

Cholesterol Profile and Cardiovascular Risk Among Senior Civil Servants in Umuahia North Local Government Area, Abia State, Nigeria

ROSEMARY ICHITA ELEKEH

elekeh.rosemary@abiastateuniversity.edu.ng

Abia State University

Chinyere A. Echendu

Michael Okpara University

Iheanacho Loveth Ifeoma

David Umahi Federal University of Health Sciences Uburu

Research Article

Keywords: Cholesterol profile, Cardiovascular risk, LDL cholesterol, HDL cholesterol, Triglycerides, Civil servants, Nigeria

Posted Date: September 30th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10619806/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Cardiovascular diseases (CVDs) remain the leading cause of death globally and constitute a growing public health challenge in low- and middle-income countries. Dyslipidaemia, characterized by abnormalities in blood lipid concentrations such as elevated total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), and reduced high-density lipoprotein cholesterol (HDL-C), is one of the most important modifiable risk factors for cardiovascular disease. Abnormal lipid profiles contribute significantly to atherosclerosis, coronary heart disease, stroke, and other cardiovascular complications.

Objective

This study assessed the cholesterol profile and cardiovascular risk among senior civil servants in Umuahia North Local Government Area, Abia State, Nigeria.

Methods

A descriptive cross-sectional study was conducted among 222 senior civil servants selected through a multistage sampling procedure. Valid lipid results were available for 221 participants for HDL-C, 220 for LDL-C and 222 for triglycerides. Data were obtained using a structured questionnaire and biochemical assessment of lipid parameters. High-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and triglyceride levels were measured and categorized according to standard clinical reference values. Data were analysed using descriptive statistics and presented as frequencies, percentages, means, and standard deviations.

Results

The mean HDL-C level among respondents was 50 mg/dL. Approximately 39.6% of respondents had HDL-C values within the range of 41–60 mg/dL, while a substantial proportion recorded HDL levels associated with increased cardiovascular risk. The mean LDL-C level was 156 mg/dL, with only 1.8% of respondents having optimal LDL-C levels. Most respondents had elevated LDL-C concentrations, particularly within the ranges of 158–207 mg/dL (35.6%) and 208–257 mg/dL (28.4%). The mean triglyceride level was 51 mg/dL, with the highest proportions observed in the ranges of 51–60 mg/dL (37.8%) and 41–50 mg/dL (35.6%). The overall lipid profile pattern suggested increased cardiovascular risk among a considerable proportion of the study population.

Conclusion

The findings indicate a high prevalence of unfavourable lipid profiles among senior civil servants in Umuahia North LGA. Elevated LDL-C levels and suboptimal HDL-C levels may predispose many respondents to cardiovascular disease. Regular lipid screening, workplace health promotion programmes, dietary modification, and increased physical activity are recommended to reduce cardiovascular risk among civil servants.

1.0 INTRODUCTION

Cardiovascular diseases (CVDs) constitute a major global public health challenge and are responsible for an estimated 20.5 million deaths annually, accounting for approximately one-third of all deaths worldwide (World Heart Federation, 2024). The burden of cardiovascular disease is increasingly shifting towards low- and middle-income countries where rapid urbanization, lifestyle changes, unhealthy dietary practices, physical inactivity, and increasing prevalence of obesity contribute significantly to disease occurrence (WHO, 2024). In sub-Saharan Africa, cardiovascular diseases have emerged as a major cause of morbidity and mortality, creating substantial economic and healthcare burdens on individuals, families, and governments (Mensah et al., 2023). Abnormal blood lipid concentrations, commonly referred to as dyslipidaemia, are among the most important modifiable risk factors for cardiovascular disease. Dyslipidaemia is characterized by elevated levels of total cholesterol, low-density lipoprotein cholesterol (LDL-C), triglycerides, and/or reduced levels of high-density lipoprotein cholesterol (HDL-C) (Mach et al., 2020). Numerous epidemiological studies have demonstrated strong associations between elevated LDL-C concentrations and the development of atherosclerosis, coronary heart disease, stroke, and other cardiovascular complications (Ference et al., 2019). Low-density lipoprotein cholesterol is widely recognized as the primary atherogenic lipoprotein because it facilitates the deposition of cholesterol within arterial walls, leading to plaque formation and progressive narrowing of blood vessels (Mach et al., 2020). Conversely, high-density lipoprotein cholesterol plays a protective role by promoting reverse cholesterol transport and reducing lipid accumulation within blood vessels (Visseren et al., 2021). Reduced HDL-C levels have therefore been associated with increased cardiovascular risk, while higher HDL-C levels generally confer protective benefits against cardiovascular disease.

