative-Food Frequency Questionnaire (SQ-FFQ) interviews with respondents who had hypertension recorded in their medical

records and were conducted for 10 days to determine consumption patterns of food sources of carbohydrates, protein and fat.

This research has received an ethical eligibility letter from the Health Research Ethics Commission, Faculty of Medicine, Halu Oleo University with Number: 014/UN29.17.1.3/ETIK/2023.

3 Results

Based on Table 1, the distribution of respondents is based on age range, highest level of education, occupation, gender. The majority of research subjects were aged 30-49 years in the case group, 17 subjects (35.4%) and the control group, 19 subjects (39.6%).

Table 1. General characteristics of respondents based on age, education, occupation, gender, and obesity.

Sample Characteristics		Case		Control		Amount	
		n	(%)	n	(%)	n	(%)
Age	16-18 years	0	0	1	2,1	1	2,1
	19-29 years	1	2,1	2	4,2	3	6,3
	30-49 years	17	35,4	19	39,6	36	75,0
	50-64 years	6	12,5	2	4,2	8	16,7
Education	bachelor	10	20,8	5	10,4	15	31,3
	Senior High School	13	27,1	11	22,9	24	50,0
	Junior High School	1	2,1	8	16,7	9	18,8
Occupation	Self employer	10	20,8	9	18,8	19	39,6
	civil servant	4	8,3	0	0	4	8,3
	Honorary employee	2	4,2	0	0	2	4,2
	Fisherman	1	2,1	1	2,1	2	4,2
	Housewife	7	14,6	14	29,2	21	43,8
Gender	Male	4	8,3	4	8,3	8	16,7
	Female	20	41,7	20	41,7	40	83,3
Obesity	Obesity 2	14	29,2	6	12,5	20	41,7
	Obesity 1	10	20,8	18	37,5	28	58,3

The obesity variable in the case group with obesity-2 there were 14 subjects (29.2%) and in the control group with obesity-2 there were 6 subjects (12.5%). Meanwhile, in the case group with obesity 1 there were 10 subjects (20.8%) and in the control group with obesity 1 there were 18 subjects (37.5%).

Table 2 shows 5 types of food ingredients that were widely consumed as sources of carbohydrates, fats and proteins. Fresh rice and corn are the main sources of carbohydrates for the people of Kapoiala District. The main sources of protein are tofu and tempeh, while the main sources of fat are palm oil and meatballs.

Table 2. Types of macronutrients that are widely consumed.

Types of macronutrients		Amount	
		n	(%)
Carbohydrate	Rice	48	100
	Fresh corn	48	100
	Noodle	42	87,5
	Sago	46	95,8
	Rice noodles	42	87,5
Proteins	Tofu	48	100
	Tempeh	48	100
	Shell	48	100
	Chicken meat	39	
	Mung beans	38	
Fat	Palm oil	48	100
	meatballs	43	
	Beef meet	39	
	Coconut milk	34	
	Chicken's liver	11	

The correlation between obesity and hypertension based on Table 3 shows p-value = 0.040 which shows that there was correlation between obesity and hypertension in coastal communities in Kapoiala District, Konawe Regency. Apart from that, the odd ratio value obtained was OR = 4.2, obesity was a risk factor for the incidence of hypertension of 4.2 times. Additionally, analysis of macronutrient intake in the working area of the Kapoiala Public Health Center can be seen in Table 4.

Based on Table 5-a, it shows the correlation between protein intake and the incidence of hypertension, p-value = 0.227 (0.227 > 0.05) there was no correlation between protein intake and the incidence of hypertension in the coastal communities of Kapoiala District, Konawe Regency.

Based on Table 5-b, showing the correlation between carbohydrate intake and the incidence of hypertension obtained p-value = 0.126 (0.126> 0.05) which shows that there was no relationship between carbohydrate intake and the incidence of hypertension in the coastal communities of Kapoiala District, Konawe Regency.

Table 3. Analysis of the risk factors for obesity and hypertension in the working area of the Kapoiala Health Center.

Obesity	Case		Control		P	OR	Lower	Upper
	n	%	n	%				
Obesity-2	14	29,2	6	12,5				
Obesity- 1	10	20,8	18	37,5	0,04	4,2	1,228	14,365
Total	24	50	24	50				

Table 4. Analysis of macronutrient intake in the working area of the Kapoiala Public Health Center.

