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The Relationship Between Body Mass Index and Total Cholesterol Levels Among Lecturers and Staff of the Medical Laboratory Technology Department, Polytechnic of Health, Ministry of Health Pontianak: A Cross-Sectional Study

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Abstract

Introduction: Elevated total cholesterol levels pose significant health risks, including cardiovascular diseases. Body Mass Index (BMI) is a simple anthropometric measure suspected to influence total cholesterol levels. This study aimed to determine the relationship between BMI and total cholesterol levels among lecturers and staff. **Methods:** This study employed a cross-sectional design. The population consisted of 43 lecturers and staff from the Department of Medical Laboratory Technology, with 38 participants selected via total sampling. BMI was calculated from direct measurements of weight and height. Total cholesterol levels were determined using the enzymatic CHOD-PAP method with a spectrophotometer. Data were analyzed using SPSS version 16, and the Fisher's Exact Test was applied to examine the association. **Results:** Of the 38 respondents, 15 (39.5%) were categorized as obese, and 23 (60.5%) as non-obese. Regarding total cholesterol, 29 respondents (76.3%) had normal levels, while 9 (23.7%) had high levels. The statistical analysis using Fisher's Exact Test yielded a p-value of 0.115 ($p > 0.05$), indicating no significant relationship between BMI and total cholesterol levels. **Conclusion:** This study found no statistically significant association between BMI and total cholesterol levels in the studied population. The findings suggest that other factors, such as diet, genetics, or fat distribution, may play a more critical role in determining cholesterol levels in this specific group. However, the limited sample size necessitates caution in interpretation, and further research with larger cohorts is recommended to confirm these findings.

Keywords: Body Mass Index, Total Cholesterol

Introduction

WHO data 2024 obesity is a complex chronic disease characterized by 43% of adults being overweight and 890 million people (16%) experiencing obesity. The Ministry of Health stated that, in 2023, 23.4% of adults in Indonesia aged 18 and above were obese.[1] National Institutes of Health data obesity or being overweight is caused by several factors, such as dietary patterns, lack of sleep, physical inactivity, certain medications, as well as genetics and family history. Unhealthy lifestyle habits, such as not engaging in physical activity and consuming foods and drinks that are high in calories but low in nutrients, can increase the risk of being overweight or even obese (. One of the methods used to estimate the distribution of body fat is by measuring body mass index (BMI).[2] BMI is a simple index used to assess the nutritional status of individuals aged 18 and above. The nutritional status indicator from body mass index (BMI) is based on anthropometric measurements of weight (W) and height (H). The formula used to calculate body mass index is weight (W) divided by height (H) in meters squared. The nutritional status classification based on body mass index includes the underweight category (BMI <18.5), normal category (BMI 18.5 – 25.0), overweight category (BMI 25.0 – 27.0), and obesity category (BMI >27.0). [1]

Research from the Multinational Monitoring of Trends and Determinants in Cardiovascular Diseases (MONICA) indicates that weight gain can be accompanied by an increase in serum cholesterol. Every 1 kg/m^2 increase in body mass index (BMI) is associated with a 7.7 mg/dl increase in total plasma cholesterol and a 0.8 mg/dl decrease in high-density lipoprotein (HDL).[3] Research by Yusuf and Ibrahim also assumes that excessive consumption of fast food can increase body mass index, and each increase in body mass index is directly proportional to an increase in total cholesterol levels [4]. A study by Yoga Adhi Dana noted that BMI has a significant correlation with blood cholesterol levels [5].Another study also states that the higher the body mass index, the higher the concentration of total cholesterol, LDL, and triglycerides.[6]

