CARDIOVASCULAR DISEASE AMONG ADOLESCENCE
IN SMPN 5 MALANG
A CROSS-SECTIONAL SURVEY STUDY

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ABSTRACT

Cardiovascular disease (CVD) is the leading cause of death in Asia-Pacific, although highly preventable, CVD was the cause of an estimated 9.4 million deaths and accounted for one-third of all deaths in 2016. Hypertension is one of cardiovascular disease risk factors. Early detection of cardiovascular disease is the main issues to reduce the prevalence of the cardiovascular disease. Adolescence was the population in which the modifiable cardiovascular risk factor firstly developed. In the year 2018, Indonesian Health Ministry discovered that the prevalence of the cardiovascular disease in East Java was 0.2 % higher than national prevalence and Malang as one of the biggest cities in East Java with high population growth, hence early detection of cardiovascular disease highlight issue. This cross-sectional survey was held in September 2019 at Public Junior High School 5 Malang (SMPN 5 Malang), which 123 students (75 females and 48 males) had participated. Bivariate analysis was done to examine the correlation between each variable and logistic regression was done to the most influential variable. Seventy-eight per cent of students were doing a sedentary lifestyle with physical activities < 300 minutes/week, 16.2 % of students were active smoker, and all were male. Among 123 students, 0.8 % with no cardiovascular risk factor, 29.2 % had one risk factor, 30.8 % had two risk factors, 27.6 % had three risk factors, and 11.3 % had four risk factors. The most prevalent risk factors were sedentary life (80 %), increase waist circumference (50 %), passive smoker (48.5 %), overweight & obesity (15 %), and active smoker (14,6 %). Waist circumference above normal was more prevalent in female (65 %) than male (31%). Hypertension had been found in 14.6 % of students and had a significant correlation with heart rate (p 0.011)

KEYWORDS

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death in Asia-Pacific, although highly preventable, CVD was the cause of an estimated 9.4 million deaths and accounted for one-third of all deaths in 2016 (WHO, 2018). Indonesian Health Ministry 2018 discovered that the prevalence of the cardiovascular disease in East Java was 0.2 % higher than national prevalence. Malang is one of the biggest city in East Java with high population growth (BPS, 2017); hence early detection of cardiovascular disease has become a highlighted issue. Risk of cardiovascular disease is divided into a modifiable and non-modifiable risk factor. Unhealthy diet, physical inactivity, tobacco use, and familial history of atherosclerotic cardiovascular disease are modifiable cardiovascular risk factors that

are potentially controlled among 0 – 19 age groups (Arnett et al., 2019). According to WHO 2014, adolescence described as population among 10 – 19 year age group and became 18 % of the worldwide population. Among the US adolescents aged 12 to 19 years, the overall prevalence was 14% for prehypertension/hypertension, which obesity was the leading risk factor. (May et al., 2012). Hence, this research aims to survey the prevalence of a cardiovascular disease among adolescence and correlation within risk factors.

MATERIAL AND METHODS

We did a cross-sectional survey in September 2019 to find any cardiovascular disease and found the risk factors by lifestyle questioner and an interview. This survey was held in Malang 5 State Junior High School. The vital sign examination was resting blood pressure, heart rate and respiratory rate. Hypertension in adolescence defined as systolic blood pressure > 120 mmHg and diastolic pressure > 80 mmHg. Measurement of body height and body weight to calculate body mass index, and asked the participants to fill the pretested and validated questionnaire that consists of the daily food intake, physical activities, and tobacco use to identify the individual lifestyle. The data were analyzed with 22th SPSS®; each variable's characteristic was served by the mean and standard deviation. Bivariate analysis with Chi-square to analyze categorical variables and Spearman correlation to analyze numeric variable. The multivariate analysis using logistic regression with significant p-value < 0.05. Abnormal data have been transformed.

Hypertension was diagnosed in those adolescents who presented office and home BP measurements (systolic and diastolic) at or above the 95th percentile for the corresponding age, gender and height (Flyn et al., 2017). According to international classifications, the cut-off points for waist circumference (WC) were adjusted by age and sex. The nutritional status of adolescents was assessed using body mass index (BMI = weight [kg] / height [m]2) which was classified according to the specific reference standard for the age and sex proposed by the World Health Organization (WHO) (2007). A sedentary lifestyle was defined as less than 300 minutes of moderate or vigorous physical activity per week (Pedro et al., 2012). Smoking was assessed by self-report of having smoked at least one day over the previous 30 days.

