

The Relationship of Physical Activity and Obesity with the Incidence of Hypertension in Adults Aged 26-45 Years in Medan

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Abstract

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BACKGROUND: The incidence rate of hypertension is increasing in Indonesia concerning unhealthy behaviours such as unhealthy physical activity and eating pattern which trigger obesity. In Indonesia, the prevalence of hypertension in > 18-year-old people was 34.1% in 2018.

AIM: The objective of the research was to find out the relationship between physical activity and obesity with the incidence of hypertension in adults (26-45 years old) in Medan.

METHODS: The research was done in Medan, using a case-control study design. The samples were 150 hypertension patients, taken by using proportional allocation: 75 of them were in the case group and the other 75 of them were in the control group. The data were gathered by conducting interviews, measurement, and questionnaires and analysed by using simple logistic regression test.

RESULTS: The result of the research showed that there was significant relationship of physical activity ($p = 0.000$; OR = 3.6; 95% CI, 1.802-7.270) and obesity ($p = 0.000$; OR = 4; 95% CI, 2.030-7.900) with the incidence of hypertension in 26-45-year-old respondents.

CONCLUSION: Make a habit of a healthy lifestyle in their daily life by doing physical activity regularly and good eating pattern to forestall hypertension.

Introduction

High blood pressure or hypertension is a global health problem. All countries in the world from high, middle and low income have the same burden in overcoming hypertension. World Health Organization statistics show the prevalence of hypertension in the world for those aged 18 years, or older is 22.1%, with a ratio of 24.1% in men and 20.1% in women [1]. This organisation reports that of the 56.9 million deaths worldwide, 54% of them are due to non-communicable diseases with the most common causes being ischemic heart disease and stroke [2]. Although most of this book addresses hypertension in the United States and another developed country, it should be noted that cardiovascular diseases are the leading cause of death worldwide, more so in the economically developed countries but also the developing world [3].

Hypertension is also referred to as "the silent killer" because most cases do not manifest any symptoms or signs even though blood pressure has far exceeded normal. This can last for years until eventually, the patient falls into an emergency such as a heart attack, stroke or kidney damage [4]. Hypertension is one of the important factors as a trigger for non-communicable diseases which is currently the number one cause of death in the world [5]. Based on data from Riset Kesehatan Dasar 2018, hypertension is the most non-communicable disease in Indonesia with the prevalence rate of 34.1 [6], which has increased from the prevalence rate reported by Riset Kesehatan Dasar 2013 (25.8%) [7].

The course of the disease (progressive hypertension) begins with high blood pressure starting from pre-hypertension in patients with asymptomatic age 10-30 years (marked increase in cardiac output), continuing to become early hypertension at the age of 20-40 years (increased resistance or peripheral

vascular power) then the age of 30-50 years develops into hypertension, in the final phase that is at the age of 40-60 years into hypertension with complications [3].

Regular physical activity is useful to regulate body weight and strengthen the heart and vascular system. Lack of physical activity can result in someone suffering from hypertension. Sedentary lifestyles are risky behaviours for diseases such as blockage of arteries, heart disease and affect life expectancy. Based on data Riset Kesehatan Dasar (2013), it appears that North Sumatra is one of the provinces with the obesity category above the national average both in men and women, while the proportion of physical activity that is lacking is 26.5% [7].

Physical activity is one of the risk factors for hypertension. The proportion of sedentary behaviour ≥ 6 hours is greater for women, people with low education, not working, living in urban areas, and residents with a quintile of ownership indices that are higher than those who are lower [7]. According to FAO / WHO / UNU (2001), the amount of physical activity carried out by a person for 24 hours is expressed in physical activity level (PAL). PAL is determined by the formula [8]:

$$\frac{\sum(PAR \times W)}{24}$$

PAL = Physical Activity Level

PAR = Physical Activity Ratio (energy cost of activity)

W = Time allocations (hours)

Physical Activity Level (PAL) is divided into three categories, namely mild, moderate and severe activity. Mild physical activity (sedentary lifestyle) has PAL values between 1.40-1.69. Someone with light activities uses a vehicle for transportation, does not exercise and tends to spend time only for activities carried out just by sitting and standing, with a little body movement. Moderate active activity (active or moderately active life) has a PAL value of 1.70-1.99. Someone with a moderate level of activity does not need large energy, but the energy needs of this activity are higher than light activities. Heavy physical activity (vigorously active lifestyle) has a PAL value of 2.00-2.40. Heavy activity is carried out by someone who works hard for a long time [8].

