ISSN: 03875547
Volume 45, Issue 06, August, 2022

Relationship between Body Mass Index and HDL Lipid Profile as Cardiovascular Disease Risk Factor

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Keywords:
BMI, Framingham risk score, HDL

ABSTRACT

The relationship between the risk of cardiovascular disease with BMI and HDL levels with Rank Spearman (ordinal data scale). Obesity is one of the modifiable risk factors and is an important key in increasing the incidence of cardiovascular disease, which is the measurement of Body Mass Index (BMI). Decreased levels of HDL (high density lipoprotein) in plasma is associated with an increased risk of cardiovascular disease. The most commonly used is the Framingham risk score (Framingham Risk Score), was is a calculation of the risk of atherosclerotic cardiovascular disease in the next 10 years. The objective was determine relationship between BMI and HDL lipid profile as cardiovascular disease risk factor. The research design was cross sectional, in a hospital in Sidoarjo, East Java, Indonesia. The relationship between the risk of cardiovascular disease with BMI and HDL levels with Rank Spearman (ordinal data scale). There were no relationship between HDL profile and BMI with cardiovascular risk factors in metabolic syndrome patients (p=0.682). Therefore, further research was needed to identify the relationship.

1. INTRODUCTION

Changes in people's consumption patterns that have an impact on increasing the prevalence of cardiovascular disease and the high cost of treatment due to cardiovascular disease that continues to increase [1]. Based on the [2], cardiovascular disease is the number one cause of death in Indonesia with a percentage of 35% in 2016. Metabolic syndrome is a group of metabolic abnormalities in an individual that are associated with an increased risk of cardiovascular disease. The prevalence of metabolic syndrome is increasing rapidly every year. Epidemiological data say the prevalence of the world metabolic syndrome is 20-25% [3].

Obesity is one of the modifiable risk factors and is an important key in increasing the incidence of cardiovascular disease. Weight gain can significantly increase the incidence of angina pectoris and also predict the incidence of coronary disease and congestive heart failure [4], [5]. Determining the level of obesity can use anthropometric measurements, one of which is the measurement of Body Mass Index (BMI) [6], [7]. A person's BMI value can be their risk for heart disease, especially in people in the obese category. In people with obesity, the work of the heart is greater when compared to non-obese people and can cause hypertrophy of this organ along with weight gain. BMI, which is measured by weight in kilograms divided by height in meters squared (kg/m2), is closely related to body weight and not related to height. It is often used to measure body fat deposits [8], [9].

Decreased levels of HDL (high density lipoprotein) in plasma is associated with an increased risk of cardiovascular disease, especially coronary heart disease (CHD). Low HDL levels were the most common lipid abnormality in the group with premature CHD [10- 12]. HDL levels are inversely related to the incidence of cardiovascular disease and mortality. The mechanism that is thought to underlie this is the ability of HDL to transport excess peripheral cholesterol back to the liver, including cholesterol present in atherosclerotic plaques [13], [14]. In addition, HDL also has a pleiotropic effect on inflammation, hemostasis, and apoptosis. The increased risk of cardiovascular disease in obese patients is largely due to dyslipidemia. More than 50% of obese patients will develop dyslipidemia [15].

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For someone who already has risk factors but has never experienced cardiovascular disease, in this case an asymptomatic patient, early prevention is needed. One form of early prevention that can be done is to predict the risk of cardiovascular disease in the future. There are several ways to perform a risk factor assessment. The most commonly used is the Framingham risk score (Framingham Risk Score) and in Europe the Systematic COronary Risk Estimation (SCORE) is used [19- 21]. The result is a calculation of the risk of atherosclerotic cardiovascular disease in the next 10 years. In this study, the Framingham Risk Score (FRS) calculation method was used. FRS is one of the calculations to determine the classic risk factors for cardiovascular disease such as age, gender, hypertension, diabetes mellitus (DM), smoking, obesity, physical activity and cholesterol levels in the blood [22- 25]. Therefore, this study wanted to determine relationship between body mass index and HDL lipid profile as cardiovascular disease risk factor.

2. METHODS

2.1 Research Design

The research design was cross sectional. The research location used in this study was around the Surabaya area starting in March-June 2022. The research location was carried out in a hospital in Sidoarjo, East Java, Indonesia. Ethical test No. 40/KE/IV/2022 in Universitas Surabaya.

2.2 Research variable

The variables were body mass index (BMI), HDL profile, and cardiovascular disease risk factor. Examination of HDL levels was carried out using the LipidPro^{TM} tool. Fasting blood samples were collected from the fingertips to obtain the patient's HDL value. The LipidPro^{TM} system consists of a meter and test strip. The detection method on the lipid pro tool uses spectrophotometry and auto coding from the RFID tag. The ability to detect HDL cholesterol values was 25-80 mg/dL and the required volume of blood samples was 5 mL. Cardiovascular risk was assessed from the Framinghan Risk Score.

