Troponin I, Hyperlipidemia and Obesity as Predictor of Cardiovascular Complications: A Cross Sectional Study

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INTRODUCTION

Obesity is a growing global health concern that affects both industrialized and developing nations [1]. It is a finding of different studies that obesity has increased more than 39 percent in all over the world according to the WHO. Cardiovascular illnesses and obesity are related to one another. It has also been demonstrated that the correlation between obesity and dyslipidemias, sleep apnea syndrome, diabetes mellitus, and hypertension raises the risk of cardiovascular diseases [2]. The skeletal muscles and heart both include members of the protein family known as troponin. It is a component of the protein complex known as troponin, which forms thin myofilaments with actin to keep the actin-tropomyosin complex in place [2,3]. Troponin is a structural protein unique to the heart that is recommended for use in the diagnosis and management of acute coronary syndrome.

ABSTRACT

High levels of Troponin I, cholesterol, triglycerides, Low Density Lipoprotein (LDL), High Density Lipoprotein (HDL) and Body Mass Index (BMI) are predictor of cardiac complications. Objective: To investigate the predictive efficacy of Troponin I, BMI, and lipid profiles in detecting cardiovascular problems. Methods: 300 male and female individuals were selected for current study. 100 normal individuals were in Control Group A, while 100 participants were placed in Group B all the individuals of Group B have the indications of different cardiac medical complications. BMI, systolic, diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, HDL levels were measured respectively. Results: In present study BMI, systolic blood pressure, diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, HDL blood serum levels of male and female in Group A and Group B were measured, the comparative analysis of above biomarkers showed a significant p-Value ≤ 0.05 change (0.02 ± 0.01, 183.01 ± 0.02, 120.01 ± 0.02, 87.01 ± 0.03, 44.01 ± 0.01), (0.02 ± 0.01, 172.01 ± 0.02, 130.01 ± 0.01, 88.01 ± 0.03, 42.01 ± 0.04), (0.39 ± 0.04, 272.01 ± 0.02, 180.01 ± 0.01, 138.01 ± 0.03, 37.01 ± 0.01) and (0.37 ± 0.04, 282.01 ± 0.02, 184.01 ± 0.01, 141.01 ± 0.03, 36.01 ± 0.01) were measured respectively. Conclusions: The present study found that there were notable significant p-value <0.05 differences in the blood serum levels of BMI, systolic and diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, and HDL in both the male and female groups in Groups A and B.
Individuals. The objective of this study is to investigate the lipid profile with cardiac complications in male and female events [15]. The objectives of present study were to identify the relationship between, Troponin I, BMI and components of lipid profile with cardiac complications in male and female individuals. The aims and objectives of present study were to identify the relationship between, Troponin I, BMI and components of lipid profile with cardiac complications in male and female individuals. Participants were chosen using stratified random sampling to achieve varied representation across age and sex categories within the community. The sample size was calculated using the Cochran Formula, with the goal of achieving 80% power and a 95% confidence level. This is a clinical cross-sectional study where in the patient's initial symptoms were noted at the time of presentation, and additional tests were performed using a calorimetry kit to measure the levels of cholesterol, LDL, triglycerides, and HDL using blood samples that were collected. All subjects in Groups A and B had their raw data collected using a Performa and a medical history questionnaire. BMI, systolic, diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, HDL levels were considered as inclusive criteria respectively. Participants were measured by using spectrophotometry kit and the regent method. Parameters were measured by using spectrophotometry kit and the regent method. Through a series of linked reactions that oxidize cholesterol’s 3-OH group and hydrolyze choleseryl esters, enzyme assays of cholesterol are performed in blood or plasma. One of the byproducts, H2O2, is measured in a process that produces color and is catalyzed by peroxidase. Glycerol is created by hydrolysis of triglycerides. One can measure serum HDL directly. The technique measures HDL cholesterol using polyethylene glycol-coupled choleseryl esterase and cholesterol oxidase, and it forms complexes with Apolipoprotein B (ApoB) containing lipoproteins using predictive efficacy of Troponin I, BMI, and lipid profiles in detecting cardiovascular problems. This study was conducted to address the significant gap in data regarding the predictive accuracy of biomarkers like Troponin I for cardiovascular complications in populations at high risk due to obesity and hyperlipidemia.

