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The Correlation Between Total Cholesterol and Blood Glucose Levels with Physical Activity in Construction Workers

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Abstract
Coronary heart disease (CHD) and Diabetes Mellitus (DM) are non-communicable diseases (NCDs), caused by elevation of total cholesterol and blood glucose levels. Both indicators can be influenced by physical activity, determined by the type of work people do. Construction workers' jobs involve a lot of physical activity with moderate to heavy intensity. This study aims to determine the correlation between total cholesterol and blood glucose levels with physical activity among construction workers. Employing an analytical observational design with a cross-sectional approach, the research involved 32 construction workers from Jatiwarna without a history of CHD and DM, who fasted before undergoing total cholesterol and blood glucose tests. The Global Physical Activity Questionnaire (GPAQ) was utilized to measure physical activity. The collected data were analyzed statistically and revealed that construction workers most frequently engage in heavy physical activity, with 25 individuals (78.1%) participating. The total cholesterol level ranged from 98.3 to 269.62 mg/dL, with mostly normal levels, but 10 participants (31.3%) had high total cholesterol levels. In terms of fasting glucose levels, the value ranged from 45.17 to 114.24 mg/dL, mostly normal except for 15 participants (53.1%) with abnormal levels. Spearman's correlation test showed a correlation between physical activity and total cholesterol levels (p-value of 0.003), as well as a correlation between physical activity and fasting glucose levels (p-value of 0.001). In conclusion, physical activity affects total cholesterol and blood glucose levels, which require balanced consideration alongside nutritious intake to maintain optimal metabolism.

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INTRODUCTION

Non-communicable diseases (NCDs), diseases that are not transmitted from person to person, tend to persist due to a combination of physiological, genetic, environmental, and behavioral factors. World Health Organization (WHO) data in 2023 showed that NCDs cause 71% of deaths each year (1). Deaths from NCDs occur in 77% of low- and middle-income countries, including Indonesia (1). The NCDs include Coronary Heart Disease (CHD), caused by elevated total cholesterol levels (hypercholesterolemia), and Diabetes Mellitus (DM) characterized by elevated blood glucose levels (hyperglycemia) (2,3). Total cholesterol and blood glucose levels in the body can be influenced by factors such as age, smoking habits, dietary habits, obesity, and physical activity (1).

Physical activity and diet greatly affect cholesterol levels in the body (4). In the context of physical activity, it refers to all body movements produced by skeletal muscles that require energy expenditure, derived from the food consumed. Cellularly, the food consumed is metabolized to produce adenosine triphosphate (ATP) utilized to perform

physical activity. The formation of ATP is adjusted to the needs, not all food consumed will be converted directly into ATP, some are stored in the from of cholesterol (5). The more physical activity, the more ATP is required, which will lead to less total cholesterol formation. Meanwhile, low physical activity promotes energy storage and fat accumulation, which can elevate cholesterol levels.

Physical activity also affects blood glucose levels. As body activity increases, muscles utilize more glucose. In order to maintain balanced blood glucose, endogenous glucose synthesis will be increased. Under normal circumstances, this state of mechanisms is maintained by the hormonal, nervous, and glucose regulation systems (6).

A person's physical activity is determined by the type of work they do. Construction workers perform a lot of physical activity at moderate to high intensity. In the construction workforce, roles are divided into several categories, including foremen, artisan labor (welders, ironworkers, carpenters), manual labor, and security personnel (7). This division shows that each worker has a different workload and set of physical activities.

Research linking physical activity to total cholesterol and blood glucose levels has revealed its relationship. For instance, Pilch et al.'s research (2015) revealed a significant relationship between physical activity and total cholesterol levels in postmenopausal women, as measured by changes in body composition, lipids, and carbohydrates (8). Another study by Intan Sahara (2017) showed a significant relationship between physical activity and fasting blood levels in students at Sriwijay Stase Sports High School (9). This study analyzes the correlation between total cholesterol and blood glucose levels with physical activity in construction workers.

