

Comparative Study of Risk Factors of Cardiac Diseases among Urban and Rural Population

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ABSTRACT Genetically Indians seems to have a great tendency to develop heart trouble. In addition, stressful lifestyles and unhealthy diets of urban population are the reasons for heart disease. The aim of the study is to analyze the impact of different factors like lifestyle, food habits, environmental pollution and lipid level on coronary artery disease. Total 168 cases having some cardiac symptoms were included in this study. Detailed histories of cases were taken by questionnaire. Serum lipid profiles were compared between urban and rural cases. Study showed that triglycerides level ($p < 0.001$), total Cholesterol ($p < 0.05$) and low density lipoprotein level ($p < 0.001$) were significantly high in urban population than rural. Presence of hypertension (52.94%) and diabetes (49.41%) were higher in urban population. The results showed that stressful unhealthy lifestyle and uncontrolled fatty diet plays a major role in coronary artery disease.

INTRODUCTION

Coronary heart disease is usually caused by a condition called atherosclerosis, which occurs when fatty material and other substances form a plaque build-up on the walls of arteries. This causes them to get narrow. As the coronary arteries narrow, blood flow to the heart can slow down or stop. This can cause chest pain (stable angina), shortness of breath, heart attack, and other symptoms. Coronary heart disease (CHD) is the leading cause of death worldwide including in India. About two-thirds of the global estimated 14.3 million annual cardiovascular disease deaths occur in the developing world. Unadjusted CHD rates have ranged from 1.6% to 7.4% in rural populations and 1% to 13.2% in urban populations (Gupta et al. 2008). Studies from rural areas have demonstrated a lower prevalence compared to studies from urban areas. Differences in the prevalence of coronary artery disease indicate that differences in diet and lifestyle characteristics and conventional risk factors may be important (Gupta et al. 1994 a, b, 1995; Beegom et al. 1995; Singh et al.

1995a,b,c; Wander et al. 1994). Certain lifestyle factors such as stress, addiction, lacking of physical activities, food habits and environmental contaminants can increase the risk of coronary artery disease. The common cause of coronary heart disease is lipid abnormalities- elevated serum triglyceride, high low density lipoprotein particles and reduced high-density lipoprotein cholesterol level.

Urbanization in India is characterized by unplanned and uncontrolled growth leading to urban sprawl. Land use planning and the pattern of development, relationship between residential areas and industrial, commercial and office complexes have a considerable impact on the environment pollution of air, water and land (Singh and Steinberg 1996). The urban waste product is discharged indirectly into rivers, lakes, ponds or creeks. This lack of adequate sewerage network and proper sanitation facilities leads to degradation of the environment in the catchment of the natural drains, which has a detrimental effect on the quality of life of the inhabitants, besides polluting the water bodies. Since cities are heavily populated areas with a large number of workshops, industrial units etc. Various types of gases and fumes that come up into atmosphere from fuel burning sources from municipal areas, transport sectors and industries cause severe air pollution. Principal pollutants of air in urban areas comprise dust particles, particulates of various compounds and gases like water vapour, smokes, carbon dioxide, Nitrogen oxide, sulphur oxides and Chlorofluorocar-

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bons etc. SO₂, NO₂, H₂S, CO₂ etc can form acids on combining with water vapour in the sunlight. These acids come down on earth during rains. This process is known as Acid Rain. When the concentration of green house gases (GHGs) rises up to greater extent in the upper atmosphere, it causes a considerable rise in the temperature of the earth. This condition is called as Global Warming. When pollutants like Chlorofluorocarbons (CFCs), aerosols, Carbon tetrachloride, Chlorine etc. accumulate in the stratosphere, these react with the Ozone of the Ozone Layer found there as a protective umbrella of the earth. In stratosphere these chemicals make it thin and tend to cause a hole in the ozone belt. The third world cities are facing a number of problems due to air pollution. It has been reported that about 60% people of Kolkata, India, suffer from respiratory diseases related to pollution (Mishra 2010).

The prevalence of Coronary heart disease was observed to be significantly higher among urban study subjects (14.8%) as compared to that among rural study subjects (9.7%) (Mahajan et al. 2012). The increase in prevalence and the rural-urban differences in the prevalence of coronary artery disease indicate that differences in diet and lifestyle characteristics and conventional risk factors may be important. Coronary risk factors such as hypertension, hypercholesterolaemia, diabetes mellitus, obesity, central obesity and sedentary lifestyle were highly prevalent in the urban subjects, and they were 2 or 3 times less common among rural subjects.

In the present study, different biochemical parameters were investigated among rural and urban population of India with a view whether life style factors play any role.

MATERIAL AND METHODS

A total 168 cases were taken from those who had major complaints of hypertension, shortness of breath, bifasicular block, angina pain, ischemic heart disease from the outdoor of Cardiology Department of Ramakrishna Mission Seva Pratishthan, West Bengal in one year. Detailed history was taken from all cases with the help of questionnaire prepared according to guidelines of the World Health Organization (Rose et al.1982). A questionnaire, which included question on life style factors (smoking, alcohol consumption), personal factors (age,

state of health, job history etc.), was obtained. All patients gave their written consent prior to the participation, and the study procedures followed were in accordance with the Institutional Ethical committee's guidelines. The patients ranging in age from 20 to 70 years were included in this study. Mean age was 46.56 ± 1.8 in urban areas and 43.25 ± 1.82 in rural areas (Table 1). Among 168 cases, 85 came from urban areas and 83 cases from rural areas. In urban cases 47 were men and 38 were female whereas in rural cases 53 were men and 31 were female.

