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The Relationship between Obesity and the Incidence of Hypertension in Young Adults (18-40 Years) in Tomohon City in 2019

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Abstract

Hypertension is an unfinished health problem until now. Hypertension is a disease that causes stroke and decreases the quality of life. One of the preventable causes of hypertension is obese. The purpose of this study is observing the relationship between nutritional status, in this case obesity, and the incidence of hypertension in young adults (18-40 years) in Tomohon City. By utilizing a cross sectional approach, this research was conducted in January-December 2019 on young adults aged 18-40 years who visited 7 community health centers in Tomohon. There were 4,040 samples who were willing to be involved in this study, who had never previously been diagnosed with hypertension by a doctor in any health facility. Based on the Pearson's chi-square test showed a p-value of age and the incidence of hypertension is 0.0001 < 0.05 with estimated risk of 2.206 (CI 95%: 1.917-2.593). P-value of gender and the incidence of hypertension is 0.0001 < 0.05 with estimated risk of 0.715 (CI 95%: 0.622-0.823). P-value of obesity and the incidence of hypertension is 0.0001 < 0.05 with estimated risk of 2.502 (CI 95%: 2.150-2.911). So, it can be concluded that there is a significant relationship between obesity and the incidence of hypertension

Keywords: *hypertension, obesity, gender, age, tomohon*

Introduction

Hypertension is a leading cause of cardiovascular disease and premature death worldwide, especially in low and middle income countries like Indonesia[1]. It is also a serious public health issue[2] . North Sulawesi Province, in which there is Tomohon city, is one of the contributors to high hypertension rates in Indonesia. According to Indonesia Basic Health Research (Indonesian: *Riset Kesehatan Dasar*/Riskesdas), Tomohon is the city with the highest prevalence of obesity in Indonesia from 2007 to 2018[3]

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Based on data from Health Office of Tomohon, hypertension has consistently been one of the main metabolic diseases since 2009. Stroke as a result of hypertension has become a non-communicable disease that is prevalent in the Community Health Center in Tomohon. It is supported by hospital records in Tomohon which state hypertension as a metabolic disease suffered by both inpatients and outpatients. Direct survey shows that hypertension is included in the top 5 metabolic diseases in this population[4]

Furthermore, according to Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7), hypertension can be classified into Stage 1 (systolic 140-159 mm Hg and/ or diastolic 90-99 mm Hg) and Stage 2 (systolic >160 mmHg and/or diastolic >100 mmHg)[5]. Most young adults are in the Stage I hypertension category and are unaware of the condition. They then continue to be exposed to risk factors until the disease becomes more

severe[6] .

Risk factors for hypertension consist of: 1) non-modifiable risk factors such as race, age, sex, and heredity (family history of hypertension); and 2) modifiable risk factors, related to changeable behavior, such as obesity, stress, smoking habits, sedentary behavior, excessive alcohol consumption, excessive salt intake and hyperlipidemia[7]

Obesity, accompanied by changes in hormonal levels, inflammation and endothelium, triggers the stimulation of several other mechanisms contributing to hypertension and increases cardiovascular morbidity[8]. Obesity is classified according to body mass index (BMI): Low body weight <18.5, Normal body weight 18.5–23.9, Overweight 24.0–27.9, Obesity ≥ 28[9]. Obesity is a serious global health problem. This is evidenced by the increasing trend of the prevalence of overweight and obesity in the last 20 years.

In Indonesia, the prevalence increases from 10.5% in 2007 to 21.8% in 2018. In adult males, there is an increase from 13.9% in 2007 to 19.7% in 2013. Additionally, in adult women, there is a very extreme increase reaching 18.1%, from 14.8% in 2007 to 32.9% in 2013. North Sulawesi Province is always in the first rank with a prevalence of 24.1% in 2013 and 30.2% in 2018. This situation is influenced by the extreme value of Tomohon, which is 33% in 2013 and around 40% in 2018[3,10]

Moreover, several studies have shown that obesity has a significant relationship with the incidence of hypertension. A research conducted by Framingham concluded that being overweight contributes to hypertension cases[11,12]. It is in line with a research by Jullaman claiming that BMI classified as obese has 1.64 times the risk of suffering from Stage 1 hypertension than normal BMI[13].

Based on the aforementioned background, the researchers are interested in observing the relationship between nutritional status, in this case obesity, and the incidence of hypertension in young adults in Tomohon.

