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Original Article

General obesity and Cardiovascular diseases among Gaur Brahmin population of NCR/Delhi

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ABSTRACT

Aims: Cardiovascular diseases are one of the leading causes of mortality and morbidity among human beings. The presence of endemic Cardiovascular diseases and their risk factors differ from population to population. The Cardiovascular diseases associated risk factors are sub-categorised into two forms, one is traditional and the other is non-traditional risk factors. The present study shows the prevalence of both risk factors and its association with Cardiovascular diseases, especially with reference to general obesity.
Materials and methods: The present study includes a total of 506 Gaur Brahmins residing in Delhi and National Capital Region India. Household survey was conducted and data were collected by using pre-tested interview schedule. Somatometric measurements were taken following the international standard techniques. Approx 5 ml blood was collected from each individual unrelated up to the first cousion. The serum was used to analyse the lipid profiles and fasting glucose level. All necessary statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) and MS Excel. The ethical clearance was obtained from the Ethical Committee of the Department of Anthropology, University of Delhi, Delhi.
Results and conclusion: The mean value of Somatometric variables such as Body Mass Index, Waist circumference and Waist-hip ratio and physiological variables DBP and SBP (diastolic blood pressure and systolic blood pressure) were found to be higher than their respective ranges in the studied population. General obesity, though found to be less common in this population as compared to abdominal obesity, but it is found to be contributing to dyslipidemia.
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1. Introduction

Cardiovascular diseases (CVD) are considered as the leading cause of death worldwide, affecting the circulatory system. The growing evidence of an increase in mortality and morbidity as 80% CVD related deaths being reported from low and middle income countries like India and Nearly half of these deaths are likely to occur among individuals with younger age (30 years) [1]. The presence of Cardiovascular diseases and its risk factors vary from population to population. In a country like India, where the genetic diversity is reported to be next to Africa and also diversifications at various levels like religion, caste, language, geography, etc. which tend to make the situation more complex [2]. In developed countries, the burden of cardiovascular disease enhanced over several decades due to a long period of epidemiological transition, whereas in the developing countries, the emergence of cardiovascular disease during the last 3 to 4 decades has been a very concerning challenge for the governments. The estimated increased ratio (76%) for cardiovascular disease incidence by 2030, compared with 1970 that is 36%, while in comparison with the developed countries, the developing nation has higher (82.4%) chance of cardiovascular disease incidence in 2030 than 1970 [3,4]. In India, the rapid pace of economy as well as epidemiological transition are leading cause of cardiovascular disease and are very important risk factors for death among people. The Cardiovascular diseases and its associated risk factors are recently being categorised into traditional and nontraditional risk factors [5].Traditional risk factors include age, sex, obesity, dyslipidemia, hypertension, etc., whereas nontraditional risk factors like metabolic syndrome, Non HDL-C, hypertriglyceride waist which are considered basically as the derivatives of the traditional risk factors. In Indian context, the extent of these risk factors is being reported mostly on the basis of geographical region

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like Chandigarh, Jharkhand, Maharashtra and Tamil Nadu [6]. However, such data needs to be dealt with caution because of the strict practice of endogamy of a population group of a single geographical region along with deeply embedded cultural milieu. In view of this, the present study attempts to document some of the traditional and nontraditional risk factors associated with Cardiovascular diseases among Gaur Brahmin Population. The strength of the study is that the population is having a common gene pool and also is exposed to almost similar environment as a participant from Delhi capital city of India and surrounding regions. The identification of dyslipidemia in Indian populations has a unique pattern with lower HDL cholesterol, increased triglyceride levels and higher proportion of LDL cholesterol. In India, there was no large scale study conducted on dyslipidemia to solve the problem related to Cardiovascular diseases [6]. Such endeavour is likely to promote country or community specific health strategies to combat or tackle the rising burden of complex diseases. The present study is one such attempt, where both traditional and nontraditional risk factors of cardiovascular diseases are reported in a specific vegetarian population from north India both in terms of Somatometric and biochemical variables. Further, the study also attempts to understand the association between general obesity and dyslipidemia among the Gaur Brahmin population.