Table 1: Detailed history of studied population

Variables	Urban (n=85)	Rural (n=83)
Age		
Range(20-70)	46.56±1.8	43.25±1.82
Gender (n, %)		
Male	47(55.2394%)	53(63.85%)
Female	38(44.7%)	31(37.35%)
Lifestyle Factors (n, %)		
Smoking	53(62.35%)	15(18.07%)
Tobacco habit	6 (7.05%)	20(16.6%)
Alcohol	27(31.76%)	16(13.28%)
Family History	49(57.64%)	28(33.74%)
Diabetes	42(49.41%)	14(17%)
Hypertension	45(52.94%)	29(35%)

The following risk factors were studied: family history of coronary heart disease, smoking, addiction in tobacco, alcohol intake, hypertension, and diabetes mellitus. Lipid levels (Triglycerides (TGL), Total Cholesterol (T. chol), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), Very Low Density Lipoprotein (VLDL) were studied using AGAPPE diagnostics kit with the help of Johnsson and Johnsson Vitros Eci autoanalyser. Hypertension was defined as a systolic blood pressure of >160mmHg and diastolic blood pressure of >90mmHg.

Statistical analysis of data was done by Student's *t* test.

RESULTS

The overall lifestyles factors of urban and rural were shown in Table 1. The cases (62.35%) of urban population were smoker whereas 18.07% in rural. But addiction in tobacco was some extent higher in rural areas (16.6%) whereas alcohol intake was high in urban areas. Family history (57.64%) of coronary heart disease was higher in urban population. Pres-

ence of hypertension (52.94%) and diabetes (49.41%) were higher in urban population. Triglycerides level was significantly high ($p<0.001$) in urban population than rural (Table 2). Total Cholesterol level of urban population was significantly high ($p<0.05$) than rural population. Serum low density lipoprotein concentration was significantly ($p<0.001$) elevated in urban population in comparison with rural population.

Table 2: Association of serum lipid level between urban and rural population.

Serum lipid	Urban	P*	Rural
TGL	204 ± 7.33	<0.001	160.5 ± 7.922
T.Chol	197.28±12.3	<0.05	158.81±8.722
HDL	42.3 ± 0.995	-	43.44±1.22
LDL	145.77± 3.188	<0.001	78.9 ± 2.25
VLDL	33.52± 2.62	-	30.93±2.23

DISCUSSION

Coronary heart disease is considered as an important public health problem, not only in developed countries but also in developing countries. There are some factors involved in increasing the risk of Coronary Artery Disease (CAD). This study is to investigate some risk factors of CAD like family history of coronary heart disease, smoking and addiction to tobacco, alcohol intake, hypertension, and diabetes mellitus. Serum lipid levels comprising of Triglycerides, Total Cholesterol, High Density Lipoprotein, Low Density Lipoprotein and Very Low Density Lipoprotein were compared between urban and rural population.

The result of this study showed that addictions like smoking cigarettes and *bidis* (dry rolled temburni leaf containing fine tobacco dust) is higher prevalent in urban areas i.e. about 62.35% but other type of tobacco habits (cathechu and jarda) is higher in rural areas 16.6%. Lipid level, triglyceride ($p<0.001$), total cholesterol ($p<0.05$) and LDL ($p<0.001$) level were significantly high in urban population than rural (Table 2).

In North Indian population, Sing et al. (1997) had shown that CAD is 9% in Urban population, 3.3% in rural population. Similar study was done by Gupta and Malhotra (1975) in a similar ethnic group which also showed that CAD is about 2.5 times commoner in Urban than rural areas. Chadda et al. (1997) studied in a same population which also indicates the

high prevalence rate of CAD in Urban areas. In case of South India, Mohan et al. (2001) explained that prevalence rate is 11% in urban population of Chennai. The study of Mondal et al. (2009) showed prevalence of CAD was 11.6% in urban population of North Bengal.

Stressful lives, unhealthy diet, lack of sufficient physical activities, pollution are direct consequences of urban life. In rural area, most of men and women used to work in the agricultural and farming activities, whereas urban men and women used to live a sedentary life compared to rural population. The roles of environmental pollution in the etiology of different disease were important consideration (De et al. 2010; Ghosh et al. 2010). Environmental and genetic factors influence a persons blood fat or lipid levels which are risk factors for Coronary Heart disease. In this study family history of coronary artery disease is very common in urban population (57.64%).

Heart disease is a leading cause of illness disability and death in industrialized countries (Homer and Spencer 2008). In the year of 1974, NIEHS-funded researchers from Harvard University started a long-term study on residents of six U.S. cities to find the extent of effect of common air pollutants on respiratory and cardiovascular health. The concentrated on the effects of gaseous pollutants such as sulfur dioxide, a colorless gas produced by coal-burning power plants, fine particle air pollution, microscopic particles from motor vehicle exhaust and power plant on the health of the residents. The result revealed that subjects residing in the more polluted cities had a higher risk of hospitalization and suffer early death from pulmonary and heart diseases as compared to those living in the less polluted cities (Dockery et al. 1993).

The environmental pollutants with high significance are heavy metals (mercury, cadmium, lead) and persistent organic pollutants (PCