Section A-Research paper
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Prevalence of cardiovascular risk factors and intergroup Atherogenic Index among tribal and non-tribal population of Udaipur region

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Abstract*:*

Objectives: In Southern Rajasthan in Udaipur region, both tribal and non-tribal individuals were examined for their distribution of hypertension, type 2 diabetes, dyslipidemia, and obesity characteristics.

Methods: From 220 participants (Tribal -78, Non- tribal-122) of both sexes older than 18 years, information on somatometric measures, blood pressure, lipid profile, and fasting blood glucose was gathered. To explore the variations in prevalence between populations, two-way ANOVA and chi square analysis were used.

Results: We found that the tribal population differed in their distribution of obesity-related factors, hypertension, type 2 diabetes, and dyslipidemia. They were less prone to Obesity, hyper tension, Diabetes and dyslipidemia than non- tribals with less physical activity and lifestyle different from tribal population. ANOVA test results showed that Atherogenic index was highly significant with Group 1 (Tribal males), Group 2 (Tribal Females), Group 3 (Non-Tribal Males) and Group 4 (Non- tribal females). The prevalence of Obesity, Diabetes Mellitus and dyslipidemia in the study was more prevalent in Non-tribals (74%, 9 %, 72%) as compared to Tribals (4.5%, 1%, 10%),

Conclusions: In order to design population-specific health initiatives, population-specific prevalence studies must be carried out, particularly in nations like India with great diversity.

Key words: *Atherogenic index, tribal population, Non- tribal Udaipur region,*

INTRODUCTION:

According to Joshi *et al*. (2014) (1), cardiovascular diseases (CVD) are the main cause of death worldwide, particularly in low- and middle-income nations. The risk of developing long-term vascular problems from type 2 diabetes (T2D) is raised by both obesity and hypertension (HTN). According to certain research (Joshi *et al*., 2014, Anjana R *et al* 2017) (1, 2), dyslipidemia is closely linked to HTN, obesity, and T2D. (Geldsetzer *et al*., 2018) (3) The trend of rising cardiovascular risk factors among Indian populations has been attributed to urbanisation and higher standards of living. According to Fernando, Razak, Lear, and Anand (2015)(4) , Asian Indians are predisposed to developing cardiovascular disease (CVD) when exposed to surroundings with a high risk of developing it.

It's critical to comprehend the varied distribution of cardiovascular risk factors because India is a heterogeneous nation in terms of its ethnic makeup, geography, and ecological makeup. According to the National Family Health Survey-4 fact sheets (NFHS-4, 2016), high body mass index (BMI) was reported to be generally prevalent at about 29% in urban and 15% in rural communities, high fasting blood glucose (FBG) was reported to be approximately 12% in urban and 9% in rural communities, and HTN was also reported to be approximately 12% in urban and 10% in rural areas of India. Therefore, the current study was carried out to comprehend the prevalence of HTN, obesity, T2D, and dyslipidemia in Tribal and non-tribal population of Udaipur region.

MATERIAL AND METHODS:

In Udaipur district of Rajasthan, a cross-sectional study was conducted. In total, 220 individuals of both sexes, between the ages of 20 and 60, were enlisted. The study was approved by Ethics committee of Pacific Institute of Medical Sciences.

Name, age, and sex-related information that relates to personal identification was gathered. The anthropometric rod, weight scale, and stainless steel measuring tape were used to measure the somatometric variables (height, weight, waist circumference, and hip circumference) while the subjects were standing and wearing only the barest minimum of clothing in accordance with the established protocols (ISAK, Marfell-Jones, Stewart, and De Ridder, 2012) (5). Each participant had their blood pressure checked three times using a mercury sphygmomanometer during intervals of at least five minutes, according to Frese, Fick, and Sadowsky (2011) (6), with the average of the three readings serving as the final measurement. Blood sample was collected and tested for plasma glucose levels and lipid profile. The parameters used to classify the Asia Pacific population included BMI, waist circumference (WC), waist-to-hip ratio (WHR) (WHO, 2011), and waist-to-height ratio (WHtR) (Peng, Li, Wang, Bo, & Chen, 2015) (7). The World Health Organisation standard guidelines (WHO, 2006) (8) were utilised for glycemic status classification, the AHA/ACC 2017 (9) classification for HTN (Whelton *et al*., 2018) (10), the NCEP ATP III guidelines for dyslipidemia (Joshi *et al*., 2014) (1), and the WHO, 2006 (8), standard guidelines for glycemic status classification.