2.3 Population and Sample

The population was all patients with at least three of the five conditions, namely hypertension, hypercholesterolemia, high triglycerides, diabetes, and obesity (BMI 25kg/m2). Samples of patients who met the criteria, among others: age 18-60 years and willing to follow all research procedures. The sample size in this study was calculated based on the formula: n=N/[(1+N)/e2]. Information: n=number of samples needed in the study; N=number of a population; e=error rate of the sample in the study (5%). Then the minimum number of samples was 31 people. The sampling technique used purposive sampling.

2.4 Data Collection and Analysis Method

Subjects who met the criteria were then asked to fill out an informed consent. Subjects assessed the risk of cardiovascular disease with the Framingham Risk Score (FRS) [20,22,26]. Examination of lipid levels and BMI was carried out at the next meeting to fulfill fasting requirements. The relationship between the risk of cardiovascular disease with BMI and HDL levels with Rank Spearman (ordinal data scale).

3. RESULTS

The number of respondents involved in the study were 44 people. Most of the respondents were male (86.36%). The highest age range was early senior as many as 13 people (29.55%). All respondents had a BMI above normal and the majority were obese (70.45%), with an average of 31.36 kg/m2. HDL values that were below the normal range were 25 people (56.82%), with an average of 45.46 mg/dL. Cardiovascular risk with the FRS (Framingham risk score) assessment from the respondents was high (61.36%) and intermediate (38.635%) (Table 1).

Table 1: Characteristics of Respondents

Characteristics	N (44)	%
Gender		
Male	5	11.36
Female	39	88.63
Age (years)		
Late adolescence (17-25)	7	15.91
Early adulthood (26-35)	12	27.27
Late adulthood (36-45)	12	27.27
Early seniors (46-55)	13	29.55
Average	36.33	
BMI (body mass index)		
Overweight (23.0-29.9)	13	29.55
Obesity (≥30)	31	70.45
Average	31.36	
HDL Level (mg/dL)		
Normal (45-60)	25	56.82
Low (>45)	19	43.18
Average	45.46	
FRS (%)		
High (≥20)	27	61.36
Intermediate (10-19)	17	38.63
Low (<10)	0	0.00

Respondents with a high level of FRS, mostly have a BMI ≥30, namely obesity (17 of 27), with a sig. (2-tailed) was 0.178, which there was no significant relationship between BMI and FRS. The correlation coefficient value was 0.207 which indicated low relationship. Most of the respondents had low HDL scores and high cardiovascular risk (12 people). However, respondents with a high level of FRS had a normal HDL level (15 of 27), with a sig. (2-tailed) is 0.836, which there was no significant relationship between HDL and

FRS. The correlation coefficient value was -0.032 which indicated low relationship (Table 2).

Table 2: Cross Tabulation between BMI and HDL Level with Cardiovascular Risk

		Framingham Risk Score (FRS)		TOTAL
		High (≥20)	Intermediate (10-19)	
BMI (kg/m2)	Overweight (23.0-29.9)	10	3	13
	Obesity (≥30)	17	14	31
	TOTAL	27	17	44
HDL Level (mg/dL)	Normal (45-60)	15	10	25
	Low (>45)	12	7	19
	TOTAL	27	17	4

The cross tabulation between BMI and HDL level with cardiovascular risk can be seen in Table 3. Most respondents had a normal HDL level with a BMI including obesity, which was 17 of 44. Based on the correlation test with sig. (2-tailed) was 0.682, which there was no significant relationship between BMI and HDL. The correlation coefficient value was 0.001 which indicated low relationship.

Table 3: Cross Tabulation between BMI and HDL Level

		HDL Level (mg/dL)		TOTAL
		Normal (45-60)	Low (>45)	
BMI (kg/m2)	Overweight (23.0-29.9)	8	5	13
	Obesity (≥30)	17	14	31
	TOTAL	25	19	44

4. DISCUSSION

One of the proatherogenic effects of obesity is dyslipidemia and most of the obese patients will experience dyslipidemia. This will affect the risk of cardiovascular disease which continues to increase in obese patients [27], [28]. The prominent dyslipidemia in obesity is low HDL levels [28], [29]. Indonesia is one of the countries in Asia Pacific which ranks 3rd with an HDL value <40 mg/dL with a prevalence of 23-66% [30]. The binding of cardiovascular risk in patients with metabolic syndrome was exacerbated by the sedentary lifestyle of today's society, such as low physical activity [24], [31], smoking habits [32], and weight gain [25].

Most of the respondents in this study were women (39 of 44), with the majority of respondents aged between 46-55 years. HDL-C distribution differed by ethnicity and gender. The sex difference in HDL-C level of six countries and showed that women had higher HDL-C level than men; the difference was the highest in Canada and USA at as high as 15.5 mg/dL, and the lowest in China at as low as 2.3 mg/dL. Age, current smoking, body mass index, alcohol intake, triglyceride and low density lipoprotein cholesterol level have significant impact on HDL cholesterol level. Educational status was also an important factor for men, while fat intake was a significant factor for women. After adjusting associated factors, the means (standard errors) of HDL cholesterol level were 43.8 (0.2) mg/dL in men and 46.3 (0.2) mg/dL in women, respectively [33]. Previous research by [34] showing from amongst 1178 participants, females had a higher age-adjusted central obesity (48%), and more than two-fold increased odds of central obesity. Increased prevalence of central obesity and female preponderance are indicative for a gender-sensitive population-level intervention to tackle cardiometabolic risk.