**METHODS**

Present study was cross-sectional and conducted in medical and cardiac units of Ghurki Trust and Teaching Hospital from March 2023 to November 2023. The Ethical Approval Clearance Certificate Ref No. 2023/1A was granted by Ethical Review Committee, Faculty of Biological Sciences, Lahore University of Biological and Applied Sciences. The aims and objectives of present study were to identify the relationship between, Troponin I, BMI and components of lipid profile with cardiac complications in male and female individuals. Participants were chosen using stratified random sampling to achieve varied representation across age and sex categories within the community. The sample size was calculated using the Cochran Formula, with the goal of achieving 80% power and a 95% confidence level. This is a clinical cross-sectional study where in the patient's initial symptoms were noted at the time of presentation, and additional tests were performed using a calorimetry kit to measure the levels of cholesterol, LDL, triglycerides, and HDL using blood samples that were collected. All subjects in Groups A and B had their raw data collected using a Performa and a medical history questionnaire. BMI, systolic, diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, HDL levels were considered as inclusive criteria respectively. Participants were measured by using spectrophotometry kit and the regent method. Through a series of linked reactions that oxidize cholesterol’s 3-OH group and hydrolyze choleseryl esters, enzyme assays of cholesterol are performed in blood or plasma. One of the byproducts, H2O2, is measured in a process that produces color and is catalyzed by peroxidase. Glycerol is created by hydrolysis of triglycerides. One can measure serum HDL directly. The technique measures HDL cholesterol using polyethylene glycol-coupled choleseryl esterase and cholesterol oxidase, and it forms complexes with Apolipoprotein B (ApoB) containing lipoproteins using predictive efficacy of Troponin I, BMI, and lipid profiles in detecting cardiovascular problems. This study was conducted to address the significant gap in data regarding the predictive accuracy of biomarkers like Troponin I for cardiovascular complications in populations at high risk due to obesity and hyperlipidemia.
sulfated alpha-cyclodextrin when Mg+2 is present. LDL cholesterol is determined by measuring total cholesterol, HDL cholesterol, and triglycerides. Using SPSS version 20.0, the bio-statistical operations were performed on all raw data collected, and all parameters were characterized by using standard mean deviation and significant (p-value < 0.05) regression.

RESULTS

In Table 1, the results of the present study are systematically presented. The sociodemographic characteristics of normal male individuals are outlined, including gender, age, smoking habits, alcohol consumption, family history of cardiac complications, and lifestyle. The mean and standard deviation values for these characteristics are as follows: gender (67.01 ± 0.03), age (54.01 ± 0.01), smoking (06.01 ± 0.02), alcoholic habit (02.01 ± 0.01), family history (03.01 ± 0.03), and lifestyle (60.01 ± 0.02). Additionally, the biological parameters of males in Group A are detailed, comprising BMI (19.01 ± 0.01 kg/m²), systolic blood pressure (124.01 ± 0.01 mmHg), diastolic blood pressure (83.01 ± 0.01 mmHg), Troponin-I levels (0.02 ± 0.01 ng/mL), cholesterol levels (183.01 ± 0.02 mg/dL), triglycerides levels (120.01 ± 0.02 mg/dL), LDL levels (87.01 ± 0.03 mg/dL), and HDL levels (44.01 ± 0.01 mg/dL).

Table 1: Group A Normal Male Individuals (n=67)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Units / Symptoms</th>
<th>Mean ± SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>67.01 ± 0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Age</td>
<td>40-60 years</td>
<td>54.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Smoking</td>
<td>Rarer</td>
<td>06.01 ± 0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Alcoholic</td>
<td>Rarer</td>
<td>02.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Family history</td>
<td>Little</td>
<td>03.01 ± 0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>Active</td>
<td>60.01 ± 0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>BMI</td>
<td>kg/m²</td>
<td>19.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>mmHg</td>
<td>124.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>mmHg</td>
<td>83.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Troponin-I Levels</td>
<td>ng/mL</td>
<td>0.02 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Cholesterol Levels</td>
<td>mg/dL</td>
<td>183.01 ± 0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Triglycerides Levels</td>
<td>mg/dL</td>
<td>120.01 ± 0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>LDL Levels</td>
<td>mg/dL</td>
<td>87.01 ± 0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>HDL Levels</td>
<td>mg/dL</td>
<td>44.01 ± 0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

The figure 1 graph depicts the mean values and standard deviations for various sociodemographic and health parameters such as age, smoking, alcohol consumption, family history, lifestyle, and multiple clinical measurements such as BMI, blood pressure, and lipid levels among healthy males in Group A.

