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Appraisal of Cardio Vascular Disease Risk Factors in a Costal Environment Fishermen's Urban Slum of Visakhapatnam

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ABSTRACT Cardio vascular diseases are the primary cause of mortality in developed countries, and emergencies have become the leading cause of death in developing countries as well. The impact of modernization, industrialization, and urbanization tends to increase the cardio vascular disease risk factor such as obesity and/or body mass index. With the increase of the body mass index, other cardio vascular disease risk factors such as blood pressure and lipids are also increasing drastically. Studies to address these factors are limited from urban slums of India, particularly from Andhra Pradesh. To provide information on these factors the present study was conducted on an endogamous fishing community, urban slum people of Visakhapatnam, Andhra Pradesh. Data were collected from 132 individuals (72 male and 60 female). Data pertaining to blood pressure, anthropometric measurements, and fasting blood samples for lipid profile were collected. Statistical analysis shows that the present study population is having high body mass index and shows the significant correlation with blood pressure and lipids. Increase of body mass index, tends to increase blood pressure and lipid levels. As a whole, the study reveals that cardiovascular risk factors are increasing due to the modernization, urbanization and industrialization. Though the changes are welcome and favorable for the progress of the population.

INTRODUCTION

Cardiovascular diseases are the primary cause of mortality in developed countries and generates a major burden of morbidity through out life (Labarthe, 1998). Additionally, Cardiovascular disease (CVD) emergencies have become the leading cause of death in developing countries as well (Bhatnagar, 1998; Minh, 2003). The continuing modernization and technological advancement of the developing world has brought about rapid life style changes, which are known to have a major input on the development of CVD and other chronic diseases (Beaglehole, 1992 and Callabero, 2001). Many recent reports have identified that, modernization and technological advancement appears to influence the accelerating prevalence of CVD risk factors, namely obesity and/or body mass index (BMI), blood pressure, low density lipoproteins (LDL), high density lipoproteins (HDL),and total cholesterol (TC) etc., in both the developed and developing world (Eriksson et al., 2001; Guo et al., 2000).

It is now well known that developing countries like India contribute a much larger share to the global CVD burden than that of the developed countries (Reddy et al., 1998). Rao (1986), in his study in the present study area Visakhapatnam showed that urbanization leads to increase in the blood pressure levels and it tends to disproportionate increase in the body weight and fat. Gurney et al., (1990) opined that the predominant underlying risk factor for the syndrome appears to be abnormal obesity, it is highly prevalent disorder associated with decreased life expectancy and increased morbidity, because of its combination with a variety of other disorders or diseases. With in the Indian subcontinent, the prevalence of CVD has increased by a factor of 10 with in the last 40 years (Mohan et al., 2005). However, recent studies suggested that LDL cholesterol strongly linked to CVD (Mohan et al., 2001)

The present study population has been selected from an urban slum of Visakhapatnam city. Visakhapatnam, which has experiencing rapid urbanization and industrialization from the past few decades, becoming as over population city, located on the seacoast of the Bay of Bengal in Andhra Pradesh, India. The purpose of the present study is to examine the influence of modernization and urbanization on CVD risk factors, specifically the BMI, blood pressure, lipids and cholesterol among a fishermen community of Jalari, as well as to expand our knowledge and understandability on the interrelationship of all these parameters to the development of CVD.

MATERIALS AND METHODS

Andhra Pradesh is the 5th largest state in India, Having long costal line of 600 miles, extending from Itchapuram in Srikakulam district to Tada in Nellore district. It is situated between 13ºN and 20ºN. There are 300 fishing villages in this seacoast with a population of roughly half a million. These include four endogamous fisherman populations namely the Jalari, Wadabalija, Palli and Besta. They depend mainly on marine fishing. The fisherman community of Visakhapatnam consists of three distinct caste groups namely Jalari, Wadabalija and Palli. The present study population, Jalari is an endogamous Hindu caste group. The settlements of Jalari's are clustered. The number of houses range from 30 to 250.