METHODS

This study employs an analytical observational design with a cross-sectional approach. It has passed ethical review by the health research ethics committee of Muhammadiyah Purwokerto University, KEPK/UMP/64/III/2024. The sample comprised 32 construction workers from Jatiwarna, selected through purposive sampling, who met inclusion and exclusion criteria. The criteria included not having a history of CHD and DM and fasting for 10 hours before the total cholesterol and blood glucose tests. The Global Physical Activity Questionnaire (GPAQ) was used to measure physical activity and was further categorized by activity type. The data obtained were analyzed statistically using SPSS at both the univariate and bivariate levels. The univariate analysis involved descriptive statistics for each variable, while the bivariate analysis, using Spearman's rank test (95% significance level, $p < 0.05$), examined correlations between physical activity and total cholesterol and blood glucose levels. These data are presented in tables and in narrative form.

RESULTS AND DISCUSSION

The research data obtained from 32 construction workers as respondents are presented in the table.

Table 1. Frequency Distribution of Characteristics of Construction Workers by Age

Variables	Mean	SD	Max	Min
Age (Years)	37.13	12.417	72	20

Based on Table 1, the ages of construction workers ranged from 20 to 72 years, with an average of 37.13 years. In this study, the oldest respondent had a total cholesterol level of 203.89 mg/dL, while the youngest had 161.44 mg/dL. These results are consistent with research by Iswanto (2018), which showed that older age is associated with higher total cholesterol levels (10). Increasing age contributes to the deterioration of bodily functions, such as decreased estrogen and testosterone levels, which can alter fat distribution, allowing fat accumulation in the body. The blood sugar level of the

oldest respondent in this study was 97.31 mg/dL, while that of the youngest was 80.18 mg/dL. This is consistent with existing theory that advancing age affects the incidence of glucose intolerance. The incidence of glucose intolerance leads to decreased ability of the body to metabolize glucose, which is balanced by genetic factors in a person (11).

Table 2. Frequency Distribution of Construction Workers' Characteristics Based on Smoking Habits, Diet and BMI

Variables	Frequency	Percentage%
Smoking Habit		
Yes	28	87.5
No	4	12.5
Diet		
2 times a day	17	53.1
3 times a day	15	46.9
BMI		
Very Thin	1	3.1
Thin	2	6.3
Normal	24	75
Overweight	3	9.4
Obese	2	6.3

Table 2 shows that 28 (87.5%) respondents have a smoking habit. Smoking habits can affect total cholesterol levels because smoking can reduce HDL cholesterol levels in the blood. HDL cholesterol functions to reduce excess cholesterol in the blood (12).

In terms of diet, 17 (53.1%) respondents had a diet of 2 times a day, and 15 (46.9%) respondents had a diet of 3 times a day. Diet is an indicator of lifestyle and can influence total cholesterol levels. Research by Hamna Vonny Lasanuddin, Rosmin Ilham, and Rianti P. Umani (2022) showed that people who have a regular diet do not experience an increase in cholesterol levels (13). Most respondents had a normal BMI (24; 75%), followed by 3 (9.4%) respondents with an overweight BMI, 2 (6.3%) respondents categorized as obese and thin, and 1 (3.1%) very thin respondent. Obesity occurs due to excessive fat accumulation, affecting total cholesterol levels (14). Furthermore, it disrupts insulin production, leading to insulin resistance and affecting blood glucose levels (15).

Table 3. Frequency Distribution of Construction Workers' Physical Activity

Physical Activity	Frequency	Percentage (%)
Low	0	0%
Medium	7	21.9
Weight	25	78.1
Total	32	100

Table 3 showed that 7 (21.9%) workers had moderate physical activity and 25 (78.1%) workers had heavy physical activity. This is consistent with the research findings of Oscar et al. (2015), which reported that physical activity levels among commercial construction workers ranged from moderate to heavy intensity (16).

Table 4. Descriptive Analysis of Total Cholesterol Levels

Variables	Frequency		Value (mg/dL)		
	Normal	High	Mean	Max	Min
Total Cholesterol Level	22 (68.8%)	10 (31.3%)	175.35	269.62	98.31

Table 4 revealed that 22 (68.8%) workers had normal total cholesterol levels, while 10 (31.3%) workers had high levels, with an average of 175.35 mg/dL. Research by Santi, Parwati, and Mirayanti (2019) revealed that the total cholesterol levels of manual workers are mostly within the normal range, with an average of 158.63 mg/dL (17). This is because manual laborers have sufficient physical activity. Table 4 also shows that the lowest total cholesterol level among construction workers was 98.31 mg/dL, and the highest was 269.62 mg/dL.