RESULT AND DISCUSSION

This survey was participated by 123 third-year students of SMPN 5 Malang. The participant of this survey was 48 male and 75 female age 14.18 (SD±0.462) years old, systolic blood pressure 115.2 (SD±14.9) mmHg, diastolic blood pressure 73.1 (SD± 9.5) mmHg, heart rate 80.6 (SD±7.1) beats per minute, body mass index 21.24 (SD±4.05) kg/m2, body height 152.79 (SD± 11.35) cm. The 70.7 % participants did 1-2 hours of daily activity, most of them were eating fast food once a week, 66 % were passive smoker, and 39% were an active smoker.

Table 1 described us the characteristics of the study participant. Female student was more populated than the male. The average age 14.18 (±0.462) years old, systolic blood pressure 115.2 (±14.9) mmHg, diastolic blood pressure 73.1 (±9.5) mmHg, heart rate 80.6 (±7.1) beats per minutes, body mass index 21.24 (±4.05) kg/m2, body height 152.79 (±11.35) cm. 51 % students did < 2 hours daily physical activity. The frequency of consuming fast food was one time/week among 43 % participant, 66% were passive smoker, 39 % active smoker.

Gender, body weight, body height, body mass index, heart rate, physical activity, passive smoker were risk factors that significantly correlated with hypertension (p<0.25). Hypertension has been found in 18 participants; 12 male and six female. All male hypertension population were a smoker. The hypertension was significantly correlated with heart rate (B 0.386 *p* 0.012) (table 2).

Cardiovascular disease (CVD) is the leading cause of death in Asia-Pacific, although highly death, cardiovascular disease is preventable by modifying the modifiable risk factors. Modifiable risk factors of cardiovascular disease are hypertension, overweight (BMI ≥ 85th percentile for a given age and sex), an increase of waist circumference (≥90th percentile for age and sex), smoking, alcohol consumption and sedentary lifestyle. Adolescence described as population among 10 – 19 years age group and become 18 % of the worldwide population. The number of another cardiovascular disease could be reduced by early detection of risk factors cardiovascular disease.

This survey found that 18 (14.6%) students were suffering from hypertension. The most prevalent risk factors were *sedentary lifestyle* (80 %), increase waist circumference (50 %), passive smoker (48.5 %), overweight & obesity (15 %), active smoker (14.6 %). Waist circumference above normal was more prevalent in females (65 %) than males (31%).

Hypertension is more prevalence in male than female. Heart rate had a significant correlation with systolic blood pressure (r 0.302 p 0.000) but not significant with BMI (r 0.111 p 0.143). Park et al., 2018 discovered that elevated blood pressure in adolescence was associated with heart rate. Park's investigation based on basic knowledge of blood pressure calculated cardiac output multiply by peripheral resistance. Moreover, cardiac output influenced by heart rate and stroke volume. Goel et al., 2016 resulted in that body mass index were significantly associated with risk of hypertension in adolescent, Prevalence of hypertension in this study correlated with BMI (B -0.72 p 0.635), waist circumference (B 0.267 p 0.77). Christofaro et al., 2017 confirmed that higher resting heart rate was commonly occurred in female students but significantly associated with higher blood pressure in boys student population.

The overweight student was 7 (5.6%) and all of them increase of waist circumference. Correlation analysis showed a strong correlation between overweight with increase waist circumference (r 0.842 p 0.000), but it was not significant with a sedentary lifestyle (r 0.0.63 p 0.416). This result was similar to a previous study that waist circumference had a significant association with body mass index dan

can serve as a positive indicator of overweight and obesity in Nigerian study population (Chinedu, 2013). The investigation of the effectiveness of anthropometric for the pediatric cardiometabolic risk factor's useful screening tool is challenging because, according to Li et al., an investigation among 15689 study participants in 2020 resulted in anthropometric indices are not effective as a screening tool for pediatric cardiometabolic risk factors, even in overweight/obese children.

Most of the hypertension students had three risk factors; passive smoker, overweight, and sedentary lifestyle and male students were more prevalent than female students. The hypertensive population, 15 % of student were active smoker, 60 % were passive smoker, and 25 % had no history of smoker exposure. A single routine BP measurement in adolescent girls efficiently predicts young adult hypertension. In adolescent boys, blood pressure (BP) predicts young adult 10-year cardiovascular risk (Vos et al., 2003). In children and adolescents, masked hypertension detected by home BP monitoring is associated with prehypertension and overweight. Repeated office measurements are essential for precise diagnosis. Masked hypertension in children appears to be intermediate phenotypes of hypertension (George et al., 2009). Bioelectrical impedance analysis(BIA)-derived BF is associated with body fat that is better suited than BMI in children and adolescents. However, Bohn et al., 2015 investigated that BIA-derived BF was not superior to BMI to predict cardiovascular risk factors in overweight or obese children and adolescents.

CONCLUSIONS AND SUGGESTION

Most of the hypertension students had three risk factors; passive smoker, overweight, and sedentary lifestyle within male students were more prevalent than female students. Hypertension had been found in 18 students and had a significant correlation with heart rate.