2. Material and methods

The present study is focused on the Gaur Brahmins, especially residing in Delhi and NCR, India. Gaur Brahmins are considered as culturally and philosophically a highest caste group in the Indian caste system [7]. The present study is a cross-sectional study investigating the role of obesity as an exposure for describing the propensity of risk factors for cardiovascular diseases. The sample size was calculated using the formula given by Kish in1965 [8]. The calculated sample size of the present study came out to be 333 samples and it was found to be 526 including 20% of the dropout rate. However, the present study includes a total of 506 individuals having the complete information about all the variables. The individuals are recruited using a strict criteria of excluding the related individual upto first cousion as the study is a part of a major project which involves genetic markers. The present study was conducted in different areas of Delhi and National capital region. Household survey was conducted and data pertaining to personal identification, ethnicity, life style and food habits etc. were collected by using pre-tested interview schedule. Somatometric measurements like height, weight, Waist and Hip Circumferences were measured using standard techniques. Approximately 5 ml intravenous blood sample was collected from all individuals after an overnight fasting of approximately 12 h. The serum was used to analyse the lipid variables like Triglycerides, Total Cholesterol, High density lipoprotein. The other derivative lipid variables like Low density lipoprotein, Very low density lipoprotein were calculated by using appropriate methods. The interview schedules and blood sample from all the participants were only taken after a prior informed written consent. The ethical clearance was obtained from the Ethical Committee of the Department of Anthropology, University of Delhi. The presently generated data are found to be normally distributed and hence central tendency mean is used for all types of analysis. All the statistical analyses were done using Statistical Package for Social Sciences (SPSS) and MS Excel.

3. Results

The somatometric and physiological variables of all the individuals were analysed. The mean value of Somatometric variables (BMI, WC and WHR) and physiological variables (DBP and SBP) were found to be higher than their respective ranges in the studied population, whereas all the lipid variables and fasting glucose were found to be in their respective ranges. After analyzing the data on the basis of the sex differences, the mean value of WC, WHR, SBP, DBP and also fasting glucose were found to be higher among males, whereas BMI and HDL were found to be higher in females. However, all these observed differences between males and females were found to be statistically non-significant excepting for fasting glucose and HDL. (Table 1).

The smoking status of all the individuals was analysed and approximately 27% of the Individuals were found to be smokers. Alcohol consumption seems to be very less in this population (10.07%). The distribution of individuals with various abnormal variables were considered and 60% of the studied population were found to be falling under the general obesitc category in the form of overweight and obesity and only 10% are found to be in the underweight category. Abdominal obesity (WC– 76.48%; WHR-78.28%) was found to be quite common in this population. Both general obesity (overweight and obese) and abdominal obesity (WC and WHR) were found to be more frequent among females as compared to that of males. However, the observed difference between males and females were found to be statistically significant only in case of abdominal obesity. Further, the number of males with hypertension (44.74%) was found to be higher as compared to females (36.93%). Hyperglycemie Males were found to be significantly higher as compared to females, whereas low HDL was also found to be significantly higher among females as compared to males. Regarding the non-traditional risk factors, a substantial frequency of non HDLC (39.32%), metabolic syndrome (46.24%) and hypertriglyceridemie waist (28.06%) were observed, whereas Non HDLC were found to be higher in males (42.46%) than females (36.93%) and Hypertriglyceremic waist were higher among females (31.01%) as compared to males (24.20%). However, the observed difference between males (17.80%) and females (67.94%) were statistically significant in case of only metabolic syndrome (Table 2).

To understand the relationship between obesity and dyslipidemia in the studied population, Obese individuals, in terms of general obesity (BMI) and abdominal obesity (WC and WHR), were considered. Individual with abnormal lipid were found to be significantly higher in the obese category with respect to general obesity, whereas normal individuals (no lipid abnormalities) were also found to be significantly higher in the obese category with respect to general obesity. Individual with abnormal lipid parameters was found to be higher in both abdominal obesity (High WC and high WHR) but statistically non-significant. There is a very interesting outcome is that the abnormal lipids were found to pose a significant 2.61-fold increase risk for general obesity (Table 3).

The Individual effect of hypercholesterolemia, hypertriglyceridemia, high LDL and low HDL were non-significantly found to be posing a risk for general obesity in studied population. However, the combination of two and more than two lipid variables like TC + TG, TG + HDL, TC + HDL and TC + TG + HDL were found to be posing a significant 4.13, 2.95, 3.83 and 3.83 fold increased risk for obesity (Table 4).

