Prevalence of Metabolic Syndrome in a study group of the Urban Population.

* Eli Mohapatra, Archana Pattnaik

*Biochemistry Department, Community medicine, Hi Tech Medical College, Bhubaneshwar, Orissa, India

Summary

Objective. To determine the prevalence of the metabolic syndrome in a study group of the urban population. *Method*. Randomly selected adults >20 years were studied using stratified sampling. Target study sample was 300(150 males and 150 females). Metabolic syndrome was diagnosed using Adult Treatment Panel-III (ATP-III) guidelines when any three of the following were present: central obesity, raised triglycerides ≥ 150 mg/dl, low high-density lipoprotein (HDL) cholesterol, blood pressure $\geq 140/\geq 90$ mm Hg, and diabetes or fasting plasma glucose (FPG) ≥ 110 mg/dl. *Results*. Metabolic syndrome was present in 71 (23.7%) subjects (CI 95%:22%–25%, $P = .001$), prevalence was 23.1% in men and 24.4% in women (P: .4). The prevalence increased from 7.5% in the population younger than 30 y to 45.6% in ages more than 50 years. Low HDL was the most common metabolic abnormality in both sexes. Most of the people with metabolic syndrome had three components of the syndrome i.e. 76.4%, 23.6% had four and none had five components simultaneously in the study group. The prevalence of obesity (BMI≥ 30 kg/m2), hypercholesterolemia (≥ 200 mg/dl) and high LDL cholesterol (≥ 130 mg/dl) was greater in the metabolic syndrome group than normal subjects ($P = .00$). *Conclusions*. There is a high prevalence of metabolic syndrome in this study group of the urban population which might lead to cardiovascular accidents. People should be made more aware of cardiovascular prevention by adopting healthy life style.

Key words metabolic syndrome, Triglyceride, High density lipoprotein, Low density lipoprotein.

1. Introduction

Metabolic syndrome has come into focus as it is one of the important risk factor for cardiovascular diseases since 1988 [1].Due to different criteria for the definition of the syndrome, the prevalence of the metabolic syndrome varies markedly between different studies [2, 3]. Metabolic syndrome is quite common in the United States [4] and there are some reports about its rise in Asia too [5]. Although some studies have reported the prevalence of individual cardiovascular risk factors among Iranian population, a few of them reported from the central parts of Iran too i.e. on taking into consideration multiple risk factors in adult population [6, 7]. The aim of this study was to observe the prevalence of the metabolic syndrome in an urban population using the ATP-III guidelines.

2. Material and Methods

In this study the anthropometric parameters, nutritional status and cardiovascular risk factors was assessed. A stratified, multistage random sampling was used and a total of 300 subjects aged more than 20 years were included in the study. Subjects completed a questionnaire which included dietary habits, past medical history, smoking status, physical activity, and educational level.

The Waist circumferences were measured between the lowest rib and the iliac crest at the level of umbilicus.

Blood pressure was measured in sitting position with a sphygmomanometer. Systolic (Korotkoff phase I) and diastolic (Korotkoff phase V) blood pressure was measured twice on the right upper arm and the average was used for analysis. Average systolic blood pressure more than 140 mmHg or diastolic blood pressure more than 90 mmHg or current use of antihypertensive medications was taken as hypertensive cases.

Laboratory measurements of Plasma glucose was measured by the glucose-peroxidase colorimetric enzymatic method with a sensitivity of 5 mg/dl. Fasting plasma glucose (FPG) more than 110 mg/dl was defined abnormal in this study. Serum Cholesterol and Triglyceride of all the participants were measured after 10–12 hours of fasting , subjects with three or more of the following five risk factors of the criteria of the modified NCEP III were defined as having metabolic syndrome: (1) triglycerides $\geq$150mg/dl, (2) HDL cholesterol ‹40 mg/dl in male and ‹30 mg/dl in female, (3) systolic blood pressure $\geq$140 mmHg or diastolic blood pressure$\geq$90 mmHg, (4) fasting plasma glucose $\geq$110mg/dl and (5) Truncal obesity (waist circumference more than 102 cm in men and 88 cm in women). Subjects with a history of hyperlipidemia, hypertension, or diabetes were considered to have the risk factor, regardless of the biochemical or clinical values.

The data are presented as frequencies, percentages, and 95% confidence intervals. The prevalence of different abnormalities was compared using X_2 test. Logistic regression analysis was used to detect the value of variables such as body mass index (BMI) and hypercholesterolemia to predict the existence of metabolic syndrome. *P* value of ‹0.05was considered statistically significant.