Table 2: Group A Normal Female Individuals (n=33)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Units / Symptoms</th>
<th>Mean ± SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>33.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Age</td>
<td>40-60 years</td>
<td>54.01 ± 0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Smoking</td>
<td>Rarer</td>
<td>01.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Alcoholic</td>
<td>Rarer</td>
<td>00.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Family history</td>
<td>Little</td>
<td>02.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>Active</td>
<td>30.01 ± 0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>BMI</td>
<td>kg/m²</td>
<td>17.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>mmHg</td>
<td>114.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>mmHg</td>
<td>73.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Troponin-I Levels</td>
<td>ng/mL</td>
<td>0.02 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Cholesterol Levels</td>
<td>mg/dL</td>
<td>172.01 ± 0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Triglycerides Levels</td>
<td>mg/dL</td>
<td>130.01 ± 0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>LDL Levels</td>
<td>mg/dL</td>
<td>88.01 ± 0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>HDL Levels</td>
<td>mg/dL</td>
<td>42.01 ± 0.04</td>
<td>0.04</td>
</tr>
</tbody>
</table>

The figure 2 shows similar sociodemographic and health statistics as Figure 1, but for normal females in Group A. It shows mean values and standard deviations, allowing for a comparison of health profiles across genders in the control group.
Figure 2: Distribution of Sociodemographic and Health Parameters in Group A Normal Female Individuals

In Table 3, sociodemographic factors include gender, with a predominance of males (57.01 ± 0.04), and age, with the majority falling within the 40-60 years range (54.01 ± 0.01). Smoking habits are represented by the majority being smokers (46.01 ± 0.03), while alcohol consumption is less common, denoted as rarer (12.01 ± 0.01). High family history prevalence (33.01 ± 0.01) and an inactive lifestyle (47.01 ± 0.04) are also notable among the studied population. In terms of clinical parameters, the table delineates BMI (27.01 ± 0.04 kg/m²), systolic blood pressure (140.01 ± 0.02 mmHg), diastolic blood pressure (89.01 ± 0.02 mmHg), Troponin-I levels (0.39 ± 0.04 ng/mL), cholesterol levels (272.01 ± 0.02 mg/dL), triglycerides levels (180.01 ± 0.01 mg/dL), LDL levels (138.01 ± 0.03 mg/dL), and HDL levels (37.01 ± 0.01 mg/dL).

Table 3: Group A Male Individuals with Cardiac Complications (n=57)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean ± SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>57.01 ± 0.04</td>
</tr>
<tr>
<td>Age</td>
<td>40-60 years</td>
<td>54.01 ± 0.01</td>
</tr>
<tr>
<td>Smoking</td>
<td>Majority</td>
<td>46.01 ± 0.03</td>
</tr>
<tr>
<td>Alcoholic</td>
<td>Rarer</td>
<td>12.01 ± 0.01</td>
</tr>
<tr>
<td>Family history</td>
<td>High</td>
<td>33.01 ± 0.01</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>Inactive</td>
<td>47.01 ± 0.04</td>
</tr>
<tr>
<td>BMI</td>
<td>kg/m²</td>
<td>27.01 ± 0.04</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>mmHg</td>
<td>140.01 ± 0.02</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>mmHg</td>
<td>89.01 ± 0.02</td>
</tr>
<tr>
<td>Troponin-I Levels</td>
<td>ng/mL</td>
<td>0.39 ± 0.04</td>
</tr>
<tr>
<td>Cholesterol Levels</td>
<td>mg/dL</td>
<td>272.01 ± 0.02</td>
</tr>
<tr>
<td>Triglycerides Levels</td>
<td>mg/dL</td>
<td>180.01 ± 0.01</td>
</tr>
<tr>
<td>LDL Levels</td>
<td>mg/dL</td>
<td>138.01 ± 0.03</td>
</tr>
<tr>
<td>HDL Levels</td>
<td>mg/dL</td>
<td>37.01 ± 0.01</td>
</tr>
</tbody>
</table>

The figure 3 graph shows comprehensive health data for male Group B members with cardiac problems. The metrics include BMI, systolic and diastolic blood pressure, Troponin I, cholesterol, triglyceride, LDL, and HDL values.