Material and Methods

By utilizing a cross sectional approach, this research was conducted in January-December 2019 on young adults aged 18-40 years who visited 7 community health centers in Tomohon. There were 4,040 samples who were willing to be involved in this study, who had never previously been diagnosed with hypertension by a doctor in any health facility. Measurements were carried out using standardized tools and procedures by competent nurses. Blood pressure measurements were carried out 3 times; the average of the three measurements was recorded as a result by ensuring that respondents were resting (inactive) and calm before being measured.

Findings

Table 1 : Distribution of Variables

Variable	Category	Total (n=4040)	%
Body Mass Index	Underweight	268	6.6
	Normal	1544	38.2
	Over Weight	1221	30.2
	Obese	1007	24.9
Obese Incident	No (< 28 Kg/m2)	3033	75.1
	Yes (> 28 Kg/m2)	1007	24.9

***Cont..*Table 1 : Distribution of Variables**

Systolic Blood Pressure	Normal	1499	37.1
	Pre Hypertension	1807	44.7
	Stage 1 Hypertension	554	13.7
	Stage 2 Hypertension	180	4.5
Diastolic Blood Pressure	Normal	1563	38.7
	Pre Hypertension	1490	36.9
	Stage 1 Hypertension	731	18.1
	Stage 2 Hypertension	256	6.3
Hypertension Incidence	No (< 140/90 mmHg)	2936	72.7
	Yes (> 140/90 mmHg)	1104	27.3
Gender	Male	1599	39.6
	Female	2441	60.4
Age	18-25 years	1545	38.2
	26-30 years	807	20.0
	31-35 years	777	19.2
	36-40 years	911	22.5

Table 1 showed that the proportion of males was 39.6% and females was 60.4%. There were 6.6% of people with BMI in underweight category, 38.2% of people with BMI in overweight category, and 24.9% of people with BMI in obese category. Thus, it can be said that there were 1,007 or 24.9% obese people (> 28 Kg/m^2) and 3,033 people or 75.1% who were not obese (< 28 Kg/m^2). Besides, systolic blood pressure classified as normal was 37.1%, pre-hypertension was 44.7%, stage 1 hypertension was 13.7%, and stage 2 hypertension was 4.5%. Diastolic blood pressure classified as normal was 38.7%, pre-hypertension was 36.9%, stage 1 hypertension was 18.1% and stage 2 hypertension was 6.3%. Thus, there were 2,936 people or 72.7% not included in hypertension category (< 140/90 mmHg), and 1,104 people or 27.3% included in the hypertension category (> 140/90 mmHg).

Table 2 : The Relationship of Incidence of Hypertension Based on Age, Obesity, and Gender

Variable	Category	Hypertension			p-value
		No	Yes	Total	
Age	18-30 years	1865 (63.5%)	487 (44.1%)	2352 (58.2%)	0.0001
	31-40 years	1071(36.5%)	617 (55.9%)	1688 (41.8%)	

Cont... **Table 2 : The Relationship of Incidence of Hypertension Based on Age, Obesity, and Gender**

Obese	No	2352 (80.1%)	681(61.7%)	3033(75.1%)	0.0001
	Yes	584 (19.9%)	423 (38.3%)	1007 (24.9%)	
Gender	Male	1097 (37.4%)	502 (45.5%)	1599 (39.6%)	0.0001
	Female	1839 (62.6%)	602 (54.5%)	2441 (60.4%)	

Based on Table 2, results of Pearson's chi-square test showed a p value of 0.0001 <0.05. It indicates that there was a significant relationship between age and the incidence of hypertension with estimated risk of 2.206 (CI 95%: 1.917-2.593), meaning that people aged >30 years were estimated to have 2.2 times the risk than people aged <30.

The results of Pearson's chi-square test obtained p value of 0.0001 < 0.05, indicating that there was a significant relationship between obesity with estimated risk of 2.502 (CI 95%: 2.150-2.911). It can be interpreted that people with a BMI > 28 Kg/m^2 or classified as obese were estimated to have 2.5 times the risk of experiencing hypertension than those who were 2.5 times the risk of developing hypertension compared to people who were < 28 Kg/m^2.

The results of Pearson's chi-square test showed a p value of 0.0001 <0.05, which means that there is a significant relationship between gender differences and the incidence of hypertension with estimated risk of 0.715 (CI 95%: 0.622-0.823). It indicates that males had 0.715 times the risk of experiencing hypertension. Therefore, it can be said that females were more at risk of getting hypertension than males at the age of 18-40 years.