This study shows that there is no relationship between BMI, FRS, and HDL levels. This is different from the existing theory, namely The Framingham risk score (FRS) is a simplified and common tool for the assessment of risk level of CAD over 10 years. The FRS considers six coronary risk factors, including age, gender, total cholesterol (TC), high density lipoprotein cholesterol (HDL), smoking habits, and systolic blood pressure [22]. Weight loss achieved through exercise is more effective at raising HDL levels than dieting. Exercise mediates positive effects on HDL levels at least partially through changes in enzymes of HDL metabolism. Increased lipid transfer to HDL by lipoprotein lipase and reduced HDL clearance by hepatic triglyceride lipase as a result of endurance training are two important mechanisms for increases in HDL observed from exercise [35]. Obesity is an important risk factor for decrease in high-density lipoprotein cholesterol (HDL-C) levels, which predisposes to cardiovascular diseases. Decreased HDL-C is strongly associated with and largely attributable to obesity [36].

5. CONCLUSION

There were no relationship between HDL profile and BMI with cardiovascular risk factors in metabolic syndrome patients. Therefore, Therefore, further research was needed to identify the relationship.

6. ACKNOWLEDGMENTS

This research was funded by the Institute of Research and Community Service of the Universitas Surabaya.

7. CONFLICT OF INTEREST

The authors have no conflicts of interest regarding this investigation.

8. REFERENCES

[1] Joseph P, Leong D, KcKee M, Anand SS, Schwalm JD, Teo K, Mente A, Yusuf S. Reducing the Global Burden of Cardiovascular Disease, Part 1: The Epidemiology and Risk Factors. Circulation Research. 2017;121:677–94. https://doi.org/10.1161/CIRCRESAHA.117.308903.

[2] WHO. Non communicable diseases (NCD) country profiles, 2018. 2018;224. Available from: https://www.who.int/nmh/publications/ncd-profiles-2018/en/.

[3] Soleha TU, Bimandama MA. The Relation of Metabolic Syndrome with Cardiovascular Disease. Majority. 2016;5(2):49-55.

[4] Powell-Wiley TM, Poirier P, Burke LE, Després JP, Gordon-Larsen P, Lavie CJ, Lear SA, Ndumele CE, Neeland IJ, Sanders P, St-Onge MP; American Heart Association Council on Lifestyle and Cardiometabolic Health; Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; Council on Epidemiology and Prevention; and Stroke Council. Obesity and Cardiovascular Disease: A Scientific Statement From the American Heart Association. Circulation. 2021;143(21):e984-e1010. doi: 10.1161/CIR.0000000000000973.

[5] Cercato C, Fonseca FA. Cardiovascular risk and obesity. Diabetol Metab Syndr. 2019;11:74. doi: 10.1186/s13098-019-0468-0.

[6] Golia N, Krishan K, Kashyap JR. Assessment of Obesity by Using Various Anthropometric Measurements among Patients with Coronary Heart Disease Residing in North India. Cureus. 2020;12(5):e7948. doi: 10.7759/cureus.7948.

[7] Piqueras P, Ballester A, Durá-Gil JV, Martinez-Hervas S, Redón J, Real JT. Anthropometric Indicators as a Tool for Diagnosis of Obesity and Other Health Risk Factors: A Literature Review. Front Psychol. 2021;12:631179. doi: 10.3389/fpsyg.2021.631179.

[8] Haase CL, Eriksen KT, Lopes S, Satylganova A, Schnecke V, McEwan P. Body mass index and risk of obesity-related conditions in a cohort of 2.9 million people: Evidence from a UK primary care database. Obes Sci Pract. 2020;7(2):137-47. doi: 10.1002/osp4.474.

[9] Khan SS, Ning H, Wilkins JT, Allen N, Carnethon M, Berry JD, Sweis RN, Lloyd-Jones DM. Association of Body Mass Index With Lifetime Risk of Cardiovascular Disease and Compression of Morbidity. JAMA Cardiol. 2018;3(4):280-7. doi: 10.1001/jamacardio.2018.0022.

[10] Ahmed HM, Miller M, Nasir K, McEvoy JW, Herrington D, Blumenthal RS, Blaha MJ. Primary Low Level of High-Density Lipoprotein Cholesterol and Risks of Coronary Heart Disease, Cardiovascular Disease, and Death: Results From the Multi-Ethnic Study of Atherosclerosis. Am J Epidemiol. 2016;183(10):875-83. doi: 10.1093/aje/kwv305.

[11] Bilen O, Kamal A, Virani SS. Lipoprotein abnormalities in South Asians and its association with cardiovascular disease: Current state and future directions. World J Cardiol. 2016;8(3):247-57. doi: 10.4330/wjc.v8.i3.247.

[12] Ariyanti R, Besral B. Dyslipidemia Associated with Hypertension Increases the Risks for Coronary Heart Disease: A Case-Control Study in Harapan Kita Hospital, National Cardiovascular Center, Jakarta. J Lipids. 2019;2019:2517013. doi: 10.1155/2019/2517013.

[13] Franczyk B, Rysz J, Ławiński J, Rysz-Górzyńska M, Gluba-Brzózka A. Is a High HDL-Cholesterol Level Always Beneficial? Biomedicines. 2021;9(9):1083. doi: 10.3390/biomedicines9091083.

[14] Ouimet M, Barrett TJ, Fisher EA. HDL and Reverse Cholesterol Transport. Circ Res. 2019;124(10):1505-18. doi: 10.1161/CIRCRESAHA.119.312617.

[15] Zhang T, Chen J, Tang X, Luo Q, Xu D, Yu B. Interaction between adipocytes and high-density lipoprotein:new insights into the mechanism of obesity-induced dyslipidemia and atherosclerosis. Lipids Health Dis. 2019;18(1):223. doi: 10.1186/s12944-019-1170-9.

[16] Kjeldsen EW, Nordestgaard LT, Frikke-Schmidt R. HDL Cholesterol and Non-Cardiovascular Disease: A Narrative Review. Int J Mol Sci. 2021;22(9):4547. doi: 10.3390/ijms22094547.

[17] Ouimet M, Barrett TJ, Fisher EA. HDL and Reverse Cholesterol Transport. Circ Res. 2019;124(10):1505-18. doi: 10.1161/CIRCRESAHA.119.312617.

[18] Casula M, Colpani O, Xie S, Catapano AL, Baragetti A. HDL in Atherosclerotic Cardiovascular Disease: In Search of a Role. Cells. 2021;10(8):1869. doi: 10.3390/cells10081869.

[19] Hermansson J, Kahan T. Systematic Review of Validity Assessments of Framingham Risk Score Results in Health Economic Modelling of Lipid-Modifying Therapies in Europe. Pharmacoeconomics. 2018;36(2):205-13. doi: 10.1007/s40273-017-0578-1.

[20] Al-Shamsi S. Performance of the Framingham coronary heart disease risk score for predicting 10-year cardiac risk in adult United Arab Emirates nationals without diabetes: a retrospective cohort study. BMC Fam Pract. 2020;21(1):175. doi: 10.1186/s12875-020-01246-2.

[21] Ko DT, Sivaswamy A, Sud M, Kotrri G, Azizi P, Koh M, Austin PC, Lee DS, Roifman I, Thanassoulis G, Tu K, Udell JA, Wijeysundera HC, Anderson TJ. Calibration and discrimination of the Framingham Risk Score and the Pooled Cohort Equations. CMAJ. 2020;192(17):E442-E449. doi: 10.1503/cmaj.190848.

[22] Jahangiry L, Farhangi MA, Rezaei F. Framingham risk score for estimation of 10-years of cardiovascular diseases risk in patients with metabolic syndrome. J Health Popul Nutr. 2017;36(1):36. doi: 10.1186/s41043-017-0114-0.

[23] Samaniyan Bavarsad P, Kheiri S, Ahmadi A. Estimation of the 10-Year Risk of Cardiovascular Diseases: Using the SCORE, WHO/ISH, and Framingham Models in the Shahrekord Cohort Study in Southwestern Iran. J Tehran Heart Cent. 2020;15(3):105-112. doi: 10.18502/jthc.v15i3.4219.

[24] Lorensia A, Muntu CM, Suryadinata RV, Septiani R. Effect of lung function disorders and physical activity on smoking and non-smoking students. J Prev Med Hyg. 2021; 62(1):E89-96.

[25] Suryadinata RV, Wirjatmadi B, Andriani M, Lorensia A. Effect of Age and Weight on Physical Activity. Journal of Public Health Research. 2020;9(2):187-90.

[26] Nyirenda M. Assessment of cardiovascular disease risks using Framingham risk scores (FRS) in HIV-positive and HIV-negative older adults in South Africa. Prev Med Rep. 2021;22:101352. doi:10.1016/j.pmedr.2021.101352.

[27] Fuster JJ, Ouchi N, Gokce N, Walsh K. Obesity-Induced Changes in Adipose Tissue Microenvironment and Their Impact on Cardiovascular Disease. Circ Res. 2016;118(11):1786-807. doi:10.1161/CIRCRESAHA.115.306885.

[28] Stadler JT, Marsche G. Obesity-Related Changes in High-Density Lipoprotein Metabolism and Function. Int J Mol Sci. 2020;21(23):8985. doi:10.3390/ijms21238985.

[29] Izadi N, Rahimi MA, Shetabi HR, Hashemi Nazari SS, Najafi F. Dyslipidemia and Its Components Across Body Mass Index Levels Among Type II Diabetic Patients in the West of Iran. Int J Prev Med. 2020;11:188. doi:10.4103/ijpvm.IJPVM_305_18.

[30] Lin CF, Chang YH, Chien SC, Lin YH, Yeh HY. Epidemiology of Dyslipidemia in the Asia Pacific Region. Int J Gerontol. 2018;12(1):2–6.

[31] Lorensia A, Suryadinata RV, Inu IA. Comparison of Vitamin D Status And Physical Activity Related With Obesity in Student Journal of Applied Pharmaceutical Science. 2022;12(4):108-18.

