Original Article

A study to compare the metabolic health (anthropologic and biochemical) between Scheduled Tribe and non-Scheduled Tribe population in underdeveloped parts in the District of Birbhum, West Bengal : A population based observational study

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Metabolic disorders are common in India. There is paucity of data regarding metabolic health from the socio-economically backward population. This population based cross-sectional observational study was designed to assess the metabolic health related parameters in tribal population (STs) from a rural area in the district of Birbhum, West Bengal, India and compare them with non-tribal population (non-STs) from the same area. Various anthropometric parameters like height, weight, BMI, and waist circumference were recorded. Biochemical parameters like fasting plasma glucose, HbA1c, HOMA-IR, lipid profile, liver enzymes, uric acid, thyroid function test, calcium, phosphorus, 25 OH vitamin D, and iPTH were measured. Anthropologic and biochemical parameters were compared between STs and non-STs. Prevalence of obesity, diabetes, dyslipidemia and metabolic syndrome was significantly lower, whereas 25 OH vitamin D level was higher in Scheduled tribes comparison to non-Scheduled tribes.

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Key words **: Scheduled tribe, Metabolic health.**

Indians are predisposed to diabetes mellitus and other metabolic morbidities[1]. Prevalence of Metabolic Syndrome (MetS) in Asian Indians varies according to region, lifestyle patterns and other socioeconomic or cultural factors. Community based health studies are immensely important in understanding the metabolic disorders and associated cardiovascular risk factors. A high proportion of people in India including West Bengal belong to underdeveloped community. Though metabolic morbidities are very common across the country, no data regarding the metabolic health parameters of tribal and other backward populations from poorly developed areas are available from any large-scale study. This study aims to estimate the prevalence of obesity, insulin resistance, diabetes, hypertension, elevated liver enzyme, hyperuricemia, vitamin D deficiency, and thyroid dysfunction in a tribal population from the district of Birbhum in West Bengal as well as to compare those parameters with non-tribal population from the same area.

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Materials and Methods

Population :

We undertook a population based observational study for assessing the metabolic health (anthropologic and biochemical) of Scheduled Tribe (ST) population [Article 366 (25) and Article 342 of Constitution of India] and non-Scheduled Tribe population in underdeveloped rural areas in the District of Birbhum, West Bengal, India.

An awareness program was conducted in the selected areas by doing sensitization camp at every 2-3 months. This has been done with the help of Rural Extension Centre, Viswa Bharati, Birbhum, India. Then a simple questionnaire was administered for assessing the awareness about metabolic health especially those related to diabetes and other metabolic problems. A composite scoring was done for overall analysis of awareness. The persons were explained about the study and only those who gave informed written consent had been included in the final study.

All adult males and females giving consent and having no definite documented chronic infective or inflammatory illness was included for the study. Smoking history, simple

anthropometric data like height, weight, waist circumference were obtained according to the standard procedure of measurement. We started awareness program in the selected areas by doing sensitization camp at every 2-3 months. This has been done with the help of Rural Extension Centre, Viswa Bharati. Then a simple questionnaire was administered for assessing the awareness about metabolic health especially those related to diabetes and thyroid problems. A composite scoring was done for overall analysis of awareness. The persons were explained about the study and only those who gave informed written consent had been included in the final study. Continued consecutive samples were collected from ST population from areas with high density of tribal population under the coverage of Rural Extension Centre, Viswa Bharati. Non-tribal population (non-ST) from the same or neighborhood areas were also selected. Thus 406 individuals including all ethnicity/caste were included in the study to make an appropriate representation of rural West Bengal. The sample size was chosen on the basis of available resources.

Height (to ±0.1 cm) was measured using a wall-mounted stadiometer. The subject stood straight, with feet placed together and flat on the ground, heels, buttocks and scapulae against the vertical backboard, and arms loose and relaxed with the palms facing medially. The head was carefully positioned in the Frankfurt plane, with the lower margins of the orbit in the same horizontal plane as the upper margin of the external auditory meatus. Body weight (to ± 0.1kg) was measured using an electronic calibrated scale. BMI was calculated as weight in kilograms divided by the square of height in meters (kg/m^2).

Blood sample for biochemical tests e.g. fasting plasma glucose (FPG), HbA1c, Fasting Serum insulin, Creatinine, Lipid profile, Uric acid, ALT, AST, Alkaline phosphatase (ALP) Free T4, TSH, Anti TPO antibody, Calcium, Phosphate, intact parathyroid hormone (iPTH), and 25 hydroxy Vitamin D (25OH D) was collected. The samples were analyzed using standard laboratory procedure. Diabetes was defined as per standard diagnostic criteria[2] satisfying either Fasting plasma glucose or HbA1c (Single measurement).The presence of metabolic syndrome was ascertained using the International Diabetic Federation (IDF) criteria[3].

Clearance from the Institutional Ethics Committee was obtained. The statistical analyses were performed with SPSS Statistics for Mackintosh, Version 21.0. Armonk, NY: IBM Corp. Chi-squared test was used to compare the categorical data and unpaired Student T test was used to compare the continuous variables.

Results

Four hundred fifty persons were screened. Complete data were available 406 individuals. Among them, 206 were STs and 200 belonged to the other casts.

Mean age was not significantly different between the groups. Male : female ratio was similar in both the groups (Table 1).

