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Prevalence of Non-Communicable Diseases Risk Factors in Two Groups of Urban Populations

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Abstract: Unhealthy lifestyle makes urban population prone to noncommunicable diseases and its risk factors. In present study health risk factors in two groups of urban population having different lifestyle were determined. A total of 150 subjects: 75 policemen's and 75 Bhabha Atomic Research Center (BARC) employees having age between 35-50 years were involved in the study. Information was collected on behavioral risk factors, followed by anthropometric and blood pressure measurements and biochemical assessment. The groups were compared using Student's t-test. Body mass index and waist circumference were correlated with continuous variable. Policemen had significantly higher ($p<0.05$) prevalence of abnormalities than BARC employees (Impaired glucose tolerance 26.66 Vs. 5.33%, Hypertension 26.66 Vs. 6.66%, Abdominal obesity 53.33 Vs. 29.33%, high triglycerides 52 Vs. 28%, high low density lipoprotein cholesterol 20 Vs. 6.66%, high very low density lipoprotein cholesterol 50.66 Vs. 25.33%, low high density lipoprotein cholesterol 16 Vs. 2.66%, high low density lipoprotein cholesterol/high density lipoprotein cholesterol ratio 34.66 and 16%). Hypertriglyceridemia waist phenotype was observed in 38.66% policemen. Tobacco chewing and alcohol consumption was more common among policemen than BARC employees. The result of the study indicates that policemen are at more risk of developing noncommunicable diseases than BARC employees. Policemen play a vital role in law enforcement so must be delivered with best possible health care.

Key words: Non communicable diseases, risk factors, lifestyle, waist circumference, hypertriglyceridemia waist phenotype

INTRODUCTION

The second half of 20th century witnessed major health transition in the world, with the improvement of the world's population health status and the dramatic decrease in the mortality rates. Among these health transitions the most globally prevalent has been the rising burden of noncommunicable diseases such as cardiovascular diseases, cancer, diabetes and respiratory disorders (Reddy, 2002). India too illustrates this health transition, which position noncommunicable diseases as a major public health challenge of growing magnitude in twenty-first century (Maria, 2006). The pace and process of noncommunicable diseases epidemic varies across the country. In India, prevalence of noncommunicable diseases is high among urban population (Shah and Mathur, 2005). Different working conditions and unhealthy lifestyle associated with different services and products exposes urban population to health risk factors, which lead to various noncommunicable diseases in the population (Wahdan, 1996). The rising burden of noncommunicable diseases and its risk factors will

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have health, social and economic consequences. Therefore controlling today's risk factors is important for preventing noncommunicable diseases of tomorrow. This study aims at identifying the class of people in urban population with increased risk factors and to take proper preventive measures to keep the prevailing risk factors under control so as to prevent futures noncommunicable diseases.

MATERIALS AND METHODS

Selection of Sample Population

The target subjects were male adults between age 35-50 years from two different groups of urban population. The policemen's in Trombay police station at Mankhurd were selected for the study. Bhabha Atomic Research Center (BARC) employees were selected as another section of the population for the study. No specific criteria for inclusion in the study were considered. Subjects were selected randomly. The study was conducted in month of February, 2008.

Ethical Considerations

Permission was obtained from the higher authorities of the policemen and BARC employees. Before commencing the procedures of interviewing and measurements, policemen and BARC employees underwent a brief orientation and written consent was obtain from them. The results of the blood samples and physical measurements were recorded and subjects were given the health reports in case of abnormalities the subjects were given medical treatment or advice to attend any health facility.

Measurements

The study was carried out in three steps:

Step 1: Review of Lifestyle

Information on behavioral risk factors of the subjects in both populations was collected with the help of the STEPs questionnaire by using the interview technique. This step focused on self-reported information on risk factors like tobacco usage (cigarette/bidi smoking, oral tobacco and snuff) and alcohol consumption. A standard measure of 60 mL was used to assess information on amount of alcohol consumption. Details of dietary habits, physical activity pattern, past history and family history of hypertension, diabetes, stroke, heart attack and cancer was also obtained. Information on the total amount of fruits and vegetables (excluding tubers) consumed daily was obtained by asking about the number of servings (80 g of fruits and vegetables consumed was taken as one serving) of fruits and vegetables consumed in the last 24 h with the help of standard (200 mL) cups; this information was cross-checked by obtaining information about the amount of fresh fruits and vegetables purchased by the family every day and the portion consumed by the target subject. Low intake of fruits and vegetables was considered when the servings were less than 5 day^{-1} (Ng *et al.*, 2006).

