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Original Research Article

Occurrence of the metabolic syndrome in newly diagnosed hypertensive adult Gujarati patients in G. K. General Hospital, Bhuj

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ABSTRACT

Background: A study of 30 newly diagnosed hypertensive Gujarati patients visiting the OPD of G. K. General Hospital, Bhuj, Gujarat, India was carried out. The main aim of the study was to estimate the occurrence of metabolic syndrome in newly diagnosed hypertensive patients
Methods: The study was carried out in a period of 2 months and data was collected after obtaining prior consent of patients and IEC approval. Blood pressure, waist circumference and BMI (body mass index) of the selected patients were measured while blood sample was collected for the laboratory investigations. The data collected was analysed using appropriate software
Results: On observation, out of 30 hypertensive patients 22 (73.33%) patients suffered from metabolic syndrome. Also in patients suffering from metabolic syndrome, along with hypertension 63.63% (n=14) patients suffered from hypertriglyceridemia, 68.18% (n=15) patients had low HDL cholesterol, 77.27% (n=17) patients had high FBS, 72.72% (n=16) patients had abnormal BMI and 63.63% (n=14) patients had abnormal waist circumference.
Conclusions: This very high occurrence values signifies the need of study with larger sample size based on region for further evaluation to treat the high risk patients on early diagnosis.

Keywords: Metabolic syndrome, Hypertension, Diabetes mellitus, Cardiovascular disease

INTRODUCTION

Metabolic syndrome (MS) is a cluster of metabolic abnormalities that increases (approximately doubles) the risk of cardiovascular morbidity and mortality.[1-5] It includes various combinations of elevated blood pressure (BP), atherogenic dyslipidemia, obesity, abnormal glucose tolerance and insulin resistance as well as such other abnormalities as pro-inflammatory and prothrombotic states.[2,3] Also, the risk of developing type 2 diabetes mellitus (T2DM) is increased 5 fold in the presence of MS.[3]

Hypertension (HTN) exerts a public health burden on the status of cardiovascular and healthcare systems in India.[6,7] 57% of all stroke deaths and 24% of all coronary heart disease (CHD) are due to HTN in India.[8]

High BP is one of the key features of the MS. The clinical guidelines for the management of hypertension underscore the importance of identifying metabolic syndrome as a group in hypertensive patients at high risk for the development of cardiovascular disease (CVD).[9]

When HTN and other metabolic risk factors co-exist in an individual, they potentiate one another leading to a synergism that increases the total CVD risk well above

that which results from the sum of individual risk factors.[10] Recognition of this fact has led to a reorientation with regard to risk stratification and management of HTN. Accordingly, many current guidelines on HTN diagnosis and management emphasize that total CVD risk should be quantified so that the type and intensity of treatment can be tailored to the degree of overall risk rather than the level of BP alone.[9] The starting point of this therapeutic approach is the search for, and identification of, the various risk factors in any individual presenting with any one of them.

Hypertension is one of the common cardiovascular risk factors. This is important because it is largely preventable by lifestyle measures. However, the magnitude of the metabolic syndrome in Gujarati population is not precisely known. Therefore, the study was designed to investigate the occurrence of metabolic syndrome in hypertensive patients.

Aim and objectives

Aim and objectives of the current study was to estimate the occurrence of metabolic syndrome in newly diagnosed hypertensive Gujarati patients.

METHODS

Study type, place and duration

Presented study was an observational study, conducted at G. K. General Hospital, Bhuj, Kutch, Gujarat, India, from June 2017 to July 2017.

Inclusion criteria

Inclusion criteria for current study were; adult patients with essential hypertension (as per the criteria defined by JNC) who visited the medicine OPD (outdoor patient department) and NCD (non communicable disease) clinic of G. K. general hospital, Bhuj (during the period of 2 months June-July).