[32] Lorensia A, Pratama AM, Hersandio R. Knowledge and Attitudes on Smoking Cessation of E-Cigarettes: A Mixed Methods Study of Pharmacist Students in Surabaya, Indonesia. Journal of Preventive Medicine and Hygiene. 2021;62((4):E918-25.

[33] Kim HJ, Park HA, Cho YG, Kang JH, Kim KW, Kang JH, Kim NR, Chung WC, Kim CH, Whang DH, Park JK. Gender Difference in the Level of HDL Cholesterol in Korean Adults. Korean J Fam Med. 2011;32(3):173-81. doi: 10.4082/kjfm.2011.32.3.173.

[34] Prasad DS, Kabir Z, Revathi Devi K, Peter PS, Das BC. Gender differences in central obesity: Implications for cardiometabolic health in South Asians. Indian Heart J. 2020;72(3):202-4. doi: 10.1016/j.ihj.2020.04.008.

[35] Rashid S, Genest J. Effect of obesity on high-density lipoprotein metabolism. Obesity (Silver Spring). 2007;15(12):2875-88. doi: 10.1038/oby.2007.342.

[36] Bora K, Pathak MS, Borah P, Das D. Association of Decreased High-Density Lipoprotein Cholesterol (HDL-C) With Obesity and Risk Estimates for Decreased HDL-C Attributable to Obesity: Preliminary Findings From a Hospital-Based Study in a City From Northeast India. J Prim Care Community Health. 2017;8(1):26-30. doi: 10.1177/2150131916664706.

TMJ
ISSN: 03875547

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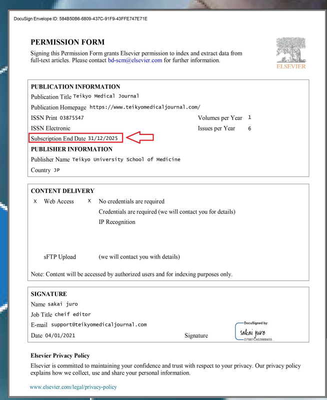

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TMJ ISSN: 03875547

Submission Deadline
03 Sep 2022 (Vol 45 , Iss 07)

Upcoming Publication
31 Aug 2022 (Vol 45 , Iss 06)

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by Amelia Lorensia

Submission date: 06-Sep-2022 10:05AM (UTC+0700)
Submission ID: 1893404525
File name: -profile-as-cardiovascular-disease-risk-factor-630492d262199.pdf (205.56K)
Word count: 3541
Character count: 19073

ISSN: 03875547
Volume 45, Issue 06, August, 2022

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2. METHODS

2.1 Research Design

The research design was cross sectional. The research location used in this study was around the Surabaya area starting in March-June 2022. The research location was carried out in a hospital in Sidoarjo, East Java, Indonesia. Ethical test No. 40/KE/IV/2022 in Universitas Surabaya.

2.2 Research variable

The variables were body mass index (BMI), HDL profile, and cardiovascular disease risk factor. Examination of HDL levels was carried out using the LipidPro^{TM} tool. Fasting blood samples were collected from the fingertips to obtain the patient's HDL value. The LipidPro^{TM} system consists of a meter and test strip. The detection method on the lipid pro tool uses spectrophotometry and auto coding from the RFID tag. The ability to detect HDL cholesterol values was 25-80 mg/dL and the required volume of blood samples was 5 mL. Cardiovascular risk was assessed from the Framinghan Risk Score.

ISSN: 03875547
Volume 45, Issue 06, August, 2022

2.3 Population and Sample

The population was all patients with at least three of the five conditions, namely hypertension, hypercholesterolemia, high triglycerides, diabetes, and obesity (BMI 25kg/m2). Samples of patients who met the criteria, among others: age 18-60 years and willing to follow all research procedures. The sample size in this study was calculated based on the formula: n=N/[(1+N)/e2]. Information: n=number of samples needed in the study; N=number of a population; e=error rate of the sample in the study (5%). Then the minimum number of samples was 31 people. The sampling technique used purposive sampling.

2.4 Data Collection and Analysis Method

Subjects who met the criteria were then asked to fill out an informed consent. Subjects assessed the risk of cardiovascular disease with the Framingham Risk Score (FRS) [20,22,26]. Examination of lipid levels and BMI was carried out at the next meeting to fulfill fasting requirements. The relationship between the risk of cardiovascular disease with BMI and HDL levels with Rank Spearman (ordinal data scale).

3. RESULTS

The number of respondents involved in the study were 44 people. Most of the respondents were male (86.36%). The highest age range was early senior as many as 13 people (29.55%). All respondents had a BMI above normal and the majority were obese (70.45%), with an average of 31.36 kg/m2. HDL values that were below the normal range were 25 people (56.82%), with an average of 45.46 mg/dL. Cardiovascular risk with the FRS (Framingham risk score) assessment from the respondents was high (61.36%) and intermediate (38.635%) (Table 1).