The sample covered in the present study selected from an urban slum of Visakhapatnam city inhabited by Jalari, which consists about 150 households. The eligibility for participation was that the person should be aged 18 years and above, that he/she should be belongs to Jalari endogamous group, inhabiting that particular habitat. The pregnant and lactating women and individuals suffering from obvious chronic diseases were not included in the sample.

Data were collected randomly from total of 132 individuals (72 male and 60 female) during January to May 2005. The demographic details were collected through a pre-tested interview schedule. The participants reported in the morning after at least 10 hours overnight fast and intra venous fasting blood samples were drawn by using 4 ml vacutainers (with out anticoagulant) to assess the serum levels of HDL, LDL, and TC. These biochemical parameters were determined by using standard assays (NICE Chemicals) on calorimeter. A minimum of three blood pressure readings were taken from each participant in a sitting posture as per the standard procedure (Rose et al., 1989) using mercury sphygmomanometer and stethoscope. Prior to measuring blood pressure, the participant was allowed to sit for a minimum 10 minutes, and asked to make sure that he/she had not done any vigorous work, smoked or chewed tobacco, taken any beverage such as tea, coffee, etc. Anthropometric measurements included weight and height, measured with participants wearing light clothing and without foot wear as per the standard procedure (Weiner and Lourie; 1981). BMI (kg/m²) was used as the index of total obesity.

RESULTS

The mean values, corresponding standard deviations and 't' values for BMI, SBP, DBP, HDL, LDL and TC among Jalari male, female, and both are presented in table 1. It inferred that the BMI, SBP and DBP mean values in optimal range, but HDL, LDL, and TC mean values are high normal range. None of the bisexual differences are significant except for HDL.

For evaluating the influence of body mass index on blood pressure and other dependent variables, the BMI categorized according to the international standards (Haslett et al., 2000) into four groups, **d"** 18.5 kg/m² (Chronic energy deficiency), 18.6 – 24.9 kg/m² (Normal) , 25.0 – 29.9 (Overweight) and e"30 kg/m² (obesity), and respective mean, standard deviations and 't' values are presented in table 2. In the present study 25% (18) male and 27% (16) female were fall under < 18.5 BMI group, 47% (34) male and 47% (28) female were fall under 18.5 -25.9 BMI group, 25% (18) male and 27% (16) female are coming under 25.0 – 29.9 BMI group, and only 3% male and none of female were coming under severe obesity. It is observed that with the raise of BMI, all other variables also rising in both male and female groups.

The results of multiple regression analysis are given in table 3. It is inferred from the 'F' values of the multiple regression equation for the

Table 1: Mean, Standard Deviation (SD), and 't' values of BMI, SBP, DBP, HDL, LDL and TC.

	Male + Female		*Male*		*Female*		*'t'*
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	
BMI (kg/m²)	21.82	4.16	21.87	4.24	21.75	4.09	0.157
SBP (mmHg)	124.89	9.57	124.25	7.83	125.66	11.33	-0.845
DBP (mmHg)	82.71	8.12	82.59	6.15	82.86	10.05	-0.189
HDL (mg/dl)	64.12	7.42	65.87	8.52	62.03	5.18	3.051*
LDL (mg/dl)	135.48	26.88	132.94	25.71	138.53	28.12	-1.191
TC (mg/dl)	199.34	30.22	198.30	24.74	200.60	30.98	0.453

Table 2: Mean, Standard Deviation (SD) and 't' values for Three BMI groups.