3. Results

The prevalence of the metabolic syndrome in the study population was 23.7% (CI 95%:22% to 25%, p=.001). The prevalence of metabolic syndrome was the same in female and male (24.4%, CI 95%: 22%–26% versus 23.1 %, CI 95%: 21%–25%, resp.)(p = .4). There was a significant age-related increase in the prevalence of metabolic syndrome in both of the genders. Prevalence of metabolic syndrome increased from 7.5% within the 20–29-year-old group to 44.7% in people more than 60 years of age. The prevalence of individual components of the metabolic syndrome is reported in Table 1. In male and female, respectively, central obesity was in 16 (10.6%) and 62 (41.4%), hypertension in 34(22.6%) and 28 (19.8%), low HDL cholesterol in 94(63%) and 140 (93.3%), high triglycerides in 65(43%) and 57 (38.4%), and impaired fasting glucose or diabetes

in 27 (18.1%) and 29 (19.2%). Prevalence of other atherosclerosis risk factors in male and female, respectively, was diabetes in 7 (4.7%) and 8 (5.3%) and high total cholesterol ≥200 mg/dl in 46 (30.7%) and 59 (39.7%). Overweight (BMI: 25–29.9 kg/m^2) was detected in 54 (36.3%) and obesity (BMI 30≥ kg/m^2) was observed in 22 subjects (14.6%).

Table 1: Prevalence of individual abnormalities of the metabolic syndrome by age in urban population. Numbers in parentheses are percent. FPG; fasting plasma glucose, TG; triglyceride, HDL; high density lipoprotein, WC; waist circumference High TG: TG > 150 mg/dl, Low HDL: HDL < 30 in female and <40 mg/dl in male, High WC: WC ≥ 88 cm in female and ≥102 cm in male, High BP: BP ≥ 140/90 mmHg.

Age(years)	FPG≥110mg/dl	High TG	Low HDL	High WC	High BP
Men(n=150) 20-39	7(25.9)	8(12.3)	9(9.4)	2(16.6)	7(20)
40-59	8(29.6)	39(60)	57(60)	4(33.3)	12(34.2)
+60	12(44.4)	18(27.7)	29(30.5)	6(50)	16(45.7)
Total	27(18)	65(43.3)	95(63.3)	12(8)	35(23.30
Women(n=150) 20-39	6(20.7)	10(17.5)	14(10.1)	7(12.7)	6(18.7)
40-59	11(37.9)	16(28.1)	96(69.1)	12(21.8)	12(37.5)
+60	12(41.4)	31(54.4)	29(20.8)	36(65.4)	14(43.7)
Total	29(19.3)	57(38)	139(92.7)	55(36.6)	32(21.3)

Table 2: Comparison between subjects with metabolic syndrome and normal people for the mean value of atherosclerosis risk factors. BMI, body mass index; WC, Waist circumference; BP, Blood pressure; LDL, low density lipoprotein; HDL, high density lipoprotein.

Variables	Men(n:150) Normal* (n:20)	Metabolic syndrome (n:34)	P value	Women (n:150) Normal*(n:5)	Metabolic syndrome (n:36)	P value
BMI(kg/m^2)	21.3±2.5	25.2±3.2	0.00	22±4.1	27.5±4.2	0.00
WC(cm)	79.5±10.1	93.1±10	0.00	75.8±9.1	92.2±9.7	0.00
Systolic BP	110±8.4	140±21.9	0.00	106±9.6	138.2±22	0.00
Diastolic BP	72±0.8	86.2±12	0.00	72±7.5	88. ±11.2	0.00
LDL-C(mg/dl)	98.2±30.2	122.5±36.6	0.00	104±31	136±41	0.00
Cholesterol (mg/dl)	161±30	202±39	0.00	176±32.1	217±49	0.00
HDL-C(mg/dl)	43.4±4.2	33.2±3	0.00	53.2±5.2	37.2±4.6	0.00
Triglyceride (mg/dl)	89±28.7	259±140	0.00	82±30	246±135	0.00

*Normal people are those without any components of metabolic syndrome.

Low HDL-C was the most common metabolic abnormality in both sexes. Mean serum HDL-C was 36.9 ±5.3mg/dl in those with the metabolic syndrome and 46.7±6mg/dl in normal individuals without any risk factors (p ‹0.001). Except for hypertension and hypertriglyceridemia, all abnormalities were more common in female than in male (p:0.00). Most of those with metabolic syndrome had three components of the syndrome 76.4%, 24.4% had four components. No one had five components.