Triglycerides also play an important role in cardiovascular health. Elevated triglyceride levels have been linked to insulin resistance, metabolic syndrome, obesity, and increased risk of cardiovascular events (Virani et al., 2021). Recent evidence suggests that triglycerides contribute independently to residual cardiovascular risk even after controlling for LDL-C concentrations (Arnett et al., 2019). Nigeria is currently experiencing a nutritional and epidemiological transition characterized by increased consumption of energy-dense foods, reduced physical activity, sedentary occupations, and rising prevalence of overweight and obesity (Akinlua et al., 2023). These changes have contributed significantly to increasing rates of hypertension, diabetes mellitus, dyslipidaemia, and cardiovascular disease among Nigerian adults (Adeloye et al., 2021). Civil servants represent a population group particularly vulnerable to cardiovascular risk factors due to prolonged sitting hours, occupational stress, limited physical activity during working hours, and unhealthy dietary behaviors. Studies conducted among public-sector employees in Nigeria and other developing countries have reported high prevalence of dyslipidaemia and

other cardiovascular risk factors among workers (Mohammed et al., 2023; Gebremichael et al., 2024). Despite this growing concern, there remains limited information regarding lipid profiles and cardiovascular risk among civil servants in southeastern Nigeria.

Understanding the cholesterol profile of senior civil servants is important for identifying individuals at risk of cardiovascular disease and informing workplace-based interventions aimed at promoting healthier lifestyles. Early detection of dyslipidaemia can facilitate timely preventive measures, reduce disease burden, and improve overall workforce productivity and wellbeing. Therefore, this study assessed the cholesterol profile and cardiovascular risk among senior civil servants in Umuahia North Local Government Area of Abia State, Nigeria. Specifically, the study evaluated HDL-C, LDL-C, and triglyceride levels and examined their implications for cardiovascular health among the respondents.

2.0 METHODS

Study Area

The study was conducted in Umuahia North Local Government Area (LGA) of Abia State, Nigeria. Umuahia North serves as the administrative headquarters of Abia State and hosts numerous government ministries, departments, and agencies. The area is predominantly urban and is characterized by increasing westernization of dietary practices, sedentary occupational lifestyles, and rising prevalence of non-communicable disease risk factors. These characteristics make the study area suitable for investigating lipid profiles and cardiovascular risk among working adults.

Study Design

This study adopted a cross-sectional descriptive survey design to assess cholesterol profile and cardiovascular risk among senior civil servants in Umuahia North Local Government Area. The study was derived from a broader investigation that examined feeding practices, nutritional status, and cholesterol profiles among senior civil servants in the study area (Elekeh, 2020). The cross-sectional design enabled the assessment of lipid profile characteristics and cardiovascular risk indicators among respondents at a specific point in time and facilitated the identification of patterns relevant to public health interventions.

Study Population

The study population comprised senior civil servants working in ministries and government establishments located within Umuahia North Local Government Area.

Inclusion Criteria

- Senior civil servants employed in government ministries and agencies.
- Civil servants who had worked for at least one year in their current employment.
- Individuals who voluntarily consented to participate in the study.

Exclusion Criteria

- Junior civil servants.
- Pregnant women.
- Individuals with acute illnesses during the study period.
- Civil servants who declined participation.

Sample Size and Sampling Technique

A total of 222 senior civil servants participated in the study. Due to incomplete laboratory results, the number of valid observations differed slightly across lipid parameters: 221 for HDL-C, 220 for LDL-C and 222 for triglycerides. Respondents were selected using a multistage sampling technique involving selection of ministries, departments, and eligible participants.

Data Collection

Data collection involved administration of a semi-structured questionnaire developed specifically for the original study and laboratory assessment of blood lipid profiles. The questionnaire obtained information on socio-demographic characteristics, feeding practices, lifestyle behaviours, and health-related factors. The questionnaire was validated by lecturers in the Department of Human Nutrition and Dietetics and approved by the thesis supervisor. An English-language copy of the questionnaire is provided as Supplementary File 1.

