Trends in Clinical and Medical Sciences

PSR Press

Article

To study the levels of glucose and lipid profiles in metabolic syndrome and non-metabolic syndrome individuals

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Received: 3 March 2023; Accepted: 12 May 2023; Published: 14 May 2023.

Abstract: Background: The increased risk of cardiovascular disease and type II diabetes is attributed to the cluster of metabolic abnormalities known as metabolic syndrome. Most people with metabolic syndrome also have several other metabolic problems, including high blood sugar, insulin resistance, abnormal lipid profiles, and high blood pressure.
Aim: This study's objective was to investigate the relationships between insulin, glucose, homeostasis metabolic assessment-estimated insulin resistance (HOMA-IR), and lipids in persons with metabolic syndrome.
Material and Methods: All the study participants consented. Control volunteers were 100 age- and gender-matched healthy volunteers. Second cohort: 100 metabolic syndrome patients treated. Same-age as well as gender normal-glycemic controls were used as the non-metabolic syndrome group. Each cohort was designated as normal if Body Mass Index (BMI) was (18.5-24.9 kg per m2), overweight (25-29.9 kg per m2), or obese (30 kg per m2).
Results: There was a statistically significant variation between 2 groups in terms of hemoglobin A1c (HbA1c), fasting blood sugar (FBS), and insulin mean values. Figure 1 displays the average levels of TC and triacylglycerols (TAGs) in patients having metabolic syndrome and in healthy control subjects. Serum weight measurements were found to be significantly varied between 2 groups. Metabolic syndrome sufferers had a mean TAGs level that was somewhat elevated compared to the control group, although they were still only around 40% higher than the norm.
Conclusion: Research along these lines is encouraged since it will lead to molecular insights that will help doctors control hyperglycemia and slow the development of related diseases. Open cholecystectomy cases can be done under thoracic epidural anaesthesia with 0.5% bupivacaine and buprenorphine or fentanyl as an adjuvant. Buprenorphine having prolong duration of analgesia can be better than fentanyl even in postoperative period.

Keywords: Metabolic syndrome; Homeostasis Model Assessment of Insulin Resistance (HOMA-IR); Hyperglycemia; Insulin; Insulin resistance.

1. Introduction

Nearly three million American children and adolescents between the ages of 12 and 19 are believed to have metabolic syndrome [1] by the American Heart Association. Among adolescents who are overweight or obese, this figure rises to 44%. According to research, 19.52 percent of the people studied in India had metabolic syndrome. Metabolic syndrome was also more common among Indian women (at 35%) than men (at 26%), according to a recent study [2].

The increased risk of type II diabetes and cardiovascular disease is attributed to the cluster of metabolic abnormalities known as metabolic syndrome. Most people with metabolic syndrome also have a number of

other metabolic problems, including high blood sugar, insulin resistance, abnormal lipid profiles, and high blood pressure [3–10]. There is a close relationship between glucose and insulin in the body's metabolic activities. Insulin is a hormone that controls glucose metabolism by promoting glucose uptake by cells; glucose is the body's major source of energy [11,12]. Insulin resistance, in which the body is less receptive to the insulin signal and high glucose levels follow, is common in people with metabolic syndrome [13,14]. One popular tool for doing so is the HOMA-IR, that uses fasting insulin and glucose levels to arrive at an estimate of insulin resistance. Individuals with insulin resistance and a high HOMA-IR value have an increased risk of developing type II diabetes and cardiovascular disease. Increased levels of low-density lipoprotein cholesterol and triglycerides and lower levels of high-density lipoprotein cholesterol define dyslipidemia, that is prevalent in those with metabolic syndrome [15–22]. Insulin resistance and glucose intolerance, two hallmarks of metabolic syndrome, often accompany dyslipidemia. In conclusion, patients having metabolic disorders have close associations between glucose, insulin, HOMA-IR, and lipids [16–19]. Hyperglycemia, dyslipidemia, and an elevated risk of cardiovascular disease and type II diabetes are hallmarks of metabolic syndrome, that is characterized by insulin resistance [18–22]. This study set out to do just that by looking at how lipids, insulin, glucose, and HOMA-IR all relate to one another in people who have metabolic syndrome.

2. Material and methods

In the current investigation, 200 individuals participated, 100 in the metabolic syndrome group and 100 in the healthy control group. This investigation focused on patients at the "Index Medical College and Research Centre" in Indore. After receiving approval from appropriate authorities, the study's researchers commenced their efforts. Each participant gave informed consent prior to the start of this research. Patients having type-I diabetes or duration of pathological symptoms and T2DM duration of less than five years were excluded. Healthy controls lacked diabetes, did not take multivitamins, and did not suffer from comorbid conditions.