Dependent Variables	*Male*		*Female*		*'t'*
BMI	*Mean*	*SD*	*Mean*	*SD*	
<18.5(kg/m²)	*n = 18(25%)*		*n = 16 (27%)*		
SBP	121.66	7.61	125.25	16.92	0.96
DBP	81.05	6.67	80.87	7.51	0.20
HDL	62.50	4.89	58.75	3.83	-1.97
LDL	109.50	14.28	117.37	18.22	1.85
TC	172.00	15.55	176.12	17.01	1.34
18.5 – 24.9 (kg/m²)	*n = 34 (47%)*		*n = 28(47%)*		
SBP	123.94	8.05	123.35	5.16	0.63
DBP	82.05	5.29	81.85	5.44	0.83
HDL	65.00	7.63	62.67	5.56	-33.52
LDL	137.14	16.41	142.57	22.99	15.89
TC	201.26	18.57	205.32	26.85	-1.1
25.0 – 29.9 (kg/m²)	*n = 18 (25%)*		*n = 16 (27%)*		
SBP	126.66	6.68	130.12	11.83	0.87
DBP	84.11	6.22	86.62	16.92	0.61
HDL	71.00	10.90	64.18	4.24	-10.97
LDL	143.61	28.97	152.62	33.28	0.28
TC	214.22	36.96	216.81	35.05	9.36
>30 (kg/m²)	*n = 02 (3%)*		*n = 0 (0%)*		
SBP	131.00	9.89	-	-	-
DBP	92.00	5.65	-	-	-
HDL	65.00	8.48	-	-	-
LDL	176.00	61.51	-	-	-
TC	241.50	53.03	-	-	-

Table 3: Multiple regression of BMI, HDL, LDL, and TC on SBP and DBP.

Sex	*Dependent*		*Independent Variables*					
		Intercept Variables	*BMI (kg/m²)*	*HDL (mg/dl)*	*LDL (mg/dl)*	*TC (mg/dl)*	*R² Value*	*F Value*
Male	SBP (mmHg)	117.36	0.45*	-0.34	-0.71	0.75	0.14	2.84
	DBP (mmHg)	81.48	0.42*	-0.03	0.65	-0.77	0.10	3.04
Female	SBP (mmHg)	115.46	0.28*	-0.35*	0.55	-0.67	0.81	3.61
	DBP (mmHg)	96.52	0.18*	-0.29	0.52	0.17	0.73	1.48
Total	SBP (mmHg)	128.93	0.30*	-0.25	0.08	0.77	0.93	4.12
	DBP (mmHg)	84.58	0.20*	-0.04	0.75	-0.77	0.82	2.87

* $p < 0.05$

influence of BMI, HDL, LDL, and TC (Independent variables) on SBP and DBP (dependent variables) are good fit for the data sets for male, female and both. The regression coefficients obtained for combined data set of both sexes are significant for BMI with both blood pressures, and independently with male and female groups also. It illustrates that both SBP and DBP elevated markedly along with increasing with BMI. The regression coefficients of HDL are negative and significant for both the SBP and DBP

It is important to notice here that even supposing the BMI, HDL, LDL, and TC were combined as independent variables, the correlation matrix systems that coefficients between independent variables such as BMI vs. LDL, BMI vs. HDL, and BMI vs. TC are highly significant indicating that they are, in fact, not true independent characters. Hence the results of multiple regression analysis may be viewed along with simple regression analysis for justification. Consequently simple regression analysis for dependent variables SBP and DBP vs. BMI, HDL, LDL and TC was carried out concurrently. The linear regression coefficients for BMI, HDL, LDL, and TC on SBP and DBP are decidedly significant, but several multiple regression coefficients of independent variables are not significant, probably because of multi co-linearity among independent variables considered, which has resulted as low R^2 values.

The correlation coefficients between dependant variable BMI and independent variables SBP, DBP, HDL, LDL and TC are presented in table 4, it is discernable from this

Table 4: Correlation coefficients between dependent (BMI) and independent variables.

Independent variable	*Dependent variable BMI (kg/m²)*		
	Male	*Female*	*Total*
SBP	0.33*	0.13	0.22*
DBP	0.33*	0.15	0.22*
HDL (mg/dl)	0.36*	0.45*	0.37*
LDL (mg/dl)	0.56*	0.52*	0.54*
TC (mg/dl)	0.58*	0.55*	0.56*

* $p < 0.05$

table all independent variables positively correlated with BMI and all are statistically significant except for female SBP and DBP. When both the sexes are combined together all the independent variables are showing positive significance with dependent variable BMI.