Obesity is a chronic condition that is the accumulation of fat in the body so that it exceeds the limit for good health. Obesity increases the risk of other diseases, such as diabetes mellitus and high blood pressure. Adult body weight is measured by calculating body mass index (BMI) with the formula of body weight in kilograms divided by height into units of meters squared [9]. The obesity criteria in this study used the criteria of BMI value of $> 27 \text{ kg/m}^2$ [10].

Preliminary surveys are carried out at the Medan city health office by recapitulating hypertension

cases according to age < 45 years in 2017, indicates that of the 39 Public Health Centers, a high number of hypertensive patients are in Community Health Centers of Mandala, Medan Deli, Amplas, Medan Johor and Teladan. In terms of the proportion of hypertension in the age < 45 years in the health office of Medan City in 2016, there was a figure of 11% compared to 12% in 2017 [11].

This study aimed to analyse the relationship of risk factors in the form of physical activity and obesity with the incidence of hypertension in adults aged 26-45 years in Medan in 2018.

Material and Methods

Types of the Study

The study used the observational analytic method with a case-control design.

Subjects

Determination of the selected location was carried out by stratified random sampling by dividing public health centres based on the high or a low number of managed cases. The study was conducted in Medan City by taking samples from the public health centres of Mandala, Amplas, Tuntungan and Padang Bulan Selayang dua. The consideration in the selection of study locations is that the public health centres represent high and the low numbers of the hypertensive case at aged ≤ 45 years in Medan City.

Population in this study where all hypertensive patients aged 26-45 years in four selected public health centres in Medan city. The sample in this study consisted of cases and controls. Cases are some patients with hypertension aged 26-45 years who were recorded in the registration book of the four selected Public Health Centers in Medan City and fulfilled the inclusion criteria, among others, namely not complicated by stroke, able to communicate well, and willing to participate in research. The controls were a portion of the population without hypertension aged 26-45 years and residing in the area of selected Public Health Centers in Medan City. This research has received approval from the Health Research Ethics Commission of the University of North Sumatera Nursing Faculty with numbers. 1778 / IV / SP / 2019.

The sample size was determined by the case-control study formula by calculating the sample size for hypothesis testing of the odds ratio for the difference of two proportions with a confidence level of 95% by which the sample consisted of 75 cases and 75 controls were obtained. The total sample in this study was 150 respondents [12].

Gathering of Data

Primary data were obtained through interviews in the form of filling out questionnaires of recalling 24-hour physical activity, and measurements of Body Mass Index (BMI). Secondary data were obtained from the register of public health centres. Data were analysed descriptively and analysed statistically using simple logistic regression.

Results

Characteristics of Respondents

Age distribution of respondents in the dominant case and control groups of 36-45 years, and by gender, the majority were female both in the case and control groups. Most respondents have high school level education and the majority of respondents by employment, are housewives. Respondents were dominantly ethnic Batak.