4. Discussion

The presence of higher mean values of general and abdominal obesity as compared to their respective normal range is an indication towards the population becoming more prone to adverse cardiovascular outcomes in the future via obesity. There are several previous studies that show the relationship between obesity and cardiovascular diseases [9–14]. General obesity is found to be less frequent as compared to that of abdominal obesity in presently

Table 1
Showing the distribution of Anthropometric (Somatometric) and biochemical parameters among Gaur Brahmins of NCR/Delhi (N = 506).

Parameters	Normal range	Total	Male	Female	T test P value
		Mean ± SD	Mean ± SD	Mean ± SD	
BMI (kg/m^2)	18.5–22.9	23.95 ± 4.99	23.81 ± 5.244	25.10 ± 11.03	0.140
WC (cms)	M < 90; F < 80	92.17 ± 10.50	92.47 ± 11.10	92.14 ± 10.35	0.741
WHR	M ≤ 0.9; F ≤ 0.8	0.93 ± 0.15	0.952 ± 0.177	0.928 ± 0.157	0.120
BP systolic (mmHg)	<120	129.78 ± 17.78	131.31 ± 19.06	128.79 ± 17.08	0.118
BP diastolic (mm Hg)	<80	84.95 ± 11	85.68 ± 11.48	84.43 ± 10.65	0.224
Fasting blood glucose (mg/dl)	80–110	101.83 ± 39.99	109.26 ± 45.86	97.73 ± 31.87	0.002
Total cholesterol (mg/dl)	100–200	179.95 ± 51.50	180.33 ± 52.59	179.69 ± 53.29	0.866
Triglycerides (mg/dl)	50–150	140.33 ± 78.93	142.88 ± 72.84	140.50 ± 84.75	0.696
HDL (mg/dl)	>35	53.19 ± 18.49	50.81 ± 15.19	55.58 ± 22.13	0.012
LDL (mg/dl)	up to 130	102.16 ± 44.42	103.81 ± 47.21	99.17 ± 44.59	0.287
VLDL (mg/dl)	10–30	28.12 ± 15.72	28.58 ± 14.56	28.21 ± 16.84	0.750

Table 2
Showing the traditional and non-traditional risk factors among Gaur Brahmins of NCR/Delhi (N = 506).

	Total N = 506	Male N = 219	Female N = 287	Chi square (p value)
Traditional risk factors				
Underweight	52 (10.63%)	25 (11.90%)	27 (9.67%)	3.304 (0.191)
Overweight	69 (14.11%)	34 (16.19%)	35 (12.54%)	
Obese	225 (46.01%)	87 (41.42%)	138 (49.46%)	
High WC	387 (76.48%)	131 (59.81%)	256 (89.19%)	137.11 (0.00)
High WHR	386 (76.28%)	147 (67.12%)	239 (83.27%)	17.91 (0.000023)
High blood pressure	204 (40.31%)	98 (44.74%)	106 (36.93%)	3.75 (0.153)
Hypercholesterinaemia	147 (29.05%)	59 (26.9%)	88 (30.6%)	0.835 (0.360)
hypertriglyceridemia	197 (38.93%)	94 (42.92%)	103 (35.8%)	2.585 (0.107)
High LDL cholesterol	119 (20.94%)	54 (24.65%)	65 (22.6%)	0.279 (0.597)
Low HDL cholesterol	117 (23.12%)	18 (8.8%)	99 (34.49%)	48.24 (0.00)
Hyperglycemia	139 (27.47%)	71 (32.42%)	68 (23.69%)	4.748 (0.029)
Smoking	135 (26.67%)	135 (61.64%)	0	238.15 (0.00)
Alcohol	51 (10.07%)	51 (23.28%)	0	71.78 (0.00)
Non-traditional risk factors				
Non HDL C	199 (39.32%)	93 (42.46%)	106 (36.93%)	1.593 (0.206)
Metabolic syndrome	234 (46.24%)	39 (17.80%)	195 (67.94%)	125.60 (0.00)
Hypertriglyceridemia waist	142 (28.06%)	53 (24.20%)	89 (31.01%)	2.853 (0.091)

Table 3
Shows the frequency of dyslipidaemia in General obesity and Abdominal Obesity among Gaur Brahmins of NCR/Delhi (N = 506).

