ORIGINAL ARTICLE

Association of Obesity and Cardiometabolic Syndrome in Bank Employees: A Cross Sectional Study

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Abstract:

Background: Metabolic syndrome also referred as cardio metabolic syndrome is identified as the prestate for cardiovascular disease, type 2 diabetes and also for chronic kidney disease. Obesity is considered as the strongest component of metabolic syndrome as per the definition given by different organizations. The easiest way to measure obesity are waist circumference, Body Mass Index (BMI) and waist to hip ratio. *Aims and Objective:* To find the association between microalbuminuria and components of cardiometabolic syndrome in the bank employees and also the association between waist circumference, body mass index and components of cardiometabolic syndrome, microalbumin. *Material and Methods:* This was a cross sectional study involving 73 subjects working in a reputed bank. Their anthropometric measurements and biochemical parameters like fasting blood glucose, lipid profile, serum cortisol and microalbumin were measured. We defined microalbuminuria as a urinary albumin to creatinine ratio of 30 to 299 mg/gm. *Results:* out of 73 participants, in 33 participants at least 3-5 parameters of cardiometabolic syndrome were found to be present and were labeled as cardiometabolic syndrome patients. Waist circumference showed positive correlation with age (r=0.498), systolic blood pressure (r=0.500), diastolic blood pressure (r=0.476), fasting blood glucose (r=0.300), triglyceride (r=0.408) and microalbumin (r=0.409). Microalbumin also exhibited a significant positive correlation with age (r=0.404), waist circumference (r=0.419), fasting blood glucose (r=0.476) and HbA1c (r=0.466), while BMI showed negative correlation with microalbumin (r=-0.085). *Conclusions:* Obesity, one of the parameters of cardiometabolic syndrome measured as waist circumference, is indicative of the syndrome rather than BMI. Microalbumin may be considered as a promising parameter of cardiometabolic syndrome.

Keywords: Cardiovascular disease, Obesity, BMI, Microalbuminuria

Introduction:

Cardiometabolic syndrome (CMS) is an another name for metabolic syndrome which is a collection of symptoms like hyperglycemia, increased triglycerides, and decreased high-density lipoprotein cholesterol (HDL-C), abdominal obesity, and hypertension [1]. It is the syndrome, which increases the risk for cardiovascular disease and type 2 diabetes. The definition of this metabolic syndrome is explained by different organizations, like the World Health Organization, National Cholesterol Education Program's Adult Treatment Panel III (NCEP: ATP III), and International Diabetes Federation. Microalbuminuria is one of the components of the metabolic syndrome as per the WHO definition [2]. It is considered as an early marker of chronic kidney disease (CKD) and found to be associated with cardiovascular events [3]. The studies reported the relationship between metabolic syndrome and microalbuminuria [4, 5]. The early detection of microalbuminuria and timely therapeutic intervention will avert future complications like overt diabetic nephropathy [6].

Obesity is an important risk factor in the diagnosis of the metabolic syndrome. Anthropometric

parameters such as Body Mass Index (BMI), Waist Circumference (WC) are widely used for the measurement of visceral adiposity [7]. Both the parameters help to identify the subjects with CMS easily [8, 9]. BMI is commonly used to check the obesity. It is used to observe and monitor the obesity in the population. But there are certain limitations. It fails to give the information about the distribution of adipose tissue. The values are affected by age, sex and lean mass [10]. The cutoff values mentioned for BMI may underestimate the obesity and its related health risk factors. Waist circumference is associated with a raised risk of developing cardiovascular disease [11]. Application of waist circumference can be considered as a better indicator of obesity related risk factors than the BMI [12]. Bank employee's work is usually associated with job stress as there is the involvement of the factors like extended duty hours, sedentary working style, physical inactivity and confrontation with customers etc. so these workers are at the increased risk of developing the cardiometabolic syndrome.

We have undertaken a cross sectional study to find relationship between microalbuminuria and components of the cardiometabolic syndrome in bank employees and also to find the association between waist circumference, BMI and the components of cardiometabolic syndrome.

Material and Methods:

Study design:

The participants were from a reputed bank with its branches in this area and were in the age group of 30-60 years. Only male participants were selected for this study as it is a part of ongoing study, which includes only male subjects. The participant's anthropometric information like height, weight, waist circumference and hip circumference were recorded. The blood pressure was measured using sphygmanometer when participants were at rest in a sitting position for ten minutes. The study was reviewed and approved by the ethics committee on the research of BLDE University, Sri B. M. Patil Medical College, Hospital and Research center, Bijapur, Karnataka.

Inclusion and exclusion criteria:

The bank employees who expressed about their job related stress were randomly included in the study. The subjects underlying medical conditions like rheumatoid arthritis, tuberculosis and any other infective conditions were excluded from the study. None of the participants had any renal disorders. A total of 73 participants was included in this study.

Cardiometabolic syndrome:

The guidelines of the NCEP ATP III PANEL (National cholesterol education programme, adult training programme III panel) were followed [14]. Cardiometabolic syndrome was considered when the three or more of the following risk factors were present.

1. Blood pressure: $\geqslant$ 130/85 mmHg.
2. Waist circumference: $\geqslant$ 90 cm (specifically for Indians).
3. Triglyceride: $\geqslant$ 150.0mg/dl.
4. HDL-Cholesterol: $\leqslant$ 40.0 mg/dl.
5. Fasting blood glucose: $\geqslant$ 100.0 mg/dl.

Biochemical analysis:

The blood and urine samples of the participants were collected after overnight fasting. The serum cortisol was estimated by ELISA method. HbA1c was measured by chemiluminescent microparticle immunoassay on Abbott instrument. Micro-albumin was measured in the urine by the Turbidimetric immunoassay using the commercial kit supplied by ERBA. The Microalbumin values were expressed as mg per gram of creatinine.

Statistical analysis:

The data of the groups of cardiometabolic syndrome and non-cardiometabolic syndrome were expressed as mean ± SD. The Independent t-test was applied to find the significance between the two groups. The Pearson correlation coefficient was used to determine the correlation between the variables in this study.

Results:

Table 1 shows the anthropometric measurements of the subjects of both cardiometabolic syndrome (n=33) and non-cardiometabolic syndrome (n=40). Weight, BMI and Waist circumference measurements showed marked difference and were statistically significant. In both the groups, the rest of the variables did not show any significant difference.

Biochemical parameters of the individuals studied in the present study are given in the (Table 2).

HDL cholesterol levels decreased and the levels of the rest of the parameters increased in subjects with Cardiometabolic syndrome.

Table 3 shows the Pearson correlation coefficient analysis between variables of BMI and WC in subjects with cardiometabolic syndrome group.

Table 4 depicts the correlation coefficient between microalbumin and other variables in the subjects with cardiometabolic syndrome group.

Table 1: Anthropometric Parameters of the Cardiometabolic syndrome and Non Cardiometabolic syndrome

Sr. No.	Parameters	CMS Mean ± S.D (N=33)	Non CMS Mean ± S.D (N=40)	P value
1	Age (Years)	048.67±6.71	045.93±6.56	0.083
2	Height (cm)	168.64±8.33	168.15 ± 11.00	0.835
3	Weight (kg)	075.00± 8.78	068.55 ± 8.90	0.003**
4	BMI (kg/ m^2)	026.52 ± 3.88	024.48 ± 4.25	0.036*
5	WC (cm)	096.26 ±8.19	87.65 ± 12.37	0.0010**
6	HC (cm)	101.36 ± 8.00	095.58 ± 11.67	0.018*
7	Waist / Hip Ratio	00.95 ± 0.04	00.91 ± 0.06	0.013*
8	SBP (mmHg)	126.73 ± 9.82	124.75 ± 9.33	0.382
9	DBP (mmHg)	084.36 ± 8.86	080.38 ± 9.59	0.071

*Cardiometabolic syndrome- CMS, BMI- Body Mass Index, Systolic blood pressure- SBP, Diastolic blood pressure- DBP, WC-Waist Circumference, HP-Hip Circumference, * Significant at p<0.05 level, ** Significant at p<0.01 level*

Table 2: Biochemical Parameters of the Cardiometabolic syndrome and Non Cardiometabolic syndrome

Sr. No.	Parameters	CMS	Non CMS	P Value
1	FBSL (mg/dl)	113.94 ± 48.52	082.13 ± 16.75	0.002**
2	Gly. HbA1c (%)	006.02 ± 1.06	005.47 ± 0.37	0.003**
3	Micro albumin (mg/gm)	023.09 ± 15.42	015.50 ± 11.41	0.018*
4	Triglyceride (mg/dl)	178.09 ±105.24	102.90 ± 45.52	0.001**
5	T-Cholesterol (mg/dl)	162.48 ± 35.15	153.25 ± 29.08	0.23
6	HDL-Cholesterol (mg/dl)	034.42 ± 7.14	041.95 ± 9.50	0.003**
7	LDL-Cholesterol (mg/dl)	092.44 ± 30.60	090.72 ± 24.91	0.792
8	VLDL-Cholesterol (mg/dl)	035.62 ± 21.05	020.58 ± 9.11	0.001**
9	Serum Cortisol (µg/dl)	021.59 ± 7.14	015.06 ± 3.36	0.001**

*FBSL-Fasting Blood Sugar Level, Cardiometabolic syndrome- CMS, * Significant at p<0.05 level, ** Significant at p<0.01 level*

Table 3: Correlation Coefficient between Variables with CMS

Sr. No.	Parameters	BMI		WC	
		"r" Value	P value	"r" Value	P value
1	Age	0.19	0.144	0.498	0.002**
2	Waist to Hip Ratio	0.268	0.068	0.348	0.024*
3	SBP	0.333	0.029*	0.5	0.002**
4	DBP	0.193	0.141	0.476	0.003**
5	FBSL	-0.011	0.475	0.3	0.045*
6	Gly. HbA1c.	-0.12	0.253	0.223	0.106
7	Triglyceride	0.267	0.067	0.408	0.009**
8	Total Cholesterol	0.126	0.242	-0.146	0.209
9	HDL-Cholesterol	0.397	0.011	-0.293	0.049*
10	LDL-Cholesterol	-0.127	0.24	-0.522	0.001**
11	VLDL-Cholesterol	0.267	0.067	0.408	0.009**
12	Serum Cortisol	-0.211	0.12	-0.046	0.4
13	Microalbumin	-0.088	0.319	0.409	0.009**

*Cardiometabolic syndrome- CMS, BMI- Body Mass Index, WC-Waist Circumference, FBSL-Fasting Blood Sugar Level, Systolic blood pressure- SBP, Diastolic blood pressure- DBP, * Significant at p<0.05 level, ** Significant at p<0.01 level*

Table 4: Correlation Coefficient between Microalbumin and Variables in Cases with CMS

Sr. No.	Parameters	"r" value	P value
1	Age	0.404	0.010**
2	BMI	-0.085	0.319
3	WC	0.419	0.009**
4	HC	0.345	0.025*
5	Waist to Hip Ratio	0.14	0.219
6	SBP	0.216	0.113
7	DBP	0.119	0.255
8	FBSL	0.476	0.003**
9	Gly HbA1c.	0.466	0.003**
10	Triglyceride	0.182	0.156
11	Total Cholesterol	-0.16	0.187
12	HDL-Cholesterol	0.101	0.287
13	LDL-Cholesterol	-0.337	0.027*
14	VLDL-Cholesterol	0.182	0.156
15	Serum Cortisol	-0.56	0.379

*Cardiometabolic syndrome- CMS, BMI- Body Mass Index, WC-Waist Circumference, FBSL-Fasting Blood Sugar Level, Systolic blood pressure- SBP, Diastolic blood pressure- DBP, * Significant at p<0.05 level, ** Significant at p<0.01 level*

Discussion:

In this present cross sectional study the association between microalbumin and the components of cardiometabolic syndrome has been examined. In our study, we have used albumin to creatinine ratio technique to assess microalbuminuria which was used by others also [4]. The earlier studies had indicated that microalbuminuria being the sign of early onset of chronic kidney disease is associated with increased risk of the cardiovascular diseases, both in diabetic and non diabetic subjects [13,14]. Thus the cardiometabolic syndrome may be linked to these diseases through microalbumin. We have observed higher level of microalbumin in subjects with cardiometabolic syndrome compared to that of subjects without cardiometabolic syndrome in our study. Further, the Pearson correlation coefficient values indicated the positive correlation between microalbumin and the variables, age (r=0.404), waist circumference (r=0.419), hip circumference (r=0.345), fasting blood glucose (r=0.476) and Gly. HbA1c (r=0.466). Similar findings were reported by another study also [15]. In our study, out of 33 subjects with cardiometabolic syndrome, 11 subjects had their microalbumin value more than 30.0 mg /gm of creatinine.

The correlation coefficient value between microalbumin and BMI (-0.085, p=0. 319) suggests the good influence of waist

circumference on microalbumin (r=0. 419, p=0. 009). There are multiple, and variable definitions to explain the diagnosis of cardiometabolic syndrome. Commonly all have given importance to obesity. It is considered as a growing health problem, conferring excess risk for the development of type-2 diabetes and cardiovascular disease [16]. BMI, waist circumference and waist to hip ratio are the tools used to measure the obesity. The studies have indicated that the increased BMI levels are associated with hypertension, CVDs and type-2 diabetes [17, 18]. However, these results were challenged by others [19]. Compared to BMI and WHR (waist to hip ratio) WC is considered as a simple and easier obesity related anthropometric parameter because it has a single measurement whereas BMI and WHR are the measurements derived from two different parameters. In our study, we have assessed the components of cardiometabolic syndrome using both the BMI and WC. Our study indicates statistically significant positive correlation coefficient between WC and other parameters such as age (r=0.498), systolic blood pressure (r=0.500), diastolic blood pressure (r=0.476), blood glucose (F) (r=0.300) and triglycerides (r=0.408).Though positive correlation coefficient was found between same variables and BMI, only systolic blood pressure value(r=0.333) was statistically significant. Obesity, metabolic syndrome are considered as the independent risk factors for chronic kidney disease (CKD) and end stage renal disease (ESRD) [20]. Hsu *et al* reported the link between ESRD and BMI even after the risk factors like hypertension and diabetes were adjusted [21]. Similarly Kurella reported the association between CKD with the occurrence of metabolic syndrome [22].

The studies about the occurrence of renal injury being initiated by the obesity and metabolic syndrome are getting much research attention [23]. So there is a need to focus on the microalbuminuria, one of the risk factors of CKD as an independent risk factor of cardiometabolic syndrome. In our study there was a marked increase in the levels of all biochemical parameters except low HDL cholesterol in the subjects with the cardiometabolic syndrome than the subjects without cardiometabolic syndrome and most of the parameters were statistically significant. The association of dyslipidemia with metabolic syndrome is well documented and the findings of our study support the same [24]. We found elevated serum cortisol levels in subjects with cardiometabolic syndrome, which is supported by others [25]. However, we found a negative correlation of cortisol with BMI and waist circumference, and of microalbumin with BMI. Shivam Champaneri *et al* [26] reported that both BMI and WC were negatively correlated with cortisol and positively correlated after adjustments for gender, age, history of diabetes, socioeconomic status, steroids, hormone replacement therapy, and smoking habit.

The poor glycemic control and raised blood pressure are considered as the risk factors for microalbuminuria. [27]. In our study, we found a positive correlation between microalbumin and fasting blood glucose, blood pressure. The correlation with fasting blood glucose was statistically significant.

Conclusion:

The data presented in this cross sectional study of Bank employees, confirms the better association between cardiometabolic syndrome and the obesity measured as the waist circumference than the BMI. Microalbuminuria, already noted as a risk factor for CKD may be considered as one of the components listed to diagnose the cardiometabolic syndrome. The larger sample size could have projected the association between obesity and cardiometabolic syndrome more precisely.

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