DISCUSSION

Obesity has many negative effects on health, being associated with cardiovascular diseases (Gunnell et al., 1998; Rexode et al., 1996), hypertension (Chapman et al., 1996, wadda et al., 1998), and dyslipidemia (Howard et al., 1987; Miseiagna et al., 1996). Some other studies have demonstrated that obesity is more strongly related to lipid abnormalities (Seidell, 1991; Terry et al., 1989). The second National Health and Nutrational Examination survey (NHANES II) data showed that over body weight is associated with higher LDL cholesterol levels (Denke et al., 1993). The increase of body weight is paralleled by a rise of both systolic and diastolic blood pressure in urban and rural population (Gupta et al., 1995; Sambasiva Rao et al., 1986). The present study results are similar to the earlier studies (Gunnell et al., 1998; Chapman et al., 1996; Howard et al., 1987). The present study reveals that body mass index shows the impact on blood pressure and lipid levels, and we can view the significant sex difference in HDL levels, that is comparatively female HDL levels are more than those of males. This indicates that the association between obesity and HDL are stronger in women than in men, as shown in American Indian study (Dongsheng et al., 2000) and some Indian studies (Mohan et al., 2001; Reddy et al., 1998).

In the present study 47% of male and female were fall under normal range, 25% male and 27% female are coming under above normal range, but in severe obesity 3% male and no one of female. In below normal range that is chronic energy deficiency 25% male and 27% female we find. The second thing is that with the increase of body mass index, other variables such as SBP, DBP, HDL, LDL and TC are also increasing drastically. With this findings can be explained most of the people are obese and more males are found to be obese when compared to their female counterparts. Body mass index having great positive significance with blood pressure, lipids and cholesterol, as shown in the other studies (Donhaue, 1985; Reddy,1998).

Beaver county lipid study showed positive and significant association between BMI and lipid profiles (Donhaue, 1985), similarly the Minneapolis children blood pressure study also showed similar results (Prineas et al., 1980). The findings of the present study also constant with the previous studies as we also found significance ($p < 0.05$) on HDL, LDL, TC, SBP and DBP with BMI. These findings can be explained by the results of certain studies (Mc Gavery, 1991; Mukherjee et al., 1988; Skarfors et al., 1991) and as mentioned previous, that hypertension and other lipid factors strongly correlated with BMI and / or obesity.

In order to further proceed with the understanding of the prevalence of BMI, and the more favorable blood pressure and lipid levels leads to aimed at elucidating the changes regarding physical activities and life style of present population.

The present study population earned their livelihood by traditional ways of fishing in the past. Men use manual boats for fishing and women's quantum of working time was spent in selling the sea produce. However, the technological development followed has lead to the decrease in manual labor and subsequently lead to their lives to modernized and urbanized ways of living. As a result men are now using mechanical boats, this has increased their catch and saves their labor and time, and now they sell their products on the seacoast to the rapid growing marine food companies. This in turn has lead to increased leisure time and decreased physical activity and women can devote their time in their household work, which was earlier spent on selling marine products. Previously they used to live in a single room hut, but now they have got pucca house with Andhra Pradesh government's initiative.

Overall, the life style of this marine fishing population has changed drastically from the past few decades. Though the change is welcome and

favorable for the progress the population. Several prospective and cross-sectional studies have shown that CVD risk factors, namely obesity, blood pressure, lipids, and cholesterol increased with urbanization and modernization (Bhatnagar, 1998, Labarthe, 1998, Mohan et al., 2001, 2005; Reddy et al., 1998). The present study results are in consonance with the earlier studies.

In conclusion, the results of the current study provide support to the existing scientific evidence suggesting that the modernization, industrialization, and urbanization tends to increase the cardiovascular risk factors, such as obesity, and increase of obesity leads to disproportionate increase of other CVD risk factors like elevated blood pressure, lipids and cholesterol The observations point out the emergent need for different measures to be implemented in order to counteract the health problems. Consequently the outcomes of the current study should guide the public health policy in developing appropriate intervention strategies to efficiently tackle these issues in life.

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