Sample characteristics		Case		Control		Amount	
		n	(%)	n	(%)	n	(%)
Protein intake	Moderate	11	22,9	6	12,5	17	35,4
	Over	13	27,1	18	37,5	31	64,6
Carbohydrate intake	More	13	27,1	19	39,6	32	66,7
	Moderate	11	22,9	5	10,4	16	33,3
Fat Intake	Risk	22	45,8	13	27,1	35	72,9
	No risk	2	4,2	11	22,9	13	27,1

Table 5. Risk factor analysis of macronutrient intake with hypertension incidence in the working area of the Kapoiala Health Center.

a. Protein intake								
Protein intake	Case		Control		p	OR	Lower	Upper
	n	%	n	%				
Moderate	11	22,9	6	12,5				
Over	13	27,1	18	37,5	0,227	2,538	0,746	8,633
Total	24	50	24	50				
b. Carbohydrate intake								
Carbohydrate intake	Case		Control		p	OR	Lower	Upper
	n	%	n	%				
Over	13	27,1	19	39,6				
Moderate	11	22,9	5	10,4	0,126	0,311	0,087	1,108
Total	24	50	24	50				
c. Fat intake								
	Case		Control		p	OR	Lower	Upper
	n	%	n	%				
Risk	22	45,8	13	27,1				
No risk	2	4,2	11	22,9	0,009	9,308	1,778	48,723
Total	24	50	24	50				

Based on Table 5-c, it shows the correlation between fat intake and the incidence of hypertension obtained p-value = 0.009 (.009 <0.05) which shows that there is a relationship between fat intake and the incidence of hypertension in the coastal

community of Kapoiala District, Konawe Regency. Apart from that, the odd ratio value obtained was OR = 9.3, so that fat intake had a risk of hypertension of 9.3 times.

4 Discussion

4.1 The Correlation between Obesity and Hypertension in the Kapoiala Health Center

The study findings showed that obesity was a risk factor for the incidence of hypertension in the Kapoiala Community Health Center Working Area. Obesity occurs because excess energy was stored in the form of fat tissue [7]. Obesity tends to get hypertension because there will be a buildup of fat throughout the body including the arteries and causes the elasticity of the arteries to decrease so that blood flow will be disrupted and requires pressure and heart contractions to circulate the blood, resulting in an increase in cardiac output which will eventually lead to hypertension.

Obesity was a pair that goes hand-in-hand, the fatter a person is, the higher their blood pressure. One of the mechanisms involved in the influence of central obesity on blood pressure involves hormonal abnormalities, adiposity (fat cells) will secrete leptin and adiponectin [8].

4.2 Carbohydrate Intake and the Incident of Hypertension at the Kapoiala Community Health Center

The study findings showed that carbohydrate intake was not a risk factor for hypertension in the Kapoiala Health Center Work Area. Excessive carbohydrate intake cause obesity or excess weight in a person and will increase the risk of increasing the prevalence of cardiovascular disease, including hypertension. Based on the results of the SQ-FFQ interviews, the results obtained were that the sources of carbohydrates frequently consumed by coastal communities in Kapoiala District were rice, sago, noodles and wheat flour. Consuming a variety of foods can reduce the risk of deficiency of certain nutrients. The results of this study was in line with the research conducted by Aulia [9]. Which shows the results that there was no significant relationship between carbohydrate intake and the incidence of hypertension with a p value = 0.728.

4.3 Proteins Intake and the Incident of Hypertension at the Kapoiala Community Health Center

The study findings showed that protein intake was not a risk factor for the incidence of hypertension in the Kapoiala Community Health Center Working Area. Protein intake was needed by the body as a source of building body structure and maintaining tissue function. Based on the results of the SQ-FFQ interviews, it was found that the sources of protein that are often consumed by coastal communities in Kapoiala District are tofu, tempeh, chicken meat, green beans. This is in contrast to the conditions of the coastal environment which should consume a lot of fish. From the results of questions

and answers, information was obtained that the marine products obtained were used for resale.

4.4 Fat Intake and the Incident of Hypertension at the Kapoiala Community Health Center

The study findings showed that fat intake was a risk factor for the incidence of hypertension in the Kapoiala Health Center working area. Based on the results of the SQ-FFQ interviews, the results showed that the sources of fat that are often consumed by coastal communities in Kapoiala District are palm oil, meatballs, beef, coconut milk and chicken liver. Kapoila people's fat consumption is still relatively high. From the research results, it was found that 70.8% of respondents were at risk of hypertension due to high daily fat intake. There is a need for health education regarding the consumption of good fats in order to increase public understanding and it is also hoped that the Kapoiala community will be more concerned about the adverse effects of excess fat consumption such as hypertension.

5 Conclusion

In the obese coastal communities in this study, it was found that high fat intake was a risk factor for hypertension. For carbohydrate intake and protein intake have no relationship with the incidence of hypertension in the coastal communities of Kapoiala District, Konawe Regency

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