Discussion

The results showed that women are more at risk of getting hypertension than men at the age of 18-40 years. It proves a theory that as the age increases, the organ function decreases, and the prevalence of hypertension differs between males and females[14-18]. Besides nearly a quarter (24.9%) of research subjects of young adults aged 18-40 years were obese, still far below the results of the 2013 Indonesia Riskesdas which claimed the prevalence of obesity was 33% in 2013 and about 40% in 2018[3,19].

An interesting point about these results is that there were 30.2% of subjects who were in the overweight category. If it is combined with obesity, more than half of young adults in Tomohon had non ideal body weight or tended to be fatter than they should be. This is much higher than the average prevalence of obesity from Riskesdas results in Indonesia; from 10.5% in 2007 and 21.8% in 2018. In addition, North Sulawesi Province is always in the first rank with a prevalence of 24.1% in 2013 and 30.2% in 2018[3,10]. The prevalence close to results in this study can be seen in a research by Integrated Development Post for Non-Communicable Disease of Port Health Office (POSBINDU PTM KKP) Bandung in 2016 on 202 samples showing that the proportion of overweight and obesity was 54.9%[6]. This is also in accordance with research which found that 53.61% of respondents are obese[19].

Results found that there were 2,936 people or 72.7% not included in hypertension category (< 140/90 mmHg), and 1,104 people or 27.3% included in the hypertension category (> 140/90 mmHg). These are close to results of research conducted by Samakul et al., in Tomohon, finding that the proportion of hypertension sufferers was 27.1% and respondents who did not suffer from hypertension were 72.9%[20]. This result is far above the 2018 Riskesdas results which found that, based on a doctor's diagnosis in North Sulawesi, the proportion of hypertension was 13.2%. It was the highest result in Indonesia, considering that the national average percentage was 8.4%. However, it was below the results of the 2018 Riskesdas measurement, which was 33.12% for North Sulawesi[3]. The proportion of

this research is still far from the proportion obtained by Anggraini et al., 62.89% of the subjects had high blood pressure or hypertension and results of Posbindu PTM KKP Bandung in 2016 which found that the proportion of stage 1 hypertension was 41.7%[6,19]

The results of this study indicate a significant relationship between obesity and hypertension in Tomohon. This is in accordance with several previous studies conducted in various regions in Indonesia. One of them is a study conducted by Natalia in 2015 which found that obesity is the most dominant risk factor for influencing the occurrence of hypertension, which is 2.16 higher than normal respondents. This is reinforced by a research by Anggraini et al., which claimed that there is a relationship between obesity and hypertension ($p = 0.004$)[19]. The same thing was also conveyed by Rohkusmawara and Syarif which stated that respondents who were obese (BMI > 25 Kg/m^2) had a 1.681 times risk of suffering from stage 1 hypertension compared to those who were not obese[6].

Furthermore, previous research conducted by Anggara and Prayitno in showed a risk of 51.1 times. This may occur due to high fat intake[21]. It is supported by a research conducted by Kartika which stated that high fat intake has a 4.246 times risk of getting hypertension than those who consume low fat[13,21,22]. Sulastri et al., found that more than half of hypertensive patients were obese (56.6%) and there was a significant relationship between obesity and the incidence of hypertension ($p <0.05$; OR = 1.82) in Minangkabau ethnic community in Padang, this city is famous for its foods that contain lots of fat[23]. Results of research related to a high-fat diet carried out in young adults aged 18-40 years at Rurukan Health Center, Tomohon showed a significant relationship between unusual food consumption and the incidence of hypertension ($p = 0.032$)[24]. However, this study also shows different results from previous studies using 108 samples aged 45-60 years. It was only in one sub-district, Central Tomohon District, Tomohon in 2014 which showed no significant relationship between obesity and hypertension ($p = 0.639 > 0.05$); although this study claimed that the prevalence of hypertension in the community was quite high (68.5%)[25].

Although the mechanism is still an area of this study research, the relationship between obesity and hypertension cannot be separated in both children and adults. Those that play a role in the pathogenesis of obesity-related hypertension that are considered important are activation of sympathetic nervous system, insulin resistance, and inflammation which can increase the profile of altered vascular function and consequently hypertension, and leptin and other neuropeptides that are thought to explain a possible link between obesity and development of hypertension[26].

Conclusions

Based on the results discussed, it can be concluded that there is a significant relationship between obesity and the incidence of hypertension. Additionally, there is a high proportion of people with hypertension and obesity in young adults in Tomohon City. Considering high prevalence of hypertension and obesity, it is necessary to optimize the prevention and control of non-communicable diseases.

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