Cholesterol is a component of fat and can be found in all cells of the body. Cholesterol is a substance naturally produced by the liver, but it can also be found in foods derived from animals, such as meat and milk. In sufficient amounts, cholesterol is needed by the body to produce hormones, vitamin D, and other components used for digesting food. Cholesterol is a type of fat that is beneficial to the body. Although it is important, cholesterol can lead to health problems such

as disorders of the heart and other organs if its levels in the body are too high (hypercholesterolemia), because cholesterol can accumulate in the blood vessels and disrupt blood flow. Since not all types of cholesterol are bad for the body, the terms good cholesterol (high-density lipoprotein) and bad cholesterol (low-density lipoprotein) are used.[7] The sources of cholesterol in the blood are 85% produced from acetyl-CoA in the liver and 15% come from food. Cholesterol is removed from the body when it is metabolized and secreted in bile salts, which are eventually excreted through feces.[8]

According to the observations of the researcher, 23 individuals, constituting 53% of the 43 lecturers and staff members in the Department of Medical Laboratory Technology at Poltekkes Kemenkes Pontianak, were identified as having a body mass index (BMI) categorised as overweight or obese. Office workers, particularly lecturers and staff, generally engage in less physically demanding and more sedentary activities, as they predominantly spend their time seated, with minimal periods of standing or movement. The reduced energy expenditure associated with such activities correlates with an increased risk of obesity.[9]

In 2024, data from the Health Service Unit at Poltekkes Kemenkes Pontianak revealed that out of 21 lecturers and staff in the Department of Medical Laboratory Technology who underwent total cholesterol level assessments, 15 individuals (71%) exhibited total cholesterol levels exceeding the normal threshold. The highest recorded total cholesterol level was 312 mg/dl, and the average level exceeding the normal threshold was 244 mg/dl. This secondary data suggest that most lecturers and staff in the Department of Medical Laboratory Technology at Poltekkes Kemenkes Pontianak have total cholesterol levels above the normal range. Consequently, researchers are interested in investigating the relationship between Body Mass Index (BMI) and Total Cholesterol Levels among the lecturers and staff at the Department of Medical Laboratory Technology, Poltekkes Kemenkes Pontianak.

Materials and methods

This study used a quantitative approach. This study had a cross-sectional design. Cross-sectional research examines the dynamics of the correlation between risk factors and effects through an approach, observation, or data collection at a single point in time.

Population and Sample

The population refers to all subjects (humans, experimental animals, laboratory data, etc.) that will be studied and meet the specified characteristics.[10] The population in this study consisted of 43 lecturers and staff members in the Department of Medical Laboratory Technology at Poltekkes Kemenkes Pontianak. A sample is a subset of the population that possesses similar characteristics. If the population is large and it is not possible for the researcher to study everyone in the population, for example, due to limited funds, time, and energy, then the researcher can use a sample taken from that population.[10] The sample in this study consisted of Lecturers and Staff in the Department of Medical Laboratory Technology at Poltekkes Kemenkes Pontianak who met the criteria for this study. The final sample, which met all the inclusion criteria, comprised 38 individuals.

Sampling Technique

The sampling method in This study used total sampling. Total sampling is a sampling technique in which all members of the population are used as samples.[10] The inclusion criteria for this study were willingness to respond, no use of cholesterol-lowering medication, and presence at the research location.

Data Collection Instruments

The instruments used for data collection included observation sheets, a digital body weight scale, a microtoise for measuring height, and a Fotometer Rayto 1904-C device for cholesterol testing.

Body Weight Measurement

Body weight was measured using a digital scale placed on a stable flat surface in a well-lit location. Participants were asked to remove their shoes, jackets, hats, and other outerwear. The assessor stood beside or in front of the scale to supervise the measurement process. The participants stood in the centre of the scale platform, facing forward in an upright position, and remained still. The participants were instructed not to touch any objects or other individuals during the process. Once the reading stabilised, body weight was recorded. The participants were then allowed to step down and put their footwear and clothing back on.

Body Height Measurement.

Height was measured using a microtoise mounted vertically on a wall at a 90° angle to the floor. The device was first checked to ensure that it was securely attached and aligned at the zero mark. The participants removed their shoes and head accessories. They were instructed to stand upright with their heels and calves touching the wall, feet flat on the floor, arms at their side, and head facing forward. The headpiece was gently lowered to touch the top of the head. Height was recorded to the nearest 0.1 cm. The participants were then permitted to put their shoes and accessories back on.