Table 4: Group B Female Individuals with Cardiac Complications (n=43)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean ± SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>43.01 ± 0.01</td>
</tr>
<tr>
<td>Age</td>
<td>40-60 years</td>
<td>54.01 ± 0.01</td>
</tr>
<tr>
<td>Smoking</td>
<td>Low</td>
<td>16.01 ± 0.01</td>
</tr>
<tr>
<td>Alcoholic</td>
<td>Non</td>
<td>0.00 ± 0.01</td>
</tr>
<tr>
<td>Family history</td>
<td>High</td>
<td>32.01 ± 0.01</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>Inactive</td>
<td>40.01 ± 0.02</td>
</tr>
<tr>
<td>BMI</td>
<td>kg/m²</td>
<td>28.01 ± 0.04</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>mmHg</td>
<td>140.01 ± 0.02</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>mmHg</td>
<td>90.01 ± 0.02</td>
</tr>
<tr>
<td>Troponin-I Levels</td>
<td>ng/mL</td>
<td>0.37 ± 0.04</td>
</tr>
<tr>
<td>Cholesterol Levels</td>
<td>mg/dL</td>
<td>282.01 ± 0.02</td>
</tr>
<tr>
<td>Triglycerides Levels</td>
<td>mg/dL</td>
<td>184.01 ± 0.01</td>
</tr>
<tr>
<td>LDL Levels</td>
<td>mg/dL</td>
<td>141.01 ± 0.03</td>
</tr>
<tr>
<td>HDL Levels</td>
<td>mg/dL</td>
<td>36.01 ± 0.01</td>
</tr>
</tbody>
</table>

The figure 3 displays the health parameters of females in Group B who have cardiac problems. It presents a clear visual depiction of mean values and standard deviations for the same set of clinical measures as in Figure 3, but customized to the female subgroup.
In Table 5, the characteristics of individuals with cardiovascular complications are stratified by gender and treatment groups (Groups A and B). The table presents the mean and standard deviation values for various variables. For male individuals in Group A, the mean and standard deviation values are as follows: age (57.01 ± 0.04 years), smoking (46.01 ± 0.03), alcoholic habits (12.01 ± 0.01), family history (33.01 ± 0.01), lifestyle (54.01 ± 0.02), BMI (28.01 ± 0.04 kg/m²), systolic blood pressure (140.01 ± 0.02 mmHg), diastolic blood pressure (83.01 ± 0.02 mmHg), Troponin-I levels (0.02 ± 0.01 ng/mL), cholesterol levels (183.01 ± 0.02 mg/dL), triglycerides levels (120.01 ± 0.02 mg/dL), LDL levels (88.01 ± 0.03 mg/dL), and HDL levels (44.01 ± 0.01 mg/dL). For female individuals in Group A, the mean and standard deviation values are: age (67.01 ± 0.03 years), smoking (46.01 ± 0.03), alcoholic habits (12.01 ± 0.01), family history (33.01 ± 0.01), lifestyle (54.01 ± 0.02), BMI (27.01 ± 0.04 kg/m²), systolic blood pressure (124.01 ± 0.02 mmHg), diastolic blood pressure (87.01 ± 0.03 mmHg), Troponin-I levels (0.02 ± 0.01 ng/mL), cholesterol levels (141.01 ± 0.03 mg/dL), triglycerides levels (184.01 ± 0.01 mg/dL), LDL levels (141.01 ± 0.03 mg/dL), and HDL levels (36.01 ± 0.01 mg/dL). A remarkable significant (p-value < 0.05) changes were seen in between the variables of each group.