Exclusion criteria

Exclusion criteria for current study were; patients who had a known history of diabetes mellitus before the diagnosis of HTN and those with findings suggesting secondary hypertension such as reno-vascular, renal parenchymal, thyroid or adrenal diseases. Patients with, congestive cardiac failure, pre-existing macro-vascular condition. Any severe illness (such as malignancy, severe infection, respiratory disease, liver disease), impairment of speech, hearing, vision, or cognition. Continuous or periodic use of corticosteroids. Pregnant females or who had given birth within the preceding six weeks. Hypertensive patients were evaluated to define whether they fulfil the criteria for metabolic syndrome in accordance with the definitions of the National cholesterol education program (NCEP) and adult treatment panel III (ATPIII).[2] NCEP/ATPIII defines metabolic syndrome as the presence of three or more of the following associated conditions; abdominal obesity (waist circumference >102 cm in men, >88 cm in women), serum triglycerides equal to or greater than 150 mg/dl, HDL cholesterol less than 39 mg/dl in men and 45 mg/dl in women, systolic blood pressure equal to or greater than 130 mmHg and/or diastolic blood pressure equal to or greater than 85 mmHg and fasting plasma glucose >110 mg/dl or use of hypoglycaemic medication.

IDF (International diabetes federation) criteria for metabolic syndrome include BMI (body mass index) instead of waist circumference.

Measurement of blood pressure

The Blood pressure of the patients visiting the OPD of G. K. general hospital was measured using sphygmomanometer. Blood pressure (both systolic and diastolic) was measured in both of the arms (in brachial artery) and the average of the two readings was taken. BP was measured in sitting position after making sure of providing ten minutes relaxation to the subjects prior to the first reading and interval of five minutes between the two readings.

Measurement of waist circumference

The waist circumference of the patients was measured at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest in standing erect position with the arms at the sides but away from the waist, feet positioned close together, and the weight evenly distributed across the feet. The waist circumference was measured with a stretch resistant measuring tape (keeping parallel to the floor) in centimetre. The subject was advised to relax and take a few deep, natural breaths before the measurement was done for the accuracy of the measurement.

For the measurement of BMI height and weight was measured:

Height was measured by making the patient upright, barefoot on the ground with the heels, buttocks and shoulder touching the wall and head in Frankfurt plane. The height was measured in meter with stadiometer.

Weight was measured using weighing balance in kilograms (kg). Body mass index (BMI) was calculated based on formula;

$$BMI = weight\ in\ kg \div height\ in\ meter2$$

Other variables those were determined for each patient includes: name, age, sex, address and contact number.

For the investigation of metabolic syndrome and biochemical tests of lipid, 12 hours of overnight fasting is required before the blood collection. Therefore patients

were asked to come with fasting. Blood sample for the test of fasting glucose was collected in fluoride bulb, while for the test of lipid profile in plain bulb. Serum was separated after centrifugation at 3000 rpm for 5 minutes and it was used for the analysis. Samples from the patients were drawn with their prior consent after informing them the purpose and nature of the study. The biochemical tests of the blood samples collected were performed with the method described in Table 1.

Table 1: Biochemical tests and respective methods used.

Biochemical tests	Method used
Fasting plasma glucose	Glucose oxidase-peroxidase method
Serum triglycerides	Glycerol-3-phosphate oxidase (GPO) method
High density lipoprotein	Phosphotungstunic acid method

The reference range for the diagnosis of metabolic syndrome from the lipid profile test was taken as mentioned in Table 2.

Table 2: Normal blood pressure range.

Blood pressure	SBP (mmHg)	DBP (mmHg)
Normal	<120	<80

The reference range for the diagnosis of metabolic syndrome from the lipid profile test was taken as mentioned in Table 3.

Table 3: Normal range of lipid profile.

Lipid	Value (mg/dl)
Serum triglyceride	80/180
HDL cholesterol	
Male	35-65
Female	40-70

The reference range for the fasting plasma glucose was taken as mentioned in Table 4.

Table 4: Normal range of plasma glucose.

Plasma glucose	Value (mg/dl)
Reference range	70-100

Statistical analysis

Results are analysed using appropriate statistical methods, Epi info software and Microsoft excel.