Table 5. Descriptive Analysis of Blood Sugar Levels

Variables	Frequency		Value (mg/dL)		
	Normal	Abnormal	Mean	Max	Min
Blood Glucose Levels	17 (53.1%)	15 (46.9%)	79.34	114.24	45.17

Table 5 shows that blood sugar levels for 17 (53.1%) workers are within normal values, and 15 (46.9%) are abnormal, with an average fasting blood sugar level of 79.34 mg/dL. Previous research revealed that a pattern of heavy physical activity has a fasting blood sugar level <80 mg/dL (9). Then, Table 5 also shows that the highest level obtained was 114.24 mg/dL and the lowest level was 45.17 mg/dL.

Table 6. Correlation Between Total Cholesterol and Blood Sugar Levels with Physical Activities

Correlation Variables	N	Sig. (p-value)	Correlation Coefficient (r)
Total Cholesterol Level with Physical Activity	32	0.003	-0.504
Blood Sugar Levels with Physical Activity	32	0.001	-0.577

Based on Table 6, the correlation between total cholesterol level and physical activity had a p-value of 0.003 ($p<0.05$) and a correlation coefficient (r) of -0.504. It can be concluded that there is a relationship between total cholesterol levels and physical activity in construction workers. The correlation coefficient in this study is moderate with a negative direction, meaning that physical activity is inversely proportional to the total cholesterol level. This finding is consistent with the research by Zuhroiyyah, Sukandar, and Sastradinanja (2017) on the relationship between physical activity and

total cholesterol, LDL, and HDL cholesterol, which showed a significant association between physical activity and total cholesterol (18).

Regarding the correlation between blood sugar levels and physical activity, the p-value is 0.001 ($p<0.05$), with a correlation coefficient (r) of -0.577. This shows that there is a strong relationship between blood sugar levels and physical activity in construction workers, with a negative correlation direction, meaning that when physical activity is heavy, blood sugar levels are not high, and vice versa. The research finding is in line with the research by Reza and Zahrah (2022) that there is a relationship between physical activity and blood sugar levels (19).

CONCLUSION

The results showed that there was a significant relationship between physical activity with total cholesterol levels and blood sugar levels. Physical activity is a factor that affects total cholesterol levels and blood sugar levels in the body. It is expected for people who do physical activity at work to maintain health with adequate and nutritious food intake needs, and balance the type of workload so as not to interfere with the body's metabolism.

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REFERENCES

1. WHO. Noncommunicable diseases [Internet]. 2025 [cited 2026 July 2]. Available from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases
2. Huff T, Boyd B, Jialal I. Physiology, Cholesterol. 2023 Mar 6. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan–. PMID: 29262185. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470561/
3. Mouri MI, Badireddy M. Hyperglycemia. [Updated 2023 Apr 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430900/
4. R.A. Hurunin, Tri Prasetyorini, Citra Amaniah Anhar, Theresa Siahaan. Vol 1 No 1, 2023. The Relationship Between Physical Activity and Dietary Patterns with Total Cholesterol Levels in Older Adults. *Proceeding International Conference on Health Research and Science (ICHRS) Vol 1 No 1*. Available from: https://www.poltekkesjakarta3.ac.id/ejurnalnew/index.php/ProsidingJKT3/article/view/1307
5. Chandel NS. Lipid Metabolism. Cold Spring Harb Perspect Biol. 2021 Sep 1;13(9):a040576. doi: 10.1101/cshperspect.a040576. PMID: 34470787; PMCID: PMC8411952. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC8411952/
6. Sarifin G., Rusli and Hasnul, D. 2021. 'Pengaruh Aktifitas Fisik Terhadap Kadar Glukosa Darah pada Mahasiswa Prodi Gizi FIK UNM', Seminar Nasional Hasil Penelitian, pp. 150–160. Available at: https://ojs.unm.ac.id/semnaslemlit/article/view/25209
7. Gunadi, V.I.., Mewo, Y.M. and Tiho, M. (2016) 'Gambaran kadar hemoglobin pada pekerja bangunan', Jurnal e-Biomedik, 4(2), pp. 2–7. Available at: https://doi.org/10.35790/ebm.4.2.2 016.14604