The type of physical activity undertaken by the subjects was assessed according to the guidelines provided by the Centre for Disease Control. Based on the guidelines, the amount of activities undertaken as part of work, travel and leisure was measured and classified as being of mild, moderate, or heavy intensity. Subjects undertaking at least 30 min of moderate-intensity activity daily, in any sphere of their daily routine (activities during working hours, traveling, or leisure time), were considered as active. For assessing physical activity during traveling, information was obtained on whether the subject walked or used a motorized vehicle or cycle. The usage of a motorized vehicle was considered as light activity. Usage of a bicycle (>30 min) and walking (>20 min) was considered to be moderate activity, while more time (>20-30 min) spent on these activities was considered as heavy activity. After this each individual was subjected for further evaluation (Mehan *et al*., 2006).

Step 2: Physical Measurements

Height and weight were measured; Body mass index was calculated using nomogram (Bray, 1985). Waist circumference was measured in the middle between 12th rib and iliac crest at the level of umbilicus. Body Mass Index between ≥ 25-29.9 kg m^{-2} indicates overweight and ≥ 30 kg m^{-2} indicates obesity (Adams *et al*., 2006). Waist circumference >94 cm indicated abdominal obesity (Paccaud, 2000). Blood pressure was measured by primary health care physician. For the precision three successive readings were taken. Subjects having blood pressure ≥ 140/90 mmHg or taking hypertensive medication were considered to have hypertension (Gupta *et al*., 2003).

Step 3: Biochemical Estimation

Venous blood sample was collected from each subject at two occasions, First-fasting and then after 2 h of 75 g glucose ingestion. Serum was separated from plasma by cold centrifugation and stored at 5-8°C until analysis. Fasting blood glucose and blood glucose after 2 h of glucose ingestion (Turner and Lott, 1975). Total cholesterol (Allain *et al*., 1974) High density lipoprotein cholesterol (Burstein *et al*., 1970) and Triglycerides (Pal, 2005) were estimated using a commercially available kit (manufactured by ErbaMannheim) and Erba chem. 7 auto analyzer. Low density lipoprotein cholesterol and very low density lipoprotein cholesterol were calculated by Friedewald's and Fredrickson's formula respectively. Low density lipoprotein cholesterol/high density lipoprotein cholesterol ratio was also calculated (Sahu *et al*., 2005).

Diagnostic Criteria (Erba Kit)

High blood glucose level was diagnosed if Fasting blood glucose ≥ 110 mg dL^{-1} blood glucose after 2 h of glucose ingestion ≥ 130 mg dL^{-1}, Impaired glucose tolerance was diagnosed if blood glucose after 2 h of glucose ingestion ≥ 130 mg dL^{-1} and <200 mg dL^{-1}, Diabetic cases were diagnosed if fasting blood glucose ≥ 126 mg dL^{-1} and blood glucose after 2 h of glucose ingestion ≥ 200 mg dL^{-1}. Abnormal blood lipid levels were diagnosed if total cholesterol >250 mg dL^{-1}, low density lipoprotein cholesterol >130 mg dL^{-1}, very low density lipoprotein cholesterol >30 mg dL^{-1}, high density lipoprotein cholesterol <30 mg dL^{-1} and triglycerides >160 mg dL^{-1}, low density lipoprotein cholesterol/High density lipoprotein cholesterol ratio >3.

Statistical Analysis

Statistical analysis was performed using PRIMER software. Results are expressed as Mean±SD. Variables have been compared using t-test. To determine correlation of body mass index and waist circumference with continuous variables of age, low intake of fruits and vegetables, physical inactivity, systolic blood pressure, diastolic blood pressure, waist circumference, fasting blood glucose, blood glucose 2 h after glucose ingestion, total cholesterol, low density lipoprotein cholesterol, very low density lipoprotein cholesterol, high density lipoprotein cholesterol, low density lipoprotein cholesterol/high density lipoprotein cholesterol ratio and triglycerides correlation analysis was performed. Smoking was graded as 0 = No tobacco users, 1 = Non-smoke tobacco users, 2 = Smoker. Physical activity was graded as 0 = Light activity, 1 = Moderate physical activity, 2 = Heavy physical activity. Statistically $p<0.05$ was considered significant.

RESULTS

The mean age of policemen was 41.23 years and BARC employees 43.87 years. Among policemen 48% were graduates and 52% had higher secondary level of education but whereas in BARC population 76% of them were graduates and 24% had higher secondary level of education. Table 1 shows the characteristics of the policemen and the BARC population. Policemen had higher mean