Body Mass Index (BMI) Calculation

$$BMI = \frac{Weight\ (kg)}{Height^2\ (m^2)}$$

Weight and height values obtained from previous measurements were used for this calculation.

Venous blood sampling

Venous blood sampling for cholesterol testing begins by selecting a puncture site in the cubital fossa (elbow crease) that is free of injury or infection. Venous occlusion with a tourniquet is performed 7-10 cm above the site and should not last more than 1 min to prevent haemolysis that could affect the results. The area was then cleaned with 70% alcohol from the inside out and allowed to dry. The puncture is performed at a 15–30-degree angle. Once sufficient blood has been collected, the tourniquet is released, the needle is withdrawn, the puncture site is pressed with dry cotton, and then covered with a plaster. The blood sample was placed in a yellow vacuum tube (containing a gel separator) and properly labelled before analysis.

Cholesterol Testing Using CHOD-PAP

Total cholesterol testing using the CHOD-PAP method on the Rayto 1904 device is an automated procedure that relies on specific enzymatic reactions. The serum sample was reacted with the Dialab reagent kit, which contains a series of enzymes: cholesterol esterase and cholesterol oxidase to break down and oxidise cholesterol, as well as peroxidase to mediate the subsequent reaction. This reaction culminates in the formation of a red quinoneimine compound from the reaction between the generated hydrogen peroxide, 4-aminoantipyrine, and phenol. The Rayto 1904 device was used to measure the absorbance photometrically. Because the colour intensity is directly proportional to the cholesterol level, the device can accurately and precisely calculate and report the total cholesterol concentration in a sample.

Data Analysis

Data analysis was performed using the Statistical Product and Service Solutions (SPSS) version 16 for Windows. The analysis included both univariate and bivariate approaches. The Chi-square test was used to examine the associations between categorical variables in the bivariate analysis.

Results

This analytical study was conducted at the Clinical Chemistry Laboratory of Poltekkes Kemenkes Pontianak in July 2025. The primary aim of this study was to examine the association between body mass index and total cholesterol levels among the lecturers and staff of the Medical Laboratory Technology Department. The final sample, which met all the inclusion criteria, comprised 38 individuals.

Univariate analysis was performed to provide an overview of each variable. Univariate analysis was conducted using statistical testing and is presented in the form of tables and narratives. The results of the univariate analysis are presented below.

Table 1. Descriptive of Total Cholesterol Levels in Respondents

	N	Min	Max	Mean	Std. Dev
Total Cholesterol	38	108	432	183.13	60.363

Based on Table 1, out of 38 respondents, the lowest total cholesterol level was 108 mg/dl, the highest was 432 mg/dl, and the average total cholesterol level of the respondents was 183.13 mg/dl.

Table 2. Descriptive Age of Respondents

	N	Min	Max	Mean	Std. Dev
Respondent Age	38	22	60	43.03	13.516

Based on Table 2, of the 38 respondents, the youngest was 22 years old, the oldest was 60 years old, and the average age of the respondents was 43 years.

Table 3. Frequency Distribution of Body Mass Index Based on Respondent's Gender

		Gender		Total
		Man	**Woman**	
Body Mass Index	**Obese**	6 15.8%	9 23.7%	15 39.5%
	Not Obese	6 15.8%	17 44.7%	23 60.5%
Total		**12** **31.6%**	**26** **68.4%**	**38** **100.0%**

Based on the table above, it is known that out of 12 male respondents, 6 (15.8%) had a body mass index in the obese category and 6 (15.8%) had a body mass index in the non-obese category. Meanwhile, of the 26 female respondents, 9 (23.7%) had a body mass index in the obese category and 17 (44.7%) had a body mass index in the non-obese category.