RESULTS

In the present study, out of 30 hypertensive patients selected for the study, occurrence of metabolic syndrome was found to be 73.3% (n=22) according to NCEP ATPIII criteria while 70% (n=21) according to IDF criteria.

Table 5: Mean and standard deviation of different variables in hypertensive patients, (n=30).

Variables	Mean	SD
Age (years)	57.50	7.798
SBP (mmHg)	157.63	28.699
DBP (mmHg)	93.67	15.877
Height (cm)	162.42	9.999
Weight (kg)	72.713	14.1202
BMI	27.5910	5.05990
Waist circumference	98.22	10.777
S. Triglyceride (mg/dl)	150.48	91.898
HDL-C (mg/dl)	39.23	9.676
FBS (mg/dl)	127.53	48.187

Regardless of metabolic syndrome, out of 30 patients, in total (n=14) (Table 6) patients suffered from hypertriglyceridemia, (n=16) (Table 7) had low HDL cholesterol, (n=18) (Table 8) patients had high FBS, (n=17) (Table 9) patients had abnormal waist circumference and (n=18) (Table 10) patients had abnormal BMI along with hypertension.

Table 6: Association of hypertriglyceridemia and metabolic syndrome.

Crosstab				
		Metabolic syndrome		Total
		0	1	
Hypertriglyceridemia	0	8	8	16
	1	0	14	14
Total		8	22	30

*0=no. of patients not suffering from the given variable, 1=no. of patients suffering from given variable, Pearson Chi-square value=9.545, degree of freedom (df)=1, p value=0.002 **(**p<0.05 is significant).

Table 7: Association of low HDL and metabolic syndrome.

Crosstab				
		Metabolic syndrome		Total
		0	1	
Low HDL	0	7	7	14
	1	1	15	16
Total		8	22	30

*0=no. of patients not suffering from the given variable, 1=no. of patients suffering from given variable, Pearson Chi-square value=7.308, degree of freedom (df)=1, p value=0.007.

In these patients suffering from metabolic syndrome, along with hypertension 63.63% (n=14) patients suffered from hypertriglyceridemia (Table 6), 68.18% (n=15)

patients had low HDL cholesterol (Table 7), 77.27% (n=17) patients had high FBS (Table 8), 72.72% (n=16) patients had abnormal BMI (Table 10) and 63.63% (n=14) patients had abnormal waist circumference (Table 9).

Table 8: Association of high FBS and metabolic syndrome.

Crosstab				
		Metabolic syndrome		Total
		0	1	
High FBS	0	7	5	12
	1	1	17	18
Total		8	22	30

*0=no. of patients not suffering from the given variable, 1=no. of patients suffering from given variable, Pearson Chi-square value=10.256, degree of freedom (df)=1, p value=0.001.

Table 9: Association of waist circumference estimate and metabolic syndrome.

Crosstab				
		Metabolic syndrome		Total
		0	1	
Waist circumference	0	5	8	13
	1	3	14	17
Total		8	22	30

*0=no. of patients not suffering from the given variable, 1=no. of patients suffering from given variable, Pearson Chi-square value=1.632, degree of freedom (df)=1, p value=0.201.

Table 10: Association of BMI estimate and metabolic syndrome.

Crosstab				
		Metabolic syndrome		Total
		0	1	
BMI estimate	0	6	6	12
	1	2	16	18
Total		8	22	30

*0=no. of patients not suffering from the given variable, 1=no. of patients suffering from given variable, Pearson Chi-square value=5.568, degree of freedom (df)=1, p value=0.018.

Out of 30 patients, 22 patients were diagnosed of metabolic syndrome, (n=14) were male and (n=8) were female, rest 8 patients were normal (female=3, male=5).