Table 1: Characteristic of study groups

Characteristic features	Policemen	BARC population
Age (years)	41.23±11.77*	43.87±11.09*
Fruit and vegetable intake (servings day^{-1})	3.50±0.74	4.20±0.91
Body mass index (kg m^{-2})	24.31±2.001*	23.42±2.941*
Waist circumference (cm)	96.15±7.154 **	91.30±7.305**
Blood pressure (mmHg)		
Systolic	125.10±12.15**	120.80±13.72**
Diastolic	83.04±0.98**	79.80±0.86**
Blood glucose (mg dL^{-1})		
Fasting	110.20±46.92*	91.91±15.97*
After 2 h of glucose ingestion	138.00±68.2*	119.60±42.54*
Lipids (mg dL^{-1})		
Total cholesterol	172.60±31.35*	158.90±26.86*
Triglycerides	166.10±57.13*	140.20±46.94*
Low density lipoprotein cholesterol	104.20±29.53*	92.48±27.11*
Very low density lipoprotein cholesterol	33.26±11.43*	28.03±9.388*
High density lipoprotein cholesterol	35.15±3.413**	38.43±2.86**
Low density lipoprotein cholesterol/ high density lipoprotein cholesterol ratio	2.98±0.85**	2.415±0.70*

*p<0.05, **p<0.001, Data compared using Student's t-test

Table 2: Prevalence of risk factors

	Policemen		BARC employees	
Risk factors	No.	%	No.	%
Family history	22	29.33	18	24.00
Tobacco consumption	17	22.66	16	21.33
Alcohol consumption	16	21.33	4	5.33
Low intake of fruits and vegetables	44	58.66	28	37.33
Physical inactivity	11	14.66	9	12.00
Body mass index ≥ 25 kg m^{-2}	21	28.00	20	26.66
Waist circumference >94 cm	40	53.33	22	29.33
Hypertension	20	26.66	5	6.66
Impaired glucose tolerance	20	26.66	4	5.33
Diabetes	9	12.00	9	12.00
Total cholesterol >250 mg dL^{-1}	3	4.00	1	1.33
Triglyceride >160 mg dL^{-1}	39	52.00	21	28.00
Low density lipoprotein cholesterol >130 mg dL^{-1}	15	20.00	5	6.66
Very low density lipoprotein cholesterol >30 mg dL^{-1}	38	50.66	19	25.33
High density lipoprotein cholesterol <30 mg dL^{-1}	12	16.00	2	2.66
Low density lipoprotein cholesterol/ high density lipoprotein cholesterol >3	26	34.66	12	16.00

Data expressed as % (n)

waist circumference and higher mean systolic and diastolic blood pressure, but they had better mean body mass index. Mean fasting blood glucose and blood glucose after 2 h of glucose ingestion, total cholesterol, low density lipoprotein cholesterol, very low density lipoprotein cholesterol and triglycerides values were higher in policemen as compared to BARC employees. High density lipoprotein cholesterol values were on lower side in policemen as compared to BARC employees. Intake of Fruits and Vegetables was not significant.

Table 2 shows that tobacco consumption was similar in both groups (22.66%; 17/75) in policemen and (21.33%; 16/75) in BARC population, but tobacco chewing was more prevalent in policemen (64.75%; 11/17) whereas smoking was more prevalent in BARC population (68.75%; 11/16). Alcohol consumption was more in policemen. Illness and family history of diabetes and cardiovascular diseases were significantly high among policemen. Fruits and vegetables intake were less policemen as compared to BARC employees. 14.66% policemen and 12% of BARC employees were physically inactive (in all the spheres of daily activity). Abdominal obesity was more prevalent among policemen. Policemen had a significantly higher prevalence of hypertension and 65% were

Table 3: Correlation of body mass index and waist circumference with continuous variables

	Policemen		BARC employees	
Risk factors	Body mass index	Waist circumference	Body mass index	Waist circumference
Waist circumference	0.36**	-	0.239**	-
Smoking/tobacco chewing	-0.15	-0.13	-0.09	-0.13
Physical inactivity	-0.23	-0.30	-0.17	-0.26
Low intake of fruits and vegetables	0.37	0.34	0.21	0.35
Systolic blood pressure	0.61	0.53	0.14	0.01
Diastolic blood pressure	0.67	0.5452	0.21	0.14
Fasting blood glucose	0.19*	0.29*	0.26*	0.28*
Blood glucose after 2 h of glucose ingestion	0.21*	0.25*	0.14*	0.25*
Total cholesterol	0.45	0.5356	0.349	0.25
Low density lipoprotein cholesterol	0.19	0.21	0.14	0.17
Very low density lipoprotein cholesterol	0.28	0.27	0.18	0.084
High density lipoprotein cholesterol	-0.13*	-0.23**	-0.20*	-0.18*
Low density lipoprotein cholesterol/ high density lipoprotein cholesterol	0.13	0.09	0.10	0.28
Triglycerides	0.21	0.31**	0.16	0.26*

*p≤0.05, **p<0.001, Data expressed as r-value (correlation coefficient)

newly diagnosed cases where as among BARC population only 2% of hypertensives were newly diagnosed. Prevalence of diabetes was same in both groups (12%), but impaired glucose tolerance was more prevalent among the policemen (26.66%). Among the policemen 58.62% and among the BARC populations 30.7% were newly detected cases of high blood glucose. Components of dyslipidaemia, especially high triglyceride levels were more common among policemen.