Table 1: Distribution Characteristics of Respondents in Cases and Controls at the Age of 26-45 years in Medan in 2019

| Characteristic of Respondent | Hypertension (case) | | Non-Hypertension (control) | |
|--|---------------------|-----|----------------------------|-----|
| | n | % | n | % |
| Age | | | | |
| 26-35 | 9 | 12 | 24 | 32 |
| 36-45 | 66 | 88 | 51 | 68 |
| Total | 75 | 100 | 75 | 100 |
| Sex | | | | |
| Male | 21 | 28 | 17 | 23 |
| Female | 54 | 72 | 58 | 77 |
| Total | 75 | 100 | 75 | 100 |
| Employment | | | | |
| Civil Servant / Army / Police | 13 | 17 | 12 | 16 |
| Private employed / Self-employed / etc | 28 | 37 | 25 | 33 |
| Housewife | 34 | 38 | 38 | 51 |
| Total | 75 | 100 | 75 | 100 |
| Level of Education | | | | |
| Middle-High School (SMP-SMA) | 53 | 71 | 34 | 47 |
| Diploma (D1-D3) | 13 | 17 | 26 | 35 |
| Bachelor/Master (S1-S2) | 9 | 12 | 15 | 23 |
| Total | 75 | 100 | 75 | 100 |
| Ethnic | | | | |
| Batak | 43 | 57 | 55 | 73 |
| Jawa | 24 | 32 | 11 | 15 |
| Minang, Melayu, dll | 8 | 11 | 9 | 12 |
| Total | 75 | 100 | 75 | 100 |

Physical Activity

Based on the data in Table 2 showed that of the 75 people who suffer from hypertension 57 (76%) people have mild physical activity and 18 (24%) have moderate and severe physical activity. While from 75 control groups, it was seen that 35 (46.6%) people had mild physical activity and 40 people have moderate and severe physical activity. Respondents with mild activity were more commonly found in the case group, while those with moderate to severe activities were found more in the control group

Obesity

Based on Table 2 below, it is known that most patients with hypertension are obese (68%), whereas, in the control group, there are 65% of subjects with obesity. Respondents with obesity were found more in

the case group compared to the control group.

Table 2: Frequency Distribution of Physical Activity and Obesity of Respondents of Adult Aged 26-45 years in Medan in 2019

| Variable | Hypertension (case) | | Non-Hypertension (control) | |
|-------------------|---------------------|------|----------------------------|------|
| | n | % | n | % |
| Physical activity | | | | |
| Mild | 57 | 76 | 35 | 46.6 |
| Moderate | 16 | 21,3 | 32 | 42.6 |
| Severe | 2 | 2,6 | 8 | 10.6 |
| Total | 75 | 100 | 75 | 100 |
| Obesity | | | | |
| Obesity | 51 | 68 | 49 | 65 |
| Non-Obesity | 24 | 32 | 26 | 35 |
| Total | 75 | 100 | 75 | 100 |

Relationship between Physical Activity and Hypertension

Based on the simple logistic regression test, it is determined that there was a relationship between physical activity with the incidence of hypertension ($P = 0.000$ and $OR = 3.619$, 95% CI: 1.802-7.270).

Relationship between Obesity and Hypertension

The result of simple logistic regression test it was determined that there was a relationship between obesity with the incidence of hypertension in adults aged 26-45 years in Medan (P -value = 0.000 and $OR = 4.005$, 95% CI: 2.030-7.900) as it was indicated in table 3.

Table 3: Relationship of Physical Activity and Obesity with the Incidence of Hypertension in Adults aged 26-45 years in Medan in 2019

| Variable | Hypertension (case) | | Non-Hypertension (control) | |
|------------------------|---------------------|----|----------------------------|------|
| | N | % | n | % |
| Physical activity | | | | |
| Mild | 57 | 76 | 35 | 46,6 |
| Moderate-Severe | 18 | 23 | 40 | 42,6 |
| P = 0.000 [*] | | | | |
| OR = 3.619 | | | | |
| 95% CI. 1.802 - 7.270 | | | | |
| Obesity | | | | |
| Obesity | 51 | 68 | 49 | 65 |
| Non-Obesity | 24 | 32 | 26 | 35 |
| P = 0.000 [*] | | | | |
| OR = 4.005 | | | | |
| 95% CI. 2.030 - 7.900 | | | | |

Discussion

Characteristics of respondents indicated that the age group of 36-45 years had more hypertension case, compared to the age group of 26-35 years. This is in line with the theory that as a person ages, the risk of developing hypertension is greater. This study is in line with Prasetyo Research (2017) in Sibella Surakarta health center at young adults (18-40 years) which shows that the highest age of the case group was distributed at the age of 36-40 years, namely the case of 19 people (45.2%) [13].