Table 4. Frequency Distribution of Total Cholesterol Levels Based on Respondent's Gender

		Gender		Total
		Man	**Woman**	
Total Cholesterol	**High**	4 10.5%	5 13.2%	9 23.7%
	Normal	8 21.0%	21 55.3%	29 76.3%
Total		**12** **31.5%**	**26** **68.5%**	**38** **100.0%**

According to the data presented in the table, among the 12 male respondents, 4 (10.5%) exhibited elevated total cholesterol levels, while 8 (21.0%) demonstrated normal total cholesterol levels. In contrast, among the 26 female respondents, five (13.2%) had elevated total cholesterol levels, and 21 (55.3%) had normal total cholesterol levels. A bivariate analysis was conducted to examine the relationship between the two variables.

Table 5. Frequency Distribution of Body Mass Index Based on Respondents' Total Cholesterol Levels

		Kolesterol Total		Total
		Tinggi	**Normal**	
Body Mass Index	**Obese**	6 15.8%	9 23,7%	15 39.5%
	Not Obese	3 7.9%	20 52.6%	23 60.5%
Total		**9** **23.7%**	**29** **76.3%**	**38** **100.0%**

Based on the data in Table 5.5, of the 15 respondents (39.5%) with a body mass index in the obese category, six (15.8%) had high total cholesterol levels, and nine (23.7%) had normal total cholesterol levels. Of the 23 respondents (60.5%) with a body mass index in the non-obese category, three (7.9%) had high total cholesterol levels and 20 (52.6%) had normal total cholesterol levels.

Table 5.6 Statistical Analysis of Chi Square Test of the Relationship between BMI and Total Cholesterol Levels

Statistik	Score	p-Value
Pearson Chi-Square	3.650	0.056
Fisher's Exact Test	-	0.115

Based on the data in Table 5.6, which is the result of the Fisher's Exact Test analysis, a significance value of p = 0.115 (p>0.05) was obtained, indicating that there is no significant relationship between the two variables. Since there was one cell (25%) with an expected count < 5, the Pearson Chi-Square test could not be used, and the Fisher's Exact Test was chosen as an alternative.

Discussion

The findings of this study indicated that six individuals (15.8%) exhibited a body mass index classified as obese, accompanied by elevated total cholesterol levels. This condition was attributed to the dietary habits and physical activity patterns of

respondents. A significant proportion of participants reported a history of consuming high-fat foods and engaging in low-physical activity levels. Dietary intake has a direct influence on total cholesterol levels; however, a diet balanced with high-fibre foods, such as those rich in omega-3 and healthy fats, can mitigate total cholesterol levels and enhance HDL cholesterol levels.[11] In this study, 31 respondents reported low physical activity. The World Health Organization (2024) advises engaging in at least 150 min of moderate-intensity physical activity (e.g. brisk walking) to achieve health benefits. Notably, three respondents (7.9%) who were not classified as obese based on their body mass index also presented with high total cholesterol levels. This increase in cholesterol levels may be attributed to age-related factors, as the average age of respondents was 43 years, categorising them as adults. These three respondents were identified as being over 43 years of age.

Widiyono and Aryani (2020)[12] asserted that an individual's health tends to deteriorate with advancing age, concomitant with a gradual increase in total cholesterol levels. Among the respondents, nine individuals (23.7%) exhibited an obese body mass index while maintaining normal total cholesterol levels. This phenomenon may be attributed to variations in fat distribution and genetic factors. Respondents with subcutaneous fat distribution (fat located beneath the skin) are likely to exhibit more favourable total cholesterol levels than those with visceral fat distribution (abdominal fat).[13] This is due to the high lipolytic activity of visceral fat, which, through the stimulation of β-adrenergic receptors, results in the release of free fatty acids (FFAs) directly into portal circulation to the liver. Excess FFAs can stimulate increased cholesterol synthesis.[14] Furthermore, Danarsih et al. (2025)[15] indicated that individuals with the AACC genetic haplotype have a reduced risk of dyslipidaemia compared to those with the GGCC genotype. This suggests that certain genetic variants of ApoA-1 confer a protective effect, enabling many individuals to maintain normal total cholesterol levels.