All participants in both categories were examined by a qualified physician from the hospital's medical department, who adhered to standard operating procedures and considered the exclusion and inclusion criteria of the research. The control group comprised 100 participants of same gender and age who lacked metabolic syndrome. 100 patient receiving treatment for metabolic syndrome comprised the second cohort. The metabolic syndrome was identified using ATP-III-established criteria. Human volunteers of comparable age and gender with a normal glycemic state served as the control group. Each individual was examined by a licensed physician who adheres to established medical procedures. The metabolic syndrome was identified using ATP-III-established criteria. BMI was determined by dividing every subject's weight (in kg) by their height (in meters) squared. After determining the individuals' BMI, they were divided into groups. Using the WHO's analytical criteria for obesity in BMI for Asian populations, individuals were again divided into three categories within each cohort: overweight (25-29.9 kg per m2), normal weight (18.5-24.9 kg per m2), and obese (30 kg per m2). Using a disposable syringe and cannula in a sterile environment, 5ml of each individual's fasting venous blood was extracted into flat containers in both groups. After being separated from blood by centrifugation for 20 min at 3000 rpm, serum samples were aliquoted and stored at 20°C.

Avantor laboratories' DPEC – GOD/POD technique measured plasma glucose. The manual's instructions generated the reagents. The ClinRep full kit was used on the BioRad Diamant and Variant to measure HbA1C. 4.5-6.1% is normal. Serum insulin levels were measured with an LDN IRMA reagent. Supplier instructions were followed. With sensitivity of 0.5 IU/mL, intra- and inter-assay CVs were 3.4% and 4.3%, resp. According to Muniyappa et al. (2008), HOMA-IR was calculated. In the case of lipid profile; to measure serum TC, CHOD/POD procedure was used. Glycerol Phosphate Oxidase and Peroxidase (Liquid stable) assessed serum TAGs. All reagents were acquired from "Avantor Performance Materials India Limited, Dehradun, Uttarakhand, India", and the estimation followed the kit manual. Supplier instructions were followed.

3. Statistical Analysis

The means of the variables were compared between 2 groups using an unpaired "t" test. Not only that but percentages were tallied. Scatter diagrams were used to analyze the correlation between the two factors. Not only that but percentages were tallied. A 0.05 level of significance was accepted.

4. Results

The results of the study are summarized in Table 1, which compares the levels of FBS (Fasting Blood Glucose), post-prandial blood glucose (PPBS), glycated hemoglobin (HbA1c), insulin, and HOMA-IR that were measured in both groups. When the two groups of study participants were compared, there was a statistically significant difference in the levels of FBS (t=13.24; df=198; P0.001), HbA1c (t=17.40; df=198; P0.05), and mean levels of insulin (t=3.70; df=198; P0.05). The participants in the metabolic syndrome group had a mean PPBS level of 147 (standard deviation: 63), whereas the healthy controls had a mean plasma glucose level of 133.9 (standard deviation: 11). In the instance of HOMA-IR, we discovered a rise in a level that was over fifty percent greater in people having metabolic disorder compared to control participants. The study examined the percentages increase as a result of the fact that we included people in both groups who were the same age and were of the same gender. In addition to determining the level of IR intensity present in the participants of both groups, we computed the HOMA-IR.

Table 1. Glycemic profile of metabolic syndrome subjects and control subjects of the study

Variable	Metabolic syndrome group (n=100)	Healthy Controls (n=100)	P Value
FBS (mg/dL)	133. 9 ± 45	86.6±11	<0.0001
PPBS (mg/dL)	147 ± 63	133.8 ± 11.6	>0.05
HbA1C (gm%)	6.9 ± 1.5	5.4 ± 0.9	<0.05
Insulin (μU/mL)	21.2 ± 5	18.5 ± 10.6	<0.05
HOMA-IR	24.9 ± 1.3	5.8 ± 2.9	<0.0001

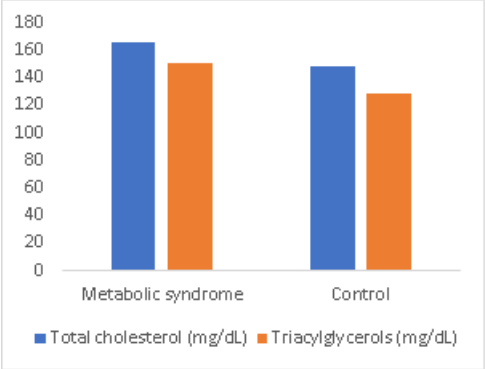

Figure 1. Lipid values as a bar chart for the sample population

5. Discussion

Metabolic syndrome may set off a chain reaction that ultimately results in diabetes problems. Hyperglycemia and a low body mass index are hallmarks of metabolic syndrome, suggesting that this condition may serve as a trigger for the chain reaction. This is because metabolic syndrome features underweight individuals. Both hyperglycemia and a lack of body fat contribute to this condition.