Venous blood samples were collected from respondents under standard laboratory conditions following an overnight fast. Blood samples were analyzed for lipid profile parameters including:

- High-Density Lipoprotein Cholesterol (HDL-C)
- Low-Density Lipoprotein Cholesterol (LDL-C)
- Triglycerides (TG)

Laboratory analyses were conducted using standard biochemical procedures as described in the project report.

Variables Assessed

HDL Cholesterol

HDL cholesterol was classified according to established cardiovascular risk guidelines:

- Low HDL-C (high cardiovascular risk)
- Normal HDL-C
- High HDL-C (protective)

LDL Cholesterol

LDL cholesterol levels were categorized as:

- Optimal
- Near optimal
- Borderline high
- High
- Very high

Triglycerides

Triglyceride levels were classified as:

- Normal
- Borderline high
- High
- Very high

These classifications were based on National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) recommendations (Grundy et al., 2019).

Data Analysis

Data were entered, cleaned, and analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics including frequencies and percentages were used to summarize respondents' lipid profile characteristics. Results were presented in tables and discussed in relation to cardiovascular disease risk.

Ethical Considerations

Ethical approval

for the original study was obtained from the appropriate institutional authorities before commencement of data collection. Participation was voluntary and informed consent was obtained from all respondents. Confidentiality and anonymity of participants were maintained throughout the study.

3.0 RESULT AND DISCUSSIONS

The lipid profile of the respondents was assessed using High-Density Lipoprotein Cholesterol (HDL-C), Low-Density Lipoprotein Cholesterol (LDL-C), and triglyceride (TG) levels. The distributions of these lipid parameters are presented in Tables 1–3.

Table 1 presents the distribution of respondents according to High-Density Lipoprotein Cholesterol (HDL-C) levels.

Table 1

Distribution of Respondents by High-Density Lipoprotein Cholesterol Levels (HDL-C) (n = 221).

HDL Range (mg/dL)	Frequency (n)	Percentage (%)
1–20	4	1.8
21–40	70	31.7
41–60	88	39.8
61–80	44	19.9
81–100	15	6.8
Total	221	100
Mean HDL-C = 50 mg/dL		
Source: Household survey (2014)		
Note: One participant had a missing HDL-C result; therefore, percentages are based on 221 valid observations.		

Table 2 presents the distribution of respondents according to Low-Density Lipoprotein Cholesterol (LDL-C) levels.

Table 2

Distribution of Respondents by Low-Density Lipoprotein Cholesterol Levels (LDL-C) (n = 220)

LDL Range (mg/dL)	Frequency (n)	Percentage (%)
57–107	4	1.8
108–157	37	16.8
158–207	79	35.9
208–257	63	28.6
258–307	37	16.8
Total	220	100
Mean LDL-C = 156 mg/dL		
Source: Household survey (2014)		
Note: Two participants had missing LDL-C results; therefore, percentages are based on 220 valid observations.		

Table 3 presents the distribution of respondents according to triglyceride (TG) levels.

Table 3
Distribution of Respondents by Triglycerides (TG) Levels (LDL-C) (N = 222)

Triglyceride Range (mg/dL)	Frequency (n)	Percentage (%)
≤ 30	4	1.8
31–40	26	11.7
41–50	79	35.6
51–60	84	37.8
61–70	29	13.1
Total	222	100.0
Mean Triglyceride = 51 mg/dL		

Source: Household survey (2014).