An important metric that can be used independently to estimate cardiac risk is the atherogenic index. It is defined as the logarithm (Log) of the plasma TG to HDL-C ratio and is highly connected with the risk of developing coronary artery disease (CAD). The AI was calculated to estimate the cardiac risk. The values were interpreted as- Low - <0.11, Intermediate- 0.11-0.24, High- >0.24. The one way ANOVA test was performed to see the significance of AI in all the 4 groups.

Shapiro-Wilk test was used to evaluate the general characteristics for normalcy. The continuous variable mean values were compared using ANOVA, and the categorical variable comparisons were made using the chi-square (2) test. The results were analysed using Microsoft Excel. P-values of 0.05 were used to determine statistical significance for all of the tests.

RESULTS

In Table 1, mean values for the continuous variables for the four population groups are displayed. Since higher ages have a significant impact on cardiovascular risk factors, the variables were taken from individuals with more than 20 years old. The mean ages of the groups of individuals were comparable for both genders. The mean age was 48 years in tribal and Non- tribal males whereas in females of tribal were 42.7 years and nontribal females were 44.2 years. The BMI of tribals were less as compared to non-tribals which were obese. Non- tribals females had maximum BMI when compared to other groups. Blood pressure was found in normal range but

little raised in Non- tribal females. Blood glucose was highest in Non-tribal males. If we atherogenic index the levels were highest in Non- tribal males compared to tribals and female tribals. (Table 1)

Atherogenic Index was found to be higher in Non- tribal population than tribal. The values were 0.25 and in intermediate range (0.11-0.24) in Tribal population which raised to 0.54 in non- tribal populations and is in higher range. The ANOVA test revealed that F statistics values were more than F critical value hence the test is significant. (Table 2 &3)

Table 1: Different parameters in Tribal and Non- tribal male and female population

Variables	Tribal Males (N=55)	Tribal Females (N=55)	Total (N=110)	Non-Tribal Males (N=55)	Non-Tribal Females (N=55)	Total (N=110)
Age (years)	48.00	42.7	46.33	48.58	44.12	46.35
Weight (Kg)	62.54	57.00	59.77	84.78	80.56	82.67
Height (cm)	159.0	152.00	155.50	150.00	145.04	147.52
BMI (Kg/M2)	24.70	24.7	24.9	37.70	38.3	38.00
WC (cm)	89.4 cm	78.4 cm	83.9	95.45	93.09	94.27
WHR (cm)	0.97	0.77	0.87	0.89	0.76	0.82
WHtR (cm)	0.50	0.60	0.55	0.65	0.67	0.66
SBP	117.12	119.56	118.78	125.75	126.43	125.87
DBP	80.32	78.98	79.43	86.33	85.46	85.22
Glucose	90.12	87.45	100.67	122.23	126.87	128.45
TC	190	141.6	163.05	176.38	179.00	176.38
TG	164.9	101.25	133.2	155.47	152.06	155.47
HDL-C	41.6	7	39.12	41.15	41.89	41.15
LDL-C	115.6	88.24	99.20	104.23	106.11	104.23
VLDL-C	32.98	20.22	2.55	30.98	30.23	30.98
AI	0.28	0.22	0.25	0.54	0.53	0.54

SUMMARY

Groups	Count	Sum	Average	Variance
Column 1	55	22.85	0.415455	0.049585
Column 2	55	20.85	0.379091	0.021912
Column 3	55	30.67	0.557636	0.097189
Column 4	55	24.05	0.437273	0.04725

Table 2 ANOVA table.

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.986769	3	0.328923	6.092995	0.000535	2.646398
Within Groups	11.6605	216	0.053984			
Total	12.64727	219				

SS — Sum of Squares , quantifies the variability between or within groups.

df — Degree of freedom (within Groups) = Number fo groups

-1

MS Mean Square means average variation between groups and within groups

F F statistics MS (between groups)/MS (within groups)

F statistics > F critical value Test is significant

Table 3: Showing prevalence of Obesity, Diabetes mellitus and Dislipidemia in tribal and non-tribal population.