Table 5: Comparative Analysis of Group A and Group B Male and Female Individuals

<table>
<thead>
<tr>
<th>Variables</th>
<th>Units / Symptoms</th>
<th>(Mean ± SD) Male G-A</th>
<th>(Mean ± SD) Male G-B</th>
<th>(Mean ± SD) Female G-A</th>
<th>(Mean ± SD) Female G-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>67.01 ± 0.03</td>
<td>33.01 ± 0.01</td>
<td>57.01 ± 0.04</td>
<td>43.01 ± 0.01</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td>54.01 ± 0.02</td>
<td>54.01 ± 0.02</td>
<td>54.01 ± 0.01</td>
<td>54.01 ± 0.01</td>
</tr>
<tr>
<td>Alcoholic habits</td>
<td></td>
<td>12.01 ± 0.01</td>
<td>12.01 ± 0.01</td>
<td>12.01 ± 0.01</td>
<td>12.01 ± 0.01</td>
</tr>
<tr>
<td>Family history</td>
<td></td>
<td>32.01 ± 0.01</td>
<td>32.01 ± 0.01</td>
<td>32.01 ± 0.01</td>
<td>32.01 ± 0.01</td>
</tr>
<tr>
<td>Lifestyle</td>
<td></td>
<td>60.01 ± 0.02</td>
<td>60.01 ± 0.02</td>
<td>60.01 ± 0.02</td>
<td>60.01 ± 0.02</td>
</tr>
<tr>
<td>BMI</td>
<td>Kg/m²</td>
<td>19.01 ± 0.01</td>
<td>19.01 ± 0.01</td>
<td>17.01 ± 0.01</td>
<td>17.01 ± 0.01</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>mmHg</td>
<td>124.01 ± 0.01</td>
<td>124.01 ± 0.01</td>
<td>114.01 ± 0.01</td>
<td>114.01 ± 0.01</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>mmHg</td>
<td>83.01 ± 0.01</td>
<td>83.01 ± 0.01</td>
<td>73.01 ± 0.01</td>
<td>73.01 ± 0.01</td>
</tr>
<tr>
<td>Troponin-I levels</td>
<td>ng/mL</td>
<td>0.02 ± 0.01</td>
<td>0.02 ± 0.01</td>
<td>0.02 ± 0.01</td>
<td>0.02 ± 0.01</td>
</tr>
<tr>
<td>Cholesterol levels</td>
<td>mg/dL</td>
<td>120.01 ± 0.02</td>
<td>120.01 ± 0.02</td>
<td>180.01 ± 0.01</td>
<td>180.01 ± 0.01</td>
</tr>
<tr>
<td>Triglycerides levels</td>
<td>mg/dL</td>
<td>272.01 ± 0.02</td>
<td>272.01 ± 0.02</td>
<td>180.01 ± 0.03</td>
<td>180.01 ± 0.03</td>
</tr>
<tr>
<td>HDL levels</td>
<td>mg/dL</td>
<td>44.01 ± 0.01</td>
<td>44.01 ± 0.01</td>
<td>42.01 ± 0.04</td>
<td>42.01 ± 0.04</td>
</tr>
</tbody>
</table>

D. Johnson et al., in 2019 concluded in their study that Cardiac Troponin I (cTnI), a benchmark for detecting myocardial damage, was recently found to predict acute myocardial infarction or mortality in individuals with unstable Coronary Heart Disease (CHD). Cardiac TnI concentrations rise with age in people with no clinical indications of CHD, indicating silent myocardial damage [16]. Obesity, which is defined by excessive amounts of adipose tissue (body fat), might raise your chance of developing hyperlipidemia. Excess weight promotes inflammation, disrupts metabolism, and leads to insulin resistance. Researchers assume that 60-70% of obese persons have hyperlipidemia. The main findings of the different studies were that obesity, higher lipedema, and high blood pressure are strongly associated with cardiovascular complications [17]. Different studies showed that obesity and lipid profile has close relationships. In the previous studies a close associations of obesity, hypercholesterolemia, hypertriglyceridemia and high blood pressure, with cardiovascular medical complications in various populations were noted [18]. The first written accounts of obesity appear at the close of the 1800s and the start of the 1900s. More than 57,000 publications have been published in PubMed as of right now with the term “obesity” in the title; these numbers increase if the term is also searched for in the abstract [19]. According to unique research, the obesity incidence among adults in numerous countries in North Africa, Oceania, and the Middle East exceeded 50% in 2013. This is pretty worrying [20]. Obesity was lower but still extremely common in other regions of the world, such as North America, where one-third of adults suffer from the...
CONCLUSIONS

The study demonstrated significant (p-Value < 0.05) variations in blood serum levels of cholesterol, triglycerides, LDL, HDL, BMI, systolic and diastolic blood pressure, Troponin I, and cholesterol levels between male and female individuals in Groups A and B. These findings highlight the possibility of using Troponin I as a predictor of cardiovascular issues and the importance of addressing modifiable risk factors as soon as possible. Further long-term study is required to validate these associations and direct targeted preventative measures.

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Authors Contribution

Conceptualization: ZH, MNS²
Methodology: SUSZ
Formal analysis: TWB
Writing, review and editing: MM, TWB, NY, MNS¹, MNS²

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

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REFERENCES


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