Table 1: Characteristics of Respondents

Characteristics	N (44)	%
Gender		
Male	5	11.36
Female	39	88.63
Age (years)		
Late adolescence (17-25)	7	15.91
Early adulthood (26-35)	12	27.27
Late adulthood (36-45)	12	27.27
Early seniors (46-55)	13	29.55
Average	36.33	
BMI (body mass index)		
Overweight (23.0-29.9)	13	29.55
Obesity (≥30)	31	70.45
Average	31.36	
HDL Level (mg/dL)		
Normal (45-60)	25	56.82
Low (>45)	19	43.18
Average	45.46	
FRS (%)		
High (≥20)	27	61.36
Intermediate (10-19)	17	38.63
Low (<10)	0	0.00

Respondents with a high level of FRS, mostly have a BMI ≥30, namely obesity (17 of 27), with a sig. (2-tailed) was 0.178, which there was no significant relationship between BMI and FRS. The correlation coefficient value was 0.207 which indicated low relationship. Most of the respondents had low HDL scores and high cardiovascular risk (12 people). However, respondents with a high level of FRS had a normal HDL level (15 of 27), with a sig. (2-tailed) is 0.836, which there was no significant relationship between HDL and

FRS. The correlation coefficient value was -0.032 which indicated low relationship (Table 2).

Table 2: Cross Tabulation between BMI and HDL Level with Cardiovascular Risk

		Framingham Risk Score (FRS)		TOTAL
		High (≥20)	Intermediate (10-19)	
BMI (kg/m2)	Overweight (23.0-29.9)	10	3	13
	Obesity (≥30)	17	14	31
	TOTAL	27	17	44
HDL Level (mg/dL)	Normal (45-60)	15	10	25
	Low (>45)	12	7	19
	TOTAL	27	17	4

The cross tabulation between BMI and HDL level with cardiovascular risk can be seen in Table 3. Most respondents had a normal HDL level with a BMI including obesity, which was 17 of 44. Based on the correlation test with sig. (2-tailed) was 0.682, which there was no significant relationship between BMI and HDL. The correlation coefficient value was 0.001 which indicated low relationship.

Table 3: Cross Tabulation between BMI and HDL Level

		HDL Level (mg/dL)		TOTAL
		Normal (45-60)	Low (>45)	
BMI (kg/m2)	Overweight (23.0-29.9)	8	5	13
	Obesity (≥30)	17	14	31
	TOTAL	25	19	44

4. DISCUSSION

One of the proatherogenic effects of obesity is dyslipidemia and most of the obese patients will experience dyslipidemia. This will affect the risk of cardiovascular disease which continues to increase in obese patients [27], [28]. The prominent dyslipidemia in obesity is low HDL levels [28], [29]. Indonesia is one of the countries in Asia Pacific which ranks 3rd with an HDL value <40 mg/dL with a prevalence of 23-66% [30]. The binding of cardiovascular risk in patients with metabolic syndrome was exacerbated by the sedentary lifestyle of today's society, such as low physical activity [24], [31], smoking habits [32], and weight gain [25].

Most of the respondents in this study were women (39 of 44), with the majority of respondents aged between 46-55 years. HDL-C distribution differed by ethnicity and gender. The sex difference in HDL-C level of six countries and showed that women had higher HDL-C level than men; the difference was the highest in Canada and USA at as high as 15.5 mg/dL, and the lowest in China at as low as 2.3 mg/dL. Age, current smoking, body mass index, alcohol intake, triglyceride and low density lipoprotein cholesterol level have significant impact on HDL cholesterol level. Educational status was also an important factor for men, while fat intake was a significant factor for women. After adjusting associated factors, the means (standard errors) of HDL cholesterol level were 43.8 (0.2) mg/dL in men and 46.3 (0.2) mg/dL in women, respectively [33]. Previous research by [34] showing from amongst 1178 participants, females had a higher age-adjusted central obesity (48%), and more than two-fold increased odds of central obesity. Increased prevalence of central obesity and female preponderance are indicative for a gender-sensitive population-level intervention to tackle cardiometabolic risk.

This study shows that there is no relationship between BMI, FRS, and HDL levels. This is different from the existing theory, namely The Framingham risk score (FRS) is a simplified and common tool for the assessment of risk level of CAD over 10 years. The FRS considers six coronary risk factors, including age, gender, total cholesterol (TC), high density lipoprotein cholesterol (HDL), smoking habits, and systolic blood pressure [22]. Weight loss achieved through exercise is more effective at raising HDL levels than dieting. Exercise mediates positive effects on HDL levels at least partially through changes in enzymes of HDL metabolism. Increased lipid transfer to HDL by lipoprotein lipase and reduced HDL clearance by hepatic triglyceride lipase as a result of endurance training are two important mechanisms for increases in HDL observed from exercise [35]. Obesity is an important risk factor for decrease in high-density lipoprotein cholesterol (HDL-C) levels, which predisposes to cardiovascular diseases. Decreased HDL-C is strongly associated with and largely attributable to obesity [36].

5. CONCLUSION

There were no relationship between HDL profile and BMI with cardiovascular risk factors in metabolic syndrome patients. Therefore, Therefore, further research was needed to identify the relationship.

6. ACKNOWLEDGMENTS

This research was funded by the Institute of Research and Community Service of the Universitas Surabaya.

7. CONFLICT OF INTEREST

The authors have no conflicts of interest regarding this investigation.