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Figures and Tables

Table 1. Baseline Characteristics Of Study Participant

Variable (n = 123)	Mean (SD) or %	*p-value*
Age (years)	14.18 (0.462)	0.000
Sex		
Male (48)	38 %	0.000
Female (75)	62 %	0.000
Body Weight (kg)	52.79 (11.35)	0.000
Body Height (cm)	157.38 (7.35)	0.75
BMI (kg/m^2)	21.24 (4.05)	0.73
Waist Circumference (cm)	74.4 (10.4)	0.34
Systolic Blood Pressure (mmHg)	115.2 (14.9)	0.000
Diastolic Blood Pressure (mmHg)	73.1 (9.5)	0.133
Heart Rate (beats per minute)	80.6 (7.1)	0.001
Duration of Physical Activities		
< 1 hour	31 %	0.000
1- 2 hour	51 %	0.000
2-3 hour	12 %	0.000
3- 4 hour	4 %	0.000
>4 hour	2 %	0.000
Fast Food		
1 time / week	43 %	0.000
>2 times / week	39 %	0.000
Once in two weeks	24 %	0.000
Once in month	15 %	
Passive Smoker		0.000
Yes	66 %	0.000
No	34 %	
Active Smoker		0.000
Yes	39 %	0.000
No	61 %	0.000

Pic 1. Cardiovascular Risk Factor Among Study Population
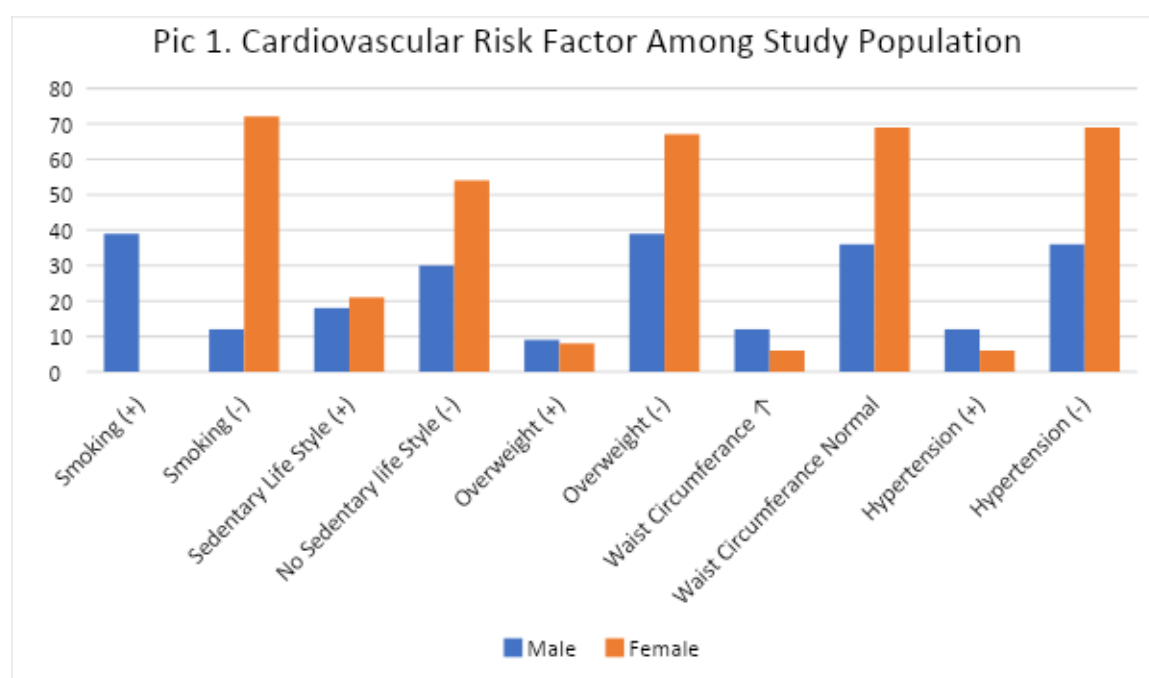
Picture 1 describes smoking as the most prevalent cardiovascular risk factor, followed by a sedentary lifestyle, waist circumference, hypertension, and overweight. Male students had more cardiovascular risk factor (smoker, waist circumference, and overweight) than female students. Female students were sedentary lifestyle than male students.

Table 2
Multivariate Analysis of Independent Risk Factors of Hypertension

Parameter	B	*p-value*
Gender	5.03	0.51
Body Weight	0.14	0.733
Body Height	- 0.01	0.975
Body Mass Index (BMI)	- 0.78	0.946
Heart Rate	0.386	0.012
Physical Activity	- 0.180	0.903
Passive Smoker	4.003	0.604