DISCUSSIONS

Cardiovascular diseases remain one of the leading causes of morbidity and mortality worldwide, and dyslipidaemia continues to be a major modifiable risk factor for the development of atherosclerosis, coronary heart disease, and stroke. This study assessed the cholesterol profile and cardiovascular risk among senior civil servants in Umuahia North Local Government Area of Abia State, Nigeria. The findings revealed a high burden of lipid abnormalities among respondents, particularly with respect to HDL and LDL cholesterol levels, suggesting an elevated risk of future cardiovascular disease within this occupational group. One of the most important findings of this study was the high proportion of respondents identified as being at risk of heart disease based on their HDL cholesterol levels. The study reported that approximately 73% of respondents were classified as being at cardiovascular risk according to HDL-C measurements, while only a minority exhibited HDL levels considered protective against cardiovascular disease. HDL cholesterol is commonly referred to as “good cholesterol” because it facilitates reverse cholesterol transport, a process through which excess cholesterol is removed from peripheral tissues and transported to the liver for excretion (Mach et al., 2020). Low HDL cholesterol concentrations have consistently been associated with increased risk of coronary artery disease, myocardial infarction, and stroke (Virani et al., 2023). The high prevalence of low or suboptimal HDL levels observed in this study therefore indicates a substantial burden of cardiovascular risk among senior civil servants. The findings are consistent with reports from several Nigerian studies that have documented low HDL cholesterol as one of the most common lipid abnormalities among adults. Chukwuonye et al. (2013) reported a high prevalence of dyslipidaemia among apparently healthy Nigerian adults, with reduced HDL cholesterol emerging as a major cardiovascular risk factor. Similarly, Oguejiofor et al. (2022) observed that low HDL cholesterol was strongly associated with obesity and other cardiometabolic abnormalities among urban populations in southeastern Nigeria. Comparable

findings have also been reported in studies conducted in Ghana, South Africa, and Ethiopia, where low HDL cholesterol was identified as a predominant lipid abnormality among employed adults and urban residents (Mensah et al., 2023). The widespread occurrence of low HDL levels among respondents may be attributable to sedentary lifestyles, inadequate physical activity, excess body weight, and suboptimal dietary practices, all of which have been shown to negatively influence HDL metabolism.

Another striking finding of this study was the distribution of LDL cholesterol levels among respondents. The mean LDL cholesterol concentration was 156 mg/dL, while only 1.8% of respondents had LDL values within the optimal range. The majority of participants were clustered within elevated LDL categories, indicating widespread exposure to a major atherosclerotic risk factor. LDL cholesterol plays a central role in the pathogenesis of cardiovascular disease because elevated concentrations promote cholesterol deposition within arterial walls, leading to plaque formation, arterial narrowing, and vascular inflammation (Grundy et al., 2019). Numerous epidemiological and clinical studies have demonstrated a strong relationship between elevated LDL cholesterol and increased risk of coronary heart disease, stroke, and cardiovascular mortality (Ference et al., 2017; Virani et al., 2023). The high prevalence of elevated LDL cholesterol observed in this study is particularly concerning because it suggests that many respondents may already be experiencing early stages of atherosclerotic disease despite being apparently healthy. Similar findings have been reported among office workers and urban populations in developing countries undergoing rapid nutritional transition. Increased consumption of refined carbohydrates, saturated fats, trans fats, and processed foods has been linked to elevated LDL cholesterol levels and increased cardiovascular risk (GBD Risk Factors Collaborators, 2024). The dietary patterns reported in the parent study, including frequent consumption of energy-dense foods and processed products, may partly explain the elevated LDL concentrations observed among respondents. Triglyceride levels among respondents appeared relatively less alarming compared with HDL and LDL findings. The mean triglyceride concentration was approximately 51 mg/dL, and the majority of respondents had values within ranges generally considered acceptable. Although elevated triglycerides are recognized as an independent cardiovascular risk factor, their contribution to cardiovascular disease risk is often amplified when accompanied by low HDL cholesterol and elevated LDL cholesterol (Mach et al., 2020). Consequently, the relatively normal triglyceride profile observed in this study does not eliminate cardiovascular risk because the pronounced abnormalities in HDL and LDL cholesterol remain significant predictors of future cardiovascular events.

The findings of this study may also reflect the influence of occupational and lifestyle factors associated with civil service employment. Civil servants typically spend prolonged periods seated while performing administrative duties, resulting in reduced energy expenditure and lower levels of physical activity. Physical inactivity has been consistently associated with adverse lipid profiles, including reduced HDL cholesterol and increased LDL cholesterol concentrations (World Health Organization, 2023). Furthermore, occupational stress, irregular meal patterns, and limited opportunities for structured exercise may contribute to the development of dyslipidaemia among working adults. Previous studies have shown that workplace sedentary behavior is independently associated with cardiovascular risk factors and metabolic disorders (Hallal et al., 2022; Adeoye et al., 2021). The findings are further