8. REFERENCES

[1] Joseph P, Leong D, KcKee M, Anand SS, Schwalm JD, Teo K, Mente A, Yusuf S. Reducing the Global Burden of Cardiovascular Disease, Part 1: The Epidemiology and Risk Factors. Circulation Research. 2017;121:677–94. https://doi.org/10.1161/CIRCRESAHA.117.308903.

[2] WHO. Non communicable diseases (NCD) country profiles, 2018. 2018;224. Available from: https://www.who.int/nmh/publications/ncd-profiles-2018/en/.

[3] Soleha TU, Bimandama MA. The Relation of Metabolic Syndrome with Cardiovascular Disease. Majority. 2016;5(2):49-55.

[4] Powell-Wiley TM, Poirier P, Burke LE, Després JP, Gordon-Larsen P, Lavie CJ, Lear SA, Ndumele CE, Neeland IJ, Sanders P, St-Onge MP; American Heart Association Council on Lifestyle and Cardiometabolic Health; Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; Council on Epidemiology and Prevention; and Stroke Council. Obesity and Cardiovascular Disease: A Scientific Statement From the American Heart Association. Circulation. 2021;143(21):e984-e1010. doi: 10.1161/CIR.0000000000000973.

[5] Cercato C, Fonseca FA. Cardiovascular risk and obesity. Diabetol Metab Syndr. 2019;11:74. doi: 10.1186/s13098-019-0468-0.

[6] Golia N, Krishan K, Kashyap JR. Assessment of Obesity by Using Various Anthropometric Measurements among Patients with Coronary Heart Disease Residing in North India. Cureus. 2020;12(5):e7948. doi: 10.7759/cureus.7948.

[7] Piqueras P, Ballester A, Durá-Gil JV, Martinez-Hervas S, Redón J, Real JT. Anthropometric Indicators as a Tool for Diagnosis of Obesity and Other Health Risk Factors: A Literature Review. Front Psychol. 2021;12:631179. doi: 10.3389/fpsyg.2021.631179.

[8] Haase CL, Eriksen KT, Lopes S, Satylganova A, Schnecke V, McEwan P. Body mass index and risk of obesity-related conditions in a cohort of 2.9 million people: Evidence from a UK primary care database. Obes Sci Pract. 2020;7(2):137-47. doi: 10.1002/osp4.474.

[9] Khan SS, Ning H, Wilkins JT, Allen N, Carnethon M, Berry JD, Sweis RN, Lloyd-Jones DM. Association of Body Mass Index With Lifetime Risk of Cardiovascular Disease and Compression of Morbidity. JAMA Cardiol. 2018;3(4):280-7. doi: 10.1001/jamacardio.2018.0022.

[10] Ahmed HM, Miller M, Nasir K, McEvoy JW, Herrington D, Blumenthal RS, Blaha MJ. Primary Low Level of High-Density Lipoprotein Cholesterol and Risks of Coronary Heart Disease, Cardiovascular Disease, and Death: Results From the Multi-Ethnic Study of Atherosclerosis. Am J Epidemiol. 2016;183(10):875-83. doi: 10.1093/aje/kwv305.

[11] Bilen O, Kamal A, Virani SS. Lipoprotein abnormalities in South Asians and its association with cardiovascular disease: Current state and future directions. World J Cardiol. 2016;8(3):247-57. doi: 10.4330/wjc.v8.i3.247.

[12] Ariyanti R, Besral B. Dyslipidemia Associated with Hypertension Increases the Risks for Coronary Heart Disease: A Case-Control Study in Harapan Kita Hospital, National Cardiovascular Center, Jakarta. J Lipids. 2019;2019:2517013. doi: 10.1155/2019/2517013.

[13] Franczyk B, Rysz J, Ławiński J, Rysz-Górzyńska M, Gluba-Brzózka A. Is a High HDL-Cholesterol Level Always Beneficial? Biomedicines. 2021;9(9):1083. doi: 10.3390/biomedicines9091083.

[14] Ouimet M, Barrett TJ, Fisher EA. HDL and Reverse Cholesterol Transport. Circ Res. 2019;124(10):1505-18. doi: 10.1161/CIRCRESAHA.119.312617.

[15] Zhang T, Chen J, Tang X, Luo Q, Xu D, Yu B. Interaction between adipocytes and high-density lipoprotein:new insights into the mechanism of obesity-induced dyslipidemia and atherosclerosis. Lipids Health Dis. 2019;18(1):223. doi: 10.1186/s12944-019-1170-9.

[16] Kjeldsen EW, Nordestgaard LT, Frikke-Schmidt R. HDL Cholesterol and Non-Cardiovascular Disease: A Narrative Review. Int J Mol Sci. 2021;22(9):4547. doi: 10.3390/ijms22094547.

[17] Ouimet M, Barrett TJ, Fisher EA. HDL and Reverse Cholesterol Transport. Circ Res. 2019;124(10):1505-18. doi: 10.1161/CIRCRESAHA.119.312617.

[18] Casula M, Colpani O, Xie S, Catapano AL, Baragetti A. HDL in Atherosclerotic Cardiovascular Disease: In Search of a Role. Cells. 2021;10(8):1869. doi: 10.3390/cells10081869.