Respondents in this study were dominated by

high school educated women with the type of work as housewives. This study is in line with basic health research (2013), where hypertension sufferers were more prevalent in women and worked as housewives [7].

The results of the statistical test showed that there was a relationship of physical activity with the incidence of hypertension with a value of OR 3.619. It follows that people with mild physical activity have a risk three times more likely to suffer from hypertension compared to people with moderate and severe physical activity. This is in line with the study by Harahap (2017) which showed a significant relationship between physical activity and the incidence of hypertension [14]. Similarly, Rihiantoro's research at the Tulang Bawang community health centre Lampung, showed that there was a relationship between physical activity and the incidence of hypertension with an OR value of 2.255 (95% CI: 1.245-4.084). This means that respondents who did mild physical activity were 2.26 times more likely to suffer from hypertension than respondents who did moderate and severe physical activity [15]. This study is also in line with a longitudinal study by Daniela Schmidt and colleagues (2006) that American adults showed that there was a significant effect of moderate to high physical activity, after adjusting for age and sex, on the risk of death [16].

At the same time as the evidence for protection from cardiovascular diseases and all-cause mortality by regular physical activity has become incontrovertible, most people in all industrialised societies are becoming a less physical activity in their daily lives, spending more and more time in sedentary activities [3].

Theoretically, physical activity greatly influences the stability of blood pressure. Heart rate tends to be higher in people who are not active in activities. The harder the heart muscle pumps blood, the higher the blood pressure that burdens the arterial wall so that peripheral resistance causes blood pressure to rise. Lack of physical activity can also increase the risk of being overweight by thereby causing an increased risk for hypertension [17].

The results of statistical tests in this study indicated that there was a significant relationship between obesity with the incidence of hypertension with a value of OR = 4.005 (95% CI: 2.030-7.900). Thus, it can be said that the probability of occurrence of hypertension in adults aged 26-45 years in Medan which obesity, is four times greater than those who are not obese. This is in line with the study of Rohkuswara (2016) in the city of Bandung with AOR = 1.681 and P-value = 0.031 [18]. Obesity has become an epidemic today. According to the American Heart Association (AHA) and the American Physiological Society, about 70% of adults in the United States suffer from obesity. Estimated risk shows that as many as 65% to 70% of the incidence of essential

hypertension is related to obesity, although population-based longitudinal studies show a somewhat lower number. Obesity is closely related to hypertension, with an increase in systolic blood pressure (SBP) of 6.5 mmHg for each 10% increase in body weight [20].

The nature of modern life, with more caloric intake, particularly from fast food and less physical activity, engenders more obesity, which is now a worldwide epidemic. Any degree of weight gain, even to a level that is not defined as overweight, is associated with an increased incidence of hypertension and, even more strikingly of type two diabetes. According to Willett et al., in Kaplan (2006) said in along-term follow up of 85,000 nurses, the incidence of hypertension increased threefold and the incidence of diabetes more than six-fold at an initial BMI of 26 as compared to at an initial BMI of 21 [3].

In conclusion, there is a relationship between Obesity and physical activity with the incidence of hypertension at the age of 26-45 years in Medan. To prevent early hypertension, it is recommended to make a habit of a healthy lifestyle in their daily life by doing physical activity regularly and good eating pattern to forestall hypertension.