In both the populations Body mass index showed significant positive correlation with waist circumference, fasting blood glucose, blood glucose after 2 h of glucose ingestion and a negative correlation with high density lipoprotein cholesterol and waist circumference showed significant positive correlation with fasting blood glucose, blood glucose after 2 h of glucose ingestion, triglyceride, low density lipoprotein cholesterol/high density lipoprotein cholesterol and a negative correlation with High Density Lipoprotein cholesterol. The correlation was significantly stronger in policemen than BARC employees. Waist circumference in both populations correlated strongly with the continuous variables than Body mass index, especially waist circumference with triglyceride in policemen. Hypertriglyceridemia waist phenotype was observed in 38.66% of policemen and 14.66% of BARC employees (Table 3).

DISCUSSION

The study was conducted on police providing security to the people and BARC employees. The working environment of police includes long working hours with round the clock shift and minimum holidays. They are always under tension as their job is highly demanding, risky and stressful. And most of the time they perform out door job. Proper health care facilities are not available to them. As compared to policemen BARC employee's job is not stressful, have fixed working hours and five days per week duty; good health facilities are available for them. The anthropometric findings clearly demonstrated that policemen were not different than BARC employees in overall body weight/size but were centrally obese, indicating greater value of waist circumference. Tendency to central obesity might be possibly explained by increased activation of the hypothalamic-pituitary-adrenal axis and insulin resistance due to stress (Yudkin *et al*., 2000). Waist circumference rather than Body mass index has stronger correlation with Blood glucose after 2 h of glucose ingestion indicating the risk for Type 2 Diabetes mellitus (Wei *et al*., 1997; Naser *et al*., 2006). Also higher prevalence of impaired glucose tolerance in policemen indicates the risk for Type 2 Diabetes mellitus (Alberti, 1998). Unfavorable blood pressure, serum lipid profile illustrated by higher levels of serum triglycerides, high very low

density lipoprotein cholesterol, low high density lipoprotein cholesterol concentrations and high low density lipoprotein cholesterol/high density lipoprotein cholesterol ratio indicated the increased risk for coronary heart diseases in policemen (Bennet *et al*., 2008). Significant correlation and simultaneous presence of both elevated triglyceride level and high waist circumference in policemen indicates the hypertriglyceridaemia waist phenotype. Research showed that simultaneous presence of an increased waist circumference and elevated fasting triglyceride levels could be used as screening tool for identification of men characterized by features of metabolic syndrome (The athrogenic metabolic traid) such as: 1) fasting hyperinsulinemia, 2) elevated apolipoprotetein B and 3) higher amounts of small low density lipoprotein particles (Lemieux *et al*., 2000; St-Pierre *et al*., 2007).

Tobacco consumption was similar in both populations, but tobacco chewing habit was more prevalent in policemen whereas BARC employees were more addicted to cigarette smoking. Prevalence of alcohol consumption in the policemen is of concern, particularly in terms of quantity as policemen reported drinking frequency less but more in quantity. The possible explanation for this behavior among policemen may be the nature of work culture. Presence of undiagnosed high blood glucose levels and high blood pressure levels in policemen indicated that they did not have regular medical check up. Positive family history of diabetes and cardiovascular diseases present in large number of policemen than BARC employees had not promoted them to have periodic check up. Several studies suggests that the prevalence of cardiovascular diseases risk factors such as hypercholesterolemia, hypertension or smoking in policemen has been either found greater (Franke *et al*., 1998; Pollock *et al*., 1978; Williams *et al*., 1987) than or similar (Franke *et al*., 1997) to that seen in the general population. Since it still remained unclear about any prediction of predisposition to noncommunicable diseases in policemen, the study was felt important to know the risk factor associated with policemen compared to general population. This study indicated: 1) Higher prevalence of noncommunicable diseases such as cardiovascular diseases and diabetes in policemen. 2) Higher risk of developing noncommunicable diseases in policemen on the basis of prevailing high waist circumference, high triglyceride levels and high very low density lipoprotein cholesterol level.

RECOMMENDATIONS

As a population guideline to reduce risk for noncommunicable diseases they:

- Should try to maintain waist circumference below 94 cm by taking proper diet and doing regular exercise
- Should do regular health check up

Based on the understanding of the risk factor burden across the population, a comprehensive and integrative community approach should be developed.

Further intervention and studies are required to find out the exact cause of difference in the metabolic parameters.

Study Limitations

The data collection through questionnaires may be amenable to errors of over and/or underreporting for which no quality control exists.

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