Parameters	No lipid abnormalities	Dyslipidaemia	Chi square (p value)	Odds ratio (CI)	Odds ratio (p-values)
General Obesity					
Underweight	24 (13.04%)	26 (8.07%)	0.002 (0.964)	0.9873 (0.5205–1.8728)	1
Overweight	27 (14.67%)	42 (13.04%)	1.399 (0.236)	1.4177 (0.794–2.530)	0.246
Obese	61 (33.15%)	175 (54.34%)	19.46 (0.00001)	2.61 (1.69–4.02)	0.0001
Abdominal Obesity					
High WHR	138 (75%)	248 (77.02%)	0.26 (0.607)	0.895 (0.586–1.366)	0.664
High WC	136 (73.91%)	251 (77.95%)	1.061 (0.848)	0.801 (0.525–1.22)	0.327

Table 4
Showing the odds ratio (OR) and 95% confidence interval for different combination of lipids for obese and Non obese individuals of Studied population.

components	obese	Non obese	X^2 (p value)	OR (CI)	P value
TG + TC	63	18	21.03 (0.000)	4.13 (2.211–7.718)	0.0001
No lipid abnormalities	61	72			
TG + HDL	25	10	7.24 (0.007)	2.95 (1.314–6.62)	0.008
No lipid abnormalities	61	72			
TC + HDL	13	4	5.64 (0.017)	3.83 (1.18–12.34)	0.024
No lipid abnormalities	61	72			
TC + TG + HDL	13	4	5.64 (0.017)	3.83 (1.18–12.34)	0.024
No lipid abnormalities	61	72			

studied population. This is in concordance with various previous studies which reported higher prevalence of abdominal obesity among the population of Tamil nadu, Maharastra, Jharkhand, Chandigardh and Delhi [15–17]. A recent study conducted by Commodore-Mensah et al. [18] explored that the Immigrants from Indian subcontinent had a higher burden of overweight and obesity than others which is concordant with present studied population. The prevalence of hypertension was found to be 40%, which is much higher than the reported frequency of hypertension among Indians [19]. This could be majority attributed to their sedentary lifestyle, consumption of saturated fat diet (Ghee, butter) and inclusion of the adult population in the study cohort. When single lipid parameters were considered hypertriglyceridemia is found to be the most frequent, followed by high hypercholesteremia and low HDL, which is similar to the previously reported frequencies among the Indian population [20]. Sex specificity is observed in the distribution of lipid exclusively with respect to Low HDL and Hyperglycemia. The prevalence of low HDL was found to significantly high among females, whereas the prevalence Hyperglycemia significantly higher among males which is similar to south Asian population [21–23]. Such high percentage of low HDL among female hints towards gender inequality, disparity and females are not aware of the major health issues in the studied population. With respect to three nontraditional risk factors, the common one is metabolic syndromes (46.24%) followed by non HDL-C (39.32%) and Hypertriglyceridemie waist (28.06%). Recent studies also suggested that one third of the urban population in large cities in India had Metabolic syndrome in which females were found to be exhibiting significantly higher frequency of Metabolic Syndrome [24].

When the relationship between obesity and dyslipidemia was observed, of the two obesity measures considered only, general obesity (BMI>25) is found to be significantly higher among dyslipidemic category (individual with abnormal lipid) indicating the significant contribution in dyslipidemia. However, abdominal obesity did not show any significant association with dyslipidemia. Odds ratio analysis reveals that only combinations of lipid like TC + TG, TG + HDL, TC + HDL and TC + TG + HDL are found to pose more than 2 fold significant risk for obesity. Though Dekker et al. [25] reported lower risk for obesity among individuals with combination of TC + TG. In the present study, TC + TG is found to be the most risky combination by posing 4.13 fold increased risk for obesity. This outcome is a concordant with other studies [26]. Fat distribution in the abnormal region in the studied population seems to be a common age related phenomena coupled with sedentary lifestyle and their dietary patterns. Thus individuals are adopted for abdominal obesity, whereas general obesity seems to be major culprit for cardiovascular diseases in this population through dyslipidemia. Futher, the present study also hints towards a different pathways for general obesity.

5. Conclusion

The studied population is found to be characterised by atherogenic lipoprotein with high TG and low HDL. General Obesity seems to be major risk factors for cardiovascular diseases in this population through Dyslipidemia. Therefore, Population specific strategies need to be developed to control general obesity which would prevent the advent of cardiovascular adversities.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dsx.2019.02.013.

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