8. Pilch, W.B. et al. (2015) 'The influence of a 12-week program of physical activity on changes in body composition and lipid and carbohydrate status in postmenopausal women', Przeglad Menopauzalny, 14(4), pp. 231– 237. Available at: https://doi.org/10.5114/pm.2015.5 6311.
9. Sahara, I. (2017) 'Hubungan Aktivitas Fisik terhadap Kadar Glukosa Darah Puasa Pada Pelajar di SMA Olahraga Negeri Sriwijaya', Universitas Muhammadiyah Palembang, 02(01), pp. 1–102. https://repository.um-palembang.ac.id/id/eprint/522/1/SKRIPSI360-1704268611.pdf
10. Iswanto, Y. (2018) 'Hubungan indeks massa tubuh (IMT), usia dan kadar glukosa darah dengan kadar kolesterol total dan trigliserida pada anggota TNI AU di RSPAU dr S. Hardjolukito Yogyakarta', Universitas Gadjah Mada Yogyakarta, pp. 4–19. Available at: https://core.ac.uk/download/pdf/19 8427947.pdf.
11. Gunawan, S. and Rahmawati, R. (2021) 'Hubungan Usia, Jenis Kelamin dan Hipertensi dengan Kejadian Diabetes Mellitus Tipe 2 di Puskesmas Tugu Kecamatan Cimanggis Kota Depok Tahun 2019', ARKESMAS (Arsip Kesehatan Masyarakat), 6(1), pp. 15–22. Available at: https://doi.org/10.22236/arkesmas. v6i1.5829.
12. Diaz L, Bielczyk-Maczynska E. High-density lipoprotein cholesterol: how studying the 'good cholesterol' could improve cardiovascular health. Open Biol. 2025 Feb;15(2):240372. doi: 10.1098/rsob.240372. Epub 2025 Feb 19. PMID: 39965658; PMCID: PMC11835495 Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC11835495/
13. Hamna Vonny Lasanuddin, Rosmin Ilham and Rianti P. Umani (2022) 'Hubungan Pola Makan dengan Peningkatan Kadar Kolesterol Lansia di Desa Tenggela, Kecamatan Tilango', Jurnal Ilmu Kedokteran dan Kesehatan Indonesia, 2(1), pp. 22–34. Available at: https://doi.org/10.55606/jikki.v2i1.566.
14. Feingold KR. Obesity and Dyslipidemia. [Updated 2026 Mar 24]. In: Feingold KR, Adler RA, Ahmed SF, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK305895/
15. Klein S, Gastaldelli A, Yki-Järvinen H, Scherer PE. Why does obesity cause diabetes? Cell Metab. 2022 Jan 4;34(1):11-20. doi: 10.1016/j.cmet.2021.12.012. PMID: 34986330; PMCID: PMC8740746. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC8740746/
16. Arias OE, Caban-Martinez AJ, Umukoro PE, Okechukwu CA, Dennerlein JT. Physical activity levels at work and outside of work among commercial construction workers. J Occup Environ Med. 2015 Jan;57(1):73-8. doi: 10.1097/JOM.0000000000000303. PMID: 25563543; PMCID: PMC4530451.
17. Santi, N.K.D.R., Parwati, P.A. and Mirayanti, N.K.A. (2019) 'Perbedaan Kadar Kolesterol Total Darah pada Pekerja Kantoran dan Pekerja Kasar', Jurnal Penelitian dan Kajian Ilmiah Kesehatan, 5(2), pp. 115–119. Available at: http://www.lppm.poltekmfh.ac.id/i ndex.php/JPKIK/article/view/7.
18. Zuhroiyyah, S.F., Sukandar, H. and Sastradinanja, S.B. (2017) 'Hubungan Aktivitas Fisik dengan Kadar Kolesterol Total, Kolesterol Low-Density Lipoprotein, dan Kolesterol High-Density Lipoprotein pada Masyarakat Jatinangor', Jurnal Sistem Kesehatan, 2(3), pp. 116–122. Available at: https://doi.org/10.24198/jsk.v2i3.1 1954.
19. Reza Azhari, & Zahrah Maulidia Septimar. (2022). Hubungan Aktivitas Fisik dengan Kadar Glukosa Darah pada Penyandang Diabetes Melitus Tipe 2 di Wilayah Perumahan Bugel Mas Indah RW 009. Nusantara Hasana Journal, 2(7), 86–90. Retrieved from https://nusantarahasanajournal.com/index.php/nhj/article/view/657