Table 2 shows the mean value of coronary risk factors in subjects with metabolic syndrome as compared to those without. BMI≥30□kg/m^2 as well as high total and LDL cholesterol, which are not part of the metabolic syndrome, are also more prevalent among men and women with this condition. Elevated LDL-C more than 130□mg/dl was found in 13.4% of normal men versus 44% of those with metabolic syndrome (p:0.00). In females high LDL-C was detected in 19.5% versus 58% in normal subjects and those with metabolic syndrome respectively (p:0.00).

Within the 20–29-year-old group of the general population, 13.2% had no abnormality (24% of males and 6% of females), while this figure dropped to 3.3% in people above 60 years of age (5.6% of males and 0.9% of females). Totally 13.4% of males and only 3.3% of females had no cardiovascular risk factor in the population.

4. Discussion

This study shows that according to ATP III criteria, 23.7% of the studied adult population has metabolic syndrome.The prevalence of Metabolic Syndrome is different in different places. The differences in the prevalence of Metabolic Syndrome might be due to varied definitions of the syndrome. For instance, Trevisan et al. [8] reported a prevalence of 3–3.5% in Italy on the basis of the presence of all five criteria. However, a wide variation in the prevalence can be observed even with using the same diagnostic criteria. For example, the frequency of Metabolic Syndrome in a sample of the Chinese population was recorded as 9.8% for male and 17.8% for female [9]. In a rural area of South Korea, Metabolic Syndrome was found to affect 29.4% of the adult population above 40 years of age [10], and similar values were established in Mexico, where 26.6% of the population studied exhibited the syndrome [11].

Though the prevalence of the metabolic syndrome in this study is higher than some previously reported from the USA, Italy, and Finland [4, 8, 10, 12],but it is close to that reported from Brazil [13], Indian urban population [14], and some reports from the US [15, 16]. High prevalence of MS also has been reported from Tehran (33%) and Isfahan, two main capital cities in the central part of Iran (24.2%) [6,7].

The cause for high prevalence of Metabolic Syndrome in this study is due to socioeconomic changes that have occurred in the population over the past years and the transition from a traditional to a western lifestyle has been associated with it along with stress. Only 10% of the study group population went for regular walking at least six times per week. Physical inactivity has been one of the important reasons for this syndrome. Based on questionnaire for physical activity only 11% have severe physical activity at least four times per week and 30% have moderate physical activity at least two times per week. Although high-fat, high-carbohydrate diet; and the sedentary lifestyle have been marked as an important aspect, but the role of genetic

factors cannot be ruled out. Female generally have less physical activity hence, overweight and obesity are common among them (17), and we did not find a significant difference between men and women for the prevalence of Metabolic Syndrome. Ford and coworkers [4] also observed little overall difference between male and female (24% versus 23.4%, resp.); however, among African-Americans and Mexican-Americans the disorder was more common in female. In this study, the greatest difference observed between the two sexes was the prevalence of abdominal obesity (9% in male versus 36.6% in female).

In our study the single most common abnormality was low HDL-C (overall 73%), which is more than what had previously been reported from USA [18], Turkey [19], Italy [20], Canada [21], and UK [22]. A high prevalence of low HDL-C has been reported previously in Iranian population [23, 24] and is very close to that was reported from Turkish [25]. This could not only be attributed to environmental factors but may also be due to genetic predispositions. Previous family and twin studies [26–28] have suggested that genetic polymorphism accounts for 40–60% of the inter individual variation in plasma HDL-C level. Surprisingly, low HDL-C was more prevalent in females in our study.

A positive effect of age on the prevalence of the syndrome in both sexes was detected in this study and resulted in 45.5% of Metabolic Syndrome in subjects more than 50 years. This effect has been reported in other studies [4]. Age-related increases in insulin resistance have been shown in young, middle-aged, and elderly healthy normal-weight adults [29], and an age-related difference in the degree of clustering of risk variables [30] has been reported too.

Hence the present study shows that Metabolic Syndrome is a serious threat for the younger generation and prevalent in the older individuals. The prevention and treatment of this condition is of major public concern and immediate steps should be taken for creating general awareness regarding healthy food habit and changes in the lifestyle by adopting daily exercise, yoga and spiritualism which has to be strictly followed to have better and brighter future.

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