supported by evidence from the obesity analysis conducted within the same study population. A substantial proportion of respondents were either overweight or obese, conditions that are strongly associated with dyslipidaemia and cardiovascular disease. Excess adiposity has been shown to promote insulin resistance, systemic inflammation, and lipid abnormalities, including elevated LDL cholesterol and reduced HDL cholesterol (Hruby & Hu, 2015). The coexistence of obesity and dyslipidaemia among respondents may therefore contribute synergistically to increased cardiovascular risk. From a public health perspective, the findings are of considerable concern because cardiovascular disease remains a major contributor to premature mortality globally and is increasing rapidly in sub-Saharan Africa. The high proportion of respondents exhibiting adverse lipid profiles suggests that a significant number of civil servants may be at risk of future cardiovascular events if preventive measures are not implemented. Early identification and management of dyslipidaemia through regular lipid screening, nutrition education, physical activity promotion, weight management programmes, and behavioural counselling could substantially reduce cardiovascular risk within this population.

Workplace-based interventions may be particularly effective because civil servants spend a significant proportion of their daily lives within government institutions. Health promotion initiatives such as periodic cardiovascular risk assessment, healthy workplace nutrition policies, exercise promotion programmes, and employee wellness campaigns could improve lipid profiles and reduce the burden of cardiovascular disease among workers. Such interventions would not only improve individual health outcomes but also enhance productivity, reduce absenteeism, and decrease healthcare costs associated with chronic diseases. Overall, the study demonstrates a substantial burden of dyslipidaemia among senior civil servants in Umuahia North Local Government Area. The finding that approximately 73% of respondents were at cardiovascular risk based on HDL cholesterol levels, coupled with the observation that only 1.8% had optimal LDL cholesterol concentrations, underscores the urgent need for targeted cardiovascular disease prevention strategies. Strengthening workplace health promotion programmes and integrating routine lipid screening into occupational health services may play an important role in reducing future cardiovascular disease risk among civil servants in Nigeria.

CONCLUSION

This study assessed the cholesterol profile and cardiovascular risk among senior civil servants in Umuahia North Local Government Area of Abia State, Nigeria. The findings revealed a considerable burden of dyslipidaemia among respondents, particularly with respect to HDL and LDL cholesterol levels. A substantial proportion of participants were identified as being at risk of cardiovascular disease based on HDL cholesterol concentrations, while only a very small proportion exhibited LDL cholesterol values within the optimal range. These findings indicate that many respondents may be at increased risk of atherosclerosis, coronary heart disease, stroke, and other cardiovascular complications. The predominance of low HDL cholesterol levels and elevated LDL cholesterol concentrations suggests the presence of unfavorable lipid profiles that may be influenced by dietary practices, sedentary occupational lifestyles, physical inactivity, excess body weight, and other behavioral factors. Although triglyceride levels were generally within acceptable ranges for many respondents, the observed HDL and

LDL abnormalities remain important indicators of increased cardiovascular risk and warrant public health attention. The findings underscore the need for routine cardiovascular risk assessment and lipid profile screening among civil servants and other occupational groups. Workplace-based interventions aimed at promoting healthy dietary practices, increasing physical activity participation, reducing obesity, and improving cardiovascular health should be prioritized. Establishing employee wellness programmes and integrating regular cardiovascular screening into occupational health services may facilitate early detection and management of dyslipidaemia before the onset of clinical cardiovascular disease. Furthermore, policymakers and healthcare providers should strengthen non-communicable disease prevention programmes targeted at working populations, particularly in urban settings where sedentary lifestyles and nutrition transition are increasingly prevalent. Early intervention and sustained health promotion efforts have the potential to reduce cardiovascular disease burden, improve workforce productivity, and enhance long-term health outcomes among civil servants. Future studies should employ longitudinal designs and incorporate additional cardiovascular risk markers, including total cholesterol, blood pressure, fasting blood glucose, inflammatory biomarkers, and cardiovascular risk prediction models, to provide a more comprehensive understanding of cardiometabolic health among Nigerian workers.

Declarations

Ethical Approval

Ethical approval for this study was obtained from the Ethics Committee of Abia State University, Uturu, Nigeria. The study was conducted in accordance with the ethical standards of the institutional research committee and in line with relevant guidelines and regulations, including the principles of the Declaration of Helsinki.