DISCUSSION

Several studies shows that at similar BMI and lower average waist circumference levels, body fat, abdominal adiposity, and cardiovascular risk factors are higher in South Asians compared to Caucasians.[25-27] A study has reported significantly high odds ratio (OR) for hypertension and hypertriglyceridemia even at a lower waist circumference range (70-80) in Indians.[28] While in present study out of 22 patients of metabolic syndrome, 8 patients had normal waist circumference and 14 patients had abnormal waist circumference (Table 5). Even in South Asian studies adults as well as children have shown that hyperglycemia, hypertension and hypertriglyceridemia occur at a lower levels of BMI and waist circumference.[28-30] This correlates well with the Y-Y hypothesis whereby the researches Yagnik and Yudkin were found to have a similar BMI of 22.3 kg/m^2, but the body fat percentages in the two differ widely at 21.2% in Yagnik and 9.1% in Yudkin.[31] In South Indian study, prevalence of metabolic syndrome was estimated to be 25.8%, 23.2% and 18.3% according to IDF, world health organization (WHO) and NCEP ATPIII criteria respectively.[32] While in present study very high occurrence of metabolic syndrome is seen, 73.33% according to NCEP ATPIII criteria and 70% according to IDF criteria.

According to the study carried out for 200 patients in 2004 in North Indian at a tertiary care hospital, the prevalence of metabolic syndrome was higher in women 62.92% as compared to men 37.08%. In reported study, the most common abnormality found was high waist circumference (seen in 91.01%), followed by low HDL-C (in 40.5%), an abnormal triglyceride level (in 32%) and abnormal FBS (in 34%). It was also found that the abnormal HDL-C was the most common abnormality in men and abnormal waist circumference was the most common abnormality in women.[33] Comparing it with present study the occurrence of metabolic syndrome was higher in males (n=14) compared to females (n=8). Also the most common abnormality in patients of metabolic syndrome, along with hypertension was high FBS (n=17) 77.27% followed by low HDL (n=15) 68.18%, and hypertriglyceridemia and waist circumference (n=14) 63.63% in both.

While in US adults, the prevalence of metabolic syndrome was found to be around 28% for men and 30% for women as shown by the National health and nutrition examination survey (NHANES) carried out by Ford et al. Also it was found that the low HDL-C was most common abnormal parameter in both male and female.[14]

In a study conducted in Chinese population, hypertension was linked to metabolic syndrome in women but not in men and also suggested the role of sympathetic activity in pathogenesis of hypertension in women may be more dependent on insulin resistance than in men.[34] In another recent study of 200 patients carried out in 2015 by Akholkar et al.[35] Prevalence of metabolic syndrome was 44.5% out of which a higher prevalence was found in women (62.92%) as compared to men (37.08%). Based on it, they also attributed that the fact that an abnormal waist circumference of 88 cm and low HDL-C of ≤50 gm% is achievable in females.

Energy dense imbalance foods (high calories, carbohydrates, saturated fats, and low fiber) are being consumed increasingly in the Indian subcontinent.[36] Overall, increasing carbohydrate and fat intake, along with decreased fiber intake is likely to contribute to obesity, the metabolic syndrome and type 2 diabetes mellitus (T2DM) in Asian Indians.[37] A study signifies the importance to identify the adults at risk for T2DM and CHD at an early age and use appropriate prevention strategies while pathological stages are still reversible.[38,39] In order to prevent metabolic syndrome, a multipronged approach is essential which includes behaviour modification, dietary modifications, increase in physical activities, prevention of smoking and alcohol excess. For this, population based community intervention programs are needed successfully to prevent metabolic syndrome.[40]

This is better explained by a non-pharmacological community based intervention study, reduction of fasting blood glucose levels and improved obesity measures of pre-diabetic and diabetic subjects from South India were seen with improvement of the dietary patterns.[41] For physicians treating individuals at high risk, aggressive life style modification will remain mainstay, until such individuals reach thresholds for drug therapy.[42] However, due to the time period of the study and also the study population being the newly diagnosed hypertensive patients visiting OPD of hospital lack of enough sample size was the limitation. Region based studies with larger sample size need to be conducted for the accurate results and early treatment to prevent the occurrence of metabolic syndrome in high risk hypertensive patients.

CONCLUSION

In the present study very high occurrence of metabolic syndrome 73.33% (N=22) out of 30 newly diagnosed hypertensive Gujarati patients visiting the OPD of G. K. general hospital, Bhuj. However, a study with larger sample size is needed to be conducted.

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