References

1. WHO. Global Health data Repository, 2015. www.searo.who.int/entity/noncommunicable_diseases/documents/sea-cced-88.pdf. accessed oktober 22, 2018
2. WHO. The top 10 causes of death, 2018. available in <http://www.who.int/newsroom/fact-sheets/detail/the-top-10-causes-of-death>. accessed oktober 22, 2018
3. Kaplan M. Kaplan's Clinical Hypertension 9th ed USA Lippincott Williams & Wilkins. Lancet. 2006; 358:1672-1686.
4. Ari R. Say goodbye to heart disease, Elex media komputindo, Jakarta. Kompas Gramedia Building, 2016:9-12.
5. Kementerian Kesehatan Republik Indonesia, 2015. Pusat data dan informasi/infodatin hipertensi. <http://www.depkes.go.id/download.php?file=download/pusdatin/infodatin/infodatin-hipertensi.pdf>. Accessed march 30, 2018.
6. Kementerian Kesehatan RI. Riset kesehatan dasar, 2013. www.depkes.go.id. Accessed June 20, 2018.
7. Kementerian Kesehatan RI. Riset kesehatan dasar, 2018. www.depkes.go.id. Accessed december 6, 2019.
8. FAO/WHO/UNU. Human Energy Requirement, Report Of a Joint Fao/Who/Unu Expert Consultation. Rome Nutritional Assessment, 2001. available in www.fao.org/publications>card. Accessed oktober 17, 2018.
9. Anies. Penyakit Degeneratif "Buku Ajar Kedokteran dan Kesehatan", Yogyakarta. Ar-Ruzz Media, 2018:19-26; 61-62.
10. Kementerian Kesehatan RI Pedoman Gizi Seimbang. Jakarta : Kementerian Kesehatan Republik Indonesia, 2014. <http://gizi.depkes.go.id>. Accessed January 8, 2019.
11. Dinkes Kota Medan. Laporan penyakit tidak menular tahun, 2018:2016 - 2017.

12. Lameshow S, Hosmer, Klar, Lwanga. Besar Sampel Dalam Penelitian Kesehatan, Yogyakarta, Gajah Mada University Press, 1997:24-26.
13. Prasetyo DA, Wijayanti AC, dan Werdani EK. Faktor-Faktor Yang Berhubungan Dengan Kejadian Hipertensi Pada Usia Muda Di Wilayah Puskesmas Sibela Surakarta, 2015. <http://eprints.ums.ac.id/37940/1/Naskah%20Publikasi.pdf>. Accessed Mei 30, 2018).
14. Harahap R. Faktor risiko aktifitas fisik, merokok, dan konsumsi alkohol, terhadap kejadian hipertensi pada laki-laki dewasa awal di Puskesmas Bromo, Tesis. USU, Medan, 2017. [www.repository USU.ac.id](http://www.repository.usu.ac.id). Accessed october 3, 2018.
15. Rihiantoro T, Widodo M. Hubungan pola makan dan aktifitas fisik dengan kejadian hipertensi di Kabupaten Tulang bawang. Jurnal Keperawatan. 2017; 13(2):159-166. <https://doi.org/10.26630/jkep.v13i2.924>
16. Schmid D, Ricci C, Leitzmann MF. Associations of objectively assessed physical activity and sedentary time with all-cause mortality in US adults: the NHANES study. PloS one. 2015; 10(3):e0119591. <https://doi.org/10.1371/journal.pone.0119591> PMID:25768112 PMCID:PMC4358950
17. Triyanto E. Pelayanan keperawatan bagi penderita hipertensi secara terpadu. Yogyakarta: Graha Ilmu. 2014.
18. Rohkuswaraa T, Syarif S. Hubungan obesitas dengan kejadian hipertensi derajat satu di pos pembinaan terpadu penyakit tidak menular (posbindu ptm) kantor kesehatan pelabuhan bandung. Jurnal Epidemiologi Kesehatan Indonesia. 2017; 1:13-18. <https://doi.org/10.7454/epidkes.v1i2.1805>
19. Bakris G, Sorrentino Matthew. Hypertension: A Companion to Braunwald's Heart Disease. 2018; 18:169-179. <https://www.clinicalkey.com/#!/browse/book/3-s2.0-2015001752x>. Accessed April 11, 2019.