Both systolic and diastolic BP were similar in STs than non-STs. Among auxologic parameters, mean BMI was significantly lower in STs in comparison to non-STs. The waist circumferencewas also significantly lower in STs in comparison to non-STs (Table 1). When BMI of ≥25 was used to define obesity, 15% of STs and 36% of non-STs were found to be obese. When obesity and overweight were considered together (BMI ≥23), 28% of STs and 53% of non-STs were found to be in this category. These differences were also statistically significant. Using waist circumference criteria for obesity (Male ≥90 cm, Female ≥80 cm), 10% of ST males and 6% of ST females were found to be obese, whereas 33% of non-ST males and 63% of non-ST females were obese. As per IDF criteria, overall the prevalence of metabolic syndrome (MetS) was 22%. However, 34% of the non-tribes qualified for MetS as compared to only 8.5 % of the tribal cohort, p<0.001.

Overall prevalence of diabetes (known plus newly detected) was 8.3%. However, the prevalence was significantly lower in STs in comparison to non-STs (3.4% *versus* 15.2%). Both HbA1c and FPG were significantly lower in STs. HOMA-IR, a marker of insulin resistance was also lower in STs. Total cholesterol, LDL cholesterol, and triglyceride were significantly lower in STs. There was no significant difference in HDL cholesterol among the groups. ALT, AST, ALP and creatinine were similar in both the groups. Uric acid level was lower in STs (Table 2).

Mean 25OH D level was significantly higher in STs. However, calcium and iPTH levels were similar in both the groups.TSH and free T4 levels were also found to be similar among the groups.

Discussion

This study compared the metabolic and other related parameters between the STs and non-STs in the district of Birbhum, West Bengal, India. Birbhum district includes significant proportion of underdeveloped areas. A significant proportion of the population comprises of scheduled tribes (6.9%)[4]. We found that overall prevalence of MetS was significantly lower in STs in comparison to non-STs. This can be attributed by less consumption of processed food and more active lifestyle of the tribals[5]. Prevalence of obesity, as measured by BMI and waist circumference were significantly lower in STs. FPG, A1c, and insulin resistance as measured by HOMA were also significantly lower in STs possibly due to the same reason. Prevalence of diabetes is lower in STs. Dyslipidemia was

Table 1 — *Clinical parameters in ST and non-STs*

	ST	Non-ST	p
Age [Mean(SD)], Year	41.7(10.2)	42.6	0.126
Male : Female	0.65	0.79	0.385
BMI [Mean(SD)], kg/m^2	21.1(3.6)	23.6(4.0)	<0.001
Waist Circumference [Mean(SD)], cm	72.8(10.2)	81.3(12.0)	<0.001
SBP [Mean(SD)], mmHg	123.9(130)	125(11.8)	0.401
DBP [Mean(SD)], mmHg	79.8(7.1)	80.5(6.0)	0.35

Table 2 — *Biochemical parameters in In STs and non-STs*

	ST [Mean(SD)]	Non-ST [Mean(SD)]	p
FPG, mg/dL	103(25)	118(45)	<0.001
HbA1c, %	5.5(0.8)	5.9(1.4)	0.001
Total Cholesterol, mg/dL	165(36)	187(40)	<0.001
LDL Cholesterol, mg/dL	96(36)	117(30)	<0.001
HDL Cholesterol, mg/dL	47(12)	45(11)	0.147
Triglycerides, mg/dL	107(48)	143(73)	<0.001
Creatinine, mg/dL	0.92(0.68)	0.88(0.87)	0.427
Uric Acid, mg/dL	4.1(1.2)	4.4(1.3)	0.032
HOMA-IR	2.3(2.1)	3.2(1.9)	<0.001
ALT, mg/dL	45(22)	50(27)	0.058
AST, mg/dL	39(26)	31(17)	0.001
ALP, mg/dL	105(45)	108(28)	0.491
Calcium, mg/dL	9.7((0.6)	9.4(0.5)	0.56
Phosphorus, mg/dL	3.3(0.6)	3.2(0.5)	0.761
Vitamin D, ng/ml	20.8(8.1)	17.3(7.2)	<0.001
iPTH, pg/ml	64.6(50.6)	58.4(30.6)	0.170
FreeT4, ng/dl	1.06(0.2)	1.06(0.2)	0.991
TSH, mcg/ml	3.4(0.9)	5.2(0.9)	0.394

also lower in STs (lower Total and LDL cholesterol), although HDL level was similar. Uric acid, another marker of metabolic syndrome, was also lower in STs. Liver enzymes were similar in both the groups. Interestingly, vitamin D level was significantly higher in STs. This could be explained by more outdoor activities of tribal population. Higher vitamin D level in outdoor workers was also observed in northern part of India[6]. Yet unknown genetic polymorphism of vitamin D binding protein may also explain the difference[7,8]. However, other markers of bone metabolism like calcium, phosphorus, iPTH were similar in both the groups. There was no significant difference of TSH and Free T4 levels between STs and Non-STs.

Conclusion :

In the rural areas of district of Birbhum, prevalence of obesity, diabetes, dyslipidemia and metabolic syndrome was significantly lower in Scheduled tribes in comparison to non-Scheduled tribes.25 OH D level was significantly higher in tribal population.

Conflict of Interest : None

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