[19] Hermansson J, Kahan T. Systematic Review of Validity Assessments of Framingham Risk Score Results in Health Economic Modelling of Lipid-Modifying Therapies in Europe. Pharmacoeconomics. 2018;36(2):205-13. doi: 10.1007/s40273-017-0578-1.

[20] Al-Shamsi S. Performance of the Framingham coronary heart disease risk score for predicting 10-year cardiac risk in adult United Arab Emirates nationals without diabetes: a retrospective cohort study. BMC Fam Pract. 2020;21(1):175. doi: 10.1186/s12875-020-01246-2.

[21] Ko DT, Sivaswamy A, Sud M, Kotrri G, Azizi P, Koh M, Austin PC, Lee DS, Roifman I, Thanassoulis G, Tu K, Udell JA, Wijeysundera HC, Anderson TJ. Calibration and discrimination of the Framingham Risk Score and the Pooled Cohort Equations. CMAJ. 2020;192(17):E442-E449. doi: 10.1503/cmaj.190848.

[22] Jahangiry L, Farhangi MA, Rezaei F. Framingham risk score for estimation of 10-years of cardiovascular diseases risk in patients with metabolic syndrome. J Health Popul Nutr. 2017;36(1):36. doi: 10.1186/s41043-017-0114-0.

[23] Samaniyan Bavarsad P, Kheiri S, Ahmadi A. Estimation of the 10-Year Risk of Cardiovascular Diseases: Using the SCORE, WHO/ISH, and Framingham Models in the Shahrekord Cohort Study in Southwestern Iran. J Tehran Heart Cent. 2020;15(3):105-112. doi: 10.18502/jthc.v15i3.4219.

[24] Lorensia A, Muntu CM, Suryadinata RV, Septiani R. Effect of lung function disorders and physical activity on smoking and non-smoking students. J Prev Med Hyg. 2021; 62(1):E89-96.

[25] Suryadinata RV, Wirjatmadi B, Andriani M, Lorensia A. Effect of Age and Weight on Physical Activity. Journal of Public Health Research. 2020;9(2):187-90.

[26] Nyirenda M. Assessment of cardiovascular disease risks using Framingham risk scores (FRS) in HIV-positive and HIV-negative older adults in South Africa. Prev Med Rep. 2021;22:101352. doi:10.1016/j.pmedr.2021.101352.

[27] Fuster JJ, Ouchi N, Gokce N, Walsh K. Obesity-Induced Changes in Adipose Tissue Microenvironment and Their Impact on Cardiovascular Disease. Circ Res. 2016;118(11):1786-807. doi:10.1161/CIRCRESAHA.115.306885.

[28] Stadler JT, Marsche G. Obesity-Related Changes in High-Density Lipoprotein Metabolism and Function. Int J Mol Sci. 2020;21(23):8985. doi:10.3390/ijms21238985.

[29] Izadi N, Rahimi MA, Shetabi HR, Hashemi Nazari SS, Najafi F. Dyslipidemia and Its Components Across Body Mass Index Levels Among Type II Diabetic Patients in the West of Iran. Int J Prev Med. 2020;11:188. doi:10.4103/ijpvm.IJPVM_305_18.

[30] Lin CF, Chang YH, Chien SC, Lin YH, Yeh HY. Epidemiology of Dyslipidemia in the Asia Pacific Region. Int J Gerontol. 2018;12(1):2–6.

[31] Lorensia A, Suryadinata RV, Inu IA. Comparison of Vitamin D Status And Physical Activity Related With Obesity in Student Journal of Applied Pharmaceutical Science. 2022;12(4):108-18.

[32] Lorensia A, Pratama AM, Hersandio R. Knowledge and Attitudes on Smoking Cessation of E-Cigarettes: A Mixed Methods Study of Pharmacist Students in Surabaya, Indonesia. Journal of Preventive Medicine and Hygiene. 2021;62((4):E918-25.

[33] Kim HJ, Park HA, Cho YG, Kang JH, Kim KW, Kang JH, Kim NR, Chung WC, Kim CH, Whang DH, Park JK. Gender Difference in the Level of HDL Cholesterol in Korean Adults. Korean J Fam Med. 2011;32(3):173-81. doi: 10.4082/kjfm.2011.32.3.173.

[34] Prasad DS, Kabir Z, Revathi Devi K, Peter PS, Das BC. Gender differences in central obesity: Implications for cardiometabolic health in South Asians. Indian Heart J. 2020;72(3):202-4. doi: 10.1016/j.ihj.2020.04.008.

[35] Rashid S, Genest J. Effect of obesity on high-density lipoprotein metabolism. Obesity (Silver Spring). 2007;15(12):2875-88. doi: 10.1038/oby.2007.342.

[36] Bora K, Pathak MS, Borah P, Das D. Association of Decreased High-Density Lipoprotein Cholesterol (HDL-C) With Obesity and Risk Estimates for Decreased HDL-C Attributable to Obesity: Preliminary Findings From a Hospital-Based Study in a City From Northeast India. J Prim Care Community Health. 2017;8(1):26-30. doi: 10.1177/2150131916664706.

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