Consent to Participate

Informed consent was obtained from all participants prior to their inclusion in the study. Participation was voluntary, and respondents were informed of their right to withdraw from the study at any time without penalty.

Consent to Publish

Not applicable.

Data Availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

FUNDING

This research received no external funding.

Clinical trial number: Not applicable.

References

1. Adeloye, D., Basquill, C., Aderemi, A. V., Thompson, J. Y., & Obi, F. A. (2021). An estimate of the prevalence of hypertension in Nigeria. *Journal of Hypertension*, 39(5), 1021–1029.
2. Akinlua, J. T., Meakin, R., Umar, A. M., & Freemantle, N. (2023). Current prevalence pattern of overweight and obesity in Nigeria: A systematic review and meta-analysis. *BMC Public Health*, 23, 1187.
3. Arnett, D. K., Blumenthal, R. S., Albert, M. A., et al. (2019). 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease. *Circulation*, 140(11), e596–e646.
4. Chukwuonye II, Chuku A, Onyeonoro UU, Madukwe OO, Oviasu E, Ogah OS, et al. (2023) Prevalence of dyslipidaemia among apparently healthy Nigerian adults. *Diabetes Metab Syndr Obes.* 6:43–51.
5. Ference, B. A., Ginsberg, H. N., Graham, I., et al. (2019). Low-density lipoproteins cause atherosclerotic cardiovascular disease. *European Heart Journal*, 38(32), 2459–2472.
6. GBD Risk Factors Collaborators (2024). Global burden of 87 risk factors in 204 countries and territories, 1990–2023: a systematic analysis for the Global Burden of Disease Study. *Lancet*.403(10441):2501–2587.
7. Gebremichael, B., Tesfaye, Y., & Alemayehu, M. (2024). Dietary diversity and associated factors among employed adults in Ethiopia: Implications for workplace nutrition programmes. *BMC Public Health*, 24, 913.
8. Grundy SM, Stone NJ, Bailey AL, Beam C, Birtcher KK, Blumenthal RS, et al (2019). 2018 AHA/ACC guideline on the management of blood cholesterol. *Circulation*. 139(25):e1082–e1143.
9. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U (2022). Global physical activity levels and implications for cardiovascular disease prevention. *Lancet Glob Health*. 10(8):e1142–e1150.
10. Hruby A, Hu FB. (2015) The epidemiology of obesity and its relationship with cardiovascular disease. *Pharmacoeconomics*. 33(7):673–689.
11. Mach F, Baigent C, Catapano AL, Koskinas KC, Casula M, Badimon L, et al. (2020) ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk. *Eur Heart J*. 41(1):111–188.
12. Mensah, G. A., Roth, G. A., & Fuster, V. (2023). The global burden of cardiovascular diseases and risk factors. *Journal of the American College of Cardiology*, 82(25), 2407–2426.
13. Mohammed, A., Yusuf, S. M., & Abdullahi, A. (2023). Workplace dietary behaviours and associated health outcomes among public-sector employees in northern Nigeria. *Nigerian Journal of Clinical Practice*, 26(4), 512–520.

14. Oguejiofor OC, Onwukwe CH, Odenigbo CU. Dyslipidaemia and cardiovascular risk factors among urban Nigerian adults. *Niger J Clin Pract.* 2022;25(4):512–519.
15. Virani SS, Morris PB, Agarwala A, Ballantyne CM, Birtcher KK, Kris-Etherton PM, et al. 2023 guideline on the management of blood cholesterol. *Circulation.* 148(24) e00–e45.
16. Virani, S. S., Morris, P. B., Agarwala, A., et al. (2021). 2021 ACC Expert Consensus Decision Pathway on the management of hypertriglyceridemia. *Journal of the American College of Cardiology*, 78(9), 960–993.
17. Visseren, F. L. J., Mach, F., Smulders, Y. M., et al. (2021). 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice. *European Heart Journal*, 42(34), 3227–3337.
18. World Health Organization (WHO). (2024). *Cardiovascular diseases (CVDs): Key facts*. Geneva: WHO.
19. World Health Organization (2023). *Global report on hypertension and cardiovascular risk reduction*. Geneva: WHO.
20. World Heart Federation. (2024). *World Heart Report 2024: Confronting the world's number one killer*. Geneva: World Heart Federation.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryFile1Questionnaire.pdf](#)