Parameters	Percentage of participants					
	Tribal Males	Tribal Females	Total Tribals	Non-Tribal Males	Non-Tribal Females	Total Tribals
Obesity	3 %	1.5 %	4.5%	44%	30%	74%
DM	0.8 %	0.2%	1%	4 %	5%	9 %
Dislipidemia	7 %	3%	10 %	55 %	17%	72 %

In each of the four groups (Tribal males, Tribal Females, Non-tribal males and Non- tribal females) Tribal males were taller and heavier than tribal and Non- tribal women. Only two of the factors taken into account, triglyceride (TG) and very-low-density lipoprotein (VLDL) levels, revealed a significant sex difference in the populations under study, with males having higher levels than females in both groups. The distribution of obesity-related factors, HTN, T2D, and dyslipidemia among the population groups found to have considerably higher levels of WC, WHR and WHtR (obesity), dyslipidemia, and BMI (obesity) in non- tribal population than tribal population, whereas non-tribals had significantly higher levels of T2D, also had significantly higher levels of BMI (overweight), WHtR (overweight), and HTN (I and II). In all demographic groups, there were noticeable sex differences in WC, WHR, WHtR, and high-density lipoproteins (HDL), all of which were shown to be higher in females than in males. A one way ANOVA was performed to compare the effect of Atherogenic Index and Groups included Tribal Males and females, and Non tribal Males and females. The results revealed that there was statistically significant differences in Atherogenic index (AI) and Group 1 (Tribal Males) Group 2 (Tribal Females), Group 3 (Non- Tribal males) and Group 4 (Non –Tribal females).

If we see prevalence of Obesity, Diabetes Mellitus and dyslipidemia in the study group the results are described in Table 3 which shows Obesity was more prevalent in Non-tribals as compared to Tribals, further subdivided into 3 % tribal males, 1.5 % tribal females, 44 % non-tribal males and 30 % Non-tribal females. Diabetes mellitus was prevalent in 0.8 % (Tribal Males), 0.2% (Tribal Females) 4 % (Non- tribal males) and 5 % (Non- tribal females). The Dislipidemia was found in 7 % (Tribal males), 3 % (Tribal females), 55% (non- tribal males), 17 % (Non- Tribal females).

DISCUSSION:

In tribal and Non-tribal populations of Udaipur region under study showed distinct distributions of obesity-related factors, HTN, T2D, and dyslipidemia. The Non-tribals had the highest rates of overall HTN (HTN I—45.2% and HTN II—45.1%), T2D (32.80%) and overall general obesity (67.7%), they had the highest rates of dyslipidemia (76.7%) and central obesity (WC - 65.3%; WHR—92.3%; total WHtR—80.4%). The tribals had marginally higher stature and weight may be to blame for such disparate distributions of the factors taken into account among the studied population.

The observed prevalence of central obesity (WC, WHR, and WHtR ranges between 31.3% and 92.3%) and overall general obesity (BMI ranges from 54.9% to 67.7%) in the study population groups it is significantly higher in Non- tribals than that estimated by NFHS-4 (2015-2016)(9) for

the entirety of India (1.5% – 45.6%) (NFSH-4, 2016) (11). According to Gerlsetzer *et al*. (2018) (3), 26.4% of Indians aged 15 and over had HTN (systolic 140 mmHg and/or diastolic 90 mmHg) across 29 states. The prevalence of pre-HTN was reported to be 51% (Sathish Kumar, Singh, & Asem, 2015) (12), which is still higher than what is currently reported. HTN and pre-HTN prevalences among the Bhils, Mina tribal group in Rajasthan, were reported to be 19.4% and 28.5%, respectively, by Mishra, Naorem, and Saraswathy (2018) (13). The general prevalence of diabetes in the northeastern area of India varies in different states, according to the most recent ICMR-INDIAB reports (Anjana *et al*., 2017) (2). The prevalence of T2D among the Tribal in the current study (4.9%) is higher than the reported prevalence. According to Joshi *et al*. (2014) (1), dyslipidimia prevalence in India ranged from 76.9% to 82.9%, which was larger than the range discovered in the current study (47.9% - 76.7%).

The current findings demonstrate a different distribution of obesity variables, HTN, T2D, and dyslipidemia among the study populations, which suggests that in nations like India with a high degree of diversity, community or population-specific studies should be encouraged to create population-specific health policies. The results of the current study also show that the tribal community due to more physical work activities has a less problem of HTN, T2D, and general obesity, whereas the Non- tribal having life style with less physical activities, more fast food culture and target oriented activities have a serious health concern for central obesity and dyslipidemia.

Atherogenic Index is a critical index that can be used as a standalone index for Cardiac risk estimation. It is defined as logarithm (Log) of the ratio of plasma concentration of TG to HDL- C and is strongly correlated to CAD risks. The AI was calculated for the estimation of cardiac risk it was further calculated using ANOVA test. The groups were Tribal Males, Tribal females, Non-tribal Males, and Non- Tribal females. The result was statistically significant. Prevalence of dyslipidemia in India has been reported to range from 76.9 % to 82.9% (Joshi *et al* 2014) which was higher than the range found in the present study (72 % in Non- Tribals and 10 % in Tribals).

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DECLARATIONS
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