The findings of this study indicate that there is no correlation between body mass index (BMI) and total cholesterol levels among lecturers and staff at the Department of Medical Laboratory Technology, Poltekkes Kemenkes Pontianak. These results are consistent with those of Wahyuni and Diansabila (2020)[3], who reported no relationship between BMI and total cholesterol levels. However, this study contrasts with the research by Dana and Maharani (2022)[5], who found a significant association between BMI and total cholesterol levels.

Conclusion

Based on the research regarding the relationship between Body Mass Index (BMI) and total cholesterol levels among lecturers and staff at the Department of Medical Laboratory Technology, Poltekkes Kemenkes Pontianak, it can be concluded that while the study population included respondents categorized as both obese and non-obese, and with both normal and high cholesterol levels, no statistically significant relationship was found between BMI and total cholesterol levels. However, this finding is inconclusive due to the limited sample size. Larger, more powerful studies are needed to confirm or refute this relationship.

Conflict of interest

The authors declare no conflicts of interest.

References

1. Kemenkes. Survei Kesehatan Indonesia (SKI) dalam Angka. 2023. 1–68 p.
2. Susantini P. Hubungan Indeks Masa Tubuh (IMT) dengan Persen Lemak Tubuh, dan Lemak Viscelar di Kota Semarang. Jurnal Gizi. 2021;
3. Wahyuni, Diansabila. Hubungan Indeks Massa Tubuh (IMT) dengan Kadar Kolesterol pada Mahasiswa Program Studi Kedokteran. Jurnal Universitas Muhammadiyah Jakarta. 2020;
4. Yusuf R, Ibrahim. Hubungan Indeks Massa Tubuh (Imt) Dengan Kadar Kolesterol Pada Remaja. Jurnal Kesehatan Saintika Meditory. 2019;
5. Dana YA, Maharani H. Hubungan Indeks Massa Tubuh Dengan Kadar Kolesterol Pada Karyawan Dan Mahasiswi Politeknik Kudus. FLORONA: Jurnal Ilmiah Kesehatan. 2022;
6. Humaera Z, Sukandar H, Rachmayati S. Korelasi Indeks Massa Tubuh dengan Profil Lipid pada Masyarakat di Jatinangor Tahun 2014. Jurnal Sistem Kesehatan. 2017;3(1):12–7.
7. Triharyanto B. Cara Mudah Mengontrol Kolesterol. Jakarta: Kreatifa Prima; 2020.
8. Jim EL. Metabolisme Lipoprotein. Jurnal Biomedik. 2014;
9. Rosa S, Riamawati L. Hubungan Asupan Kalsium, Air, dan Aktivitas Fisik dengan Kejadian Obesitas Sentral pada Pekerja Bagian Perkantoran. Jurnal Amerta Nutr. 2019;
10. Adiputra IMS, dkk. Metodologi Penelitian Kesehatan. Medan: Yayasan Kita Menulis; 2021.
11. Saras T. Memahami, Mengelola dan Menyelaraskan Kesehatan. Semarang, Jawa Tengah: Tiram Media; 2023.
12. Widiyono V.D.H. AA. Buku Kesehatan Air Rebusan Daun Salam Untuk Menurunkan Kolesterol. Kediri: Lembaga Chakra Brahmana; 2020.
13. Kim SD. 260 Resep Jus Buah dan Sayur. Yogyakarta: Genesis; 2018.
14. Von Krüchten R, dkk. Association between Adipose Tissue Depots and Dyslipidemia: The KORA-MRI Population-Based Study. Nutrients. 2022;14(4).
15. Danarsih DE, dkk. Variasi genetik apolipoprotein A-I meningkatkan risiko dislipidemia pada etnis Jawa. Media Ilmu Kesehatan. 2025;