The FBS, Hba1c, and insulin levels of patients with metabolic syndrome were greater compared to a healthy control group. Examining the ages of the individuals in the two categories revealed no significant differences in this characteristic. The study's findings determined this result. Those who participated in the study and were diagnosed with metabolic syndrome demonstrated an increase in fat-free mass. Participants who were sufficiently robust to function as controls did not exhibit this trend in body composition [21,22].

The higher blood sugar levels in the metabolic syndrome group may be a result of aging, according to this study. Our findings also point to concerns associated with aging in metabolic syndrome patients. According to previous research, metabolic syndrome is currently one of the diseases associated with the aging process [12,13]. Researchers [1,8,12,14,17,22] found that those over the age of 40 are more likely to develop metabolic syndrome. This conclusion was arrived after two separate examinations. Surprisingly, the researchers found no correlation between the ages of the control group participants and their blood sugar levels. On the other hand, we did observe a difference in age between those with and without metabolic syndrome, but the

difference was not statistically significant. This finding suggests that those with a high metabolic syndrome predisposition are more likely to develop the condition than those with a low predisposition. In other words, those who are predisposed to metabolic disorders are more likely to acquire the disorder than those who are not. Those who are genetically predisposed to metabolic syndrome are more likely to develop the condition. The highest prevalence of diabetes is among adults older than 65; however, elderly adults are frequently excluded from many studies, including diabetes research [16,17].

It is crucial to investigate the observation of an inverse relationship between age and HbA1c in both metabolic syndrome and control groups. Both volunteer groups independently discovered this. At first glance, this appears to be a paradox; however, one plausible explanation is that oxidative stress rises with age and that the rise in HbA1c is a compensatory response to both the aging process and the production of free radicals. Another plausible hypothesis is that oxidative stress rises with age and that the rise in HbA1c is a consequence of both the aging process and free radical production. There is also the theory that oxidative stress rises with age and that both aging and the production of free radicals contribute to the increase in HbA1c. This is yet another rational explanation. Numerous studies [14–21] have demonstrated that individuals with metabolic disorders are more likely to have elevated levels of oxidative stress than healthy controls or individuals of the same age. Although no attempt was made to measure levels of free radicals, the research demonstrates that oxidative stress is elevated in both metabolic syndrome patients and elderly controls [17–20].

In comparison to healthy controls, individuals with metabolic syndrome exhibited statistically significant alterations in postprandial blood glucose levels and serum weight. This was disclosed when those with metabolic syndrome were compared to healthy controls. Produced by the pineal gland and other organs, weight is an endocrine and biological process-regulating hormone. In addition, the interaction between BMI and insulin is necessary for maintaining a balance between normal normoglycemia and elevated hyperglycemia. This condition is necessary for the organism to function normally. According to studies [15,16] from around the world, hyperglycemia occurs in individuals with a disruption in this crosstalk. According to genome-wide investigations [12,13], obesity is associated with hyperglycemia and the risk of developing metabolic syndrome in individuals who are predisposed to the condition. Previous research [17,18] has demonstrated that obesity enhances insulin sensitivity. The discovery that alteration in insulin balance may increase insulin resistance and hyperglycemia lends credibility to these findings [17–22]. Consequently, it has been observed that individuals with higher blood glucose levels had less body obesity. Because glucose prevents weight gain, this is the case. This research confirms previous findings that individuals with metabolic syndrome had abnormally elevated blood sugar levels (hyperglycemia). Underweight people were more likely to have metabolic syndrome, resulting in postprandial hyperglycemia. Consequently, we may conclude that postprandial hyperglycemia is the consequence of a loss of body mass. Contrary to the findings of one study, it has been determined that injecting male Wistar rodents with weight did not affect their blood sugar levels. Even though the rodents were not weighed, this is true.

6. Conclusion

Research along these lines is encouraged since it will lead to molecular insights that will help doctors control hyperglycemia and slow the development of related diseases. The results of these investigations will add to our knowledge of molecular insights that may one day help doctors control hyperglycemia. This research also suggests that people with metabolic syndrome may not have adequate compensatory mechanisms to deal with pathophysiological abnormalities. Despite the lack of prior extensive investigation into the issue at hand, the current study was able to establish this finding.

Author Contributions: All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript.

Conflicts of Interest: The authors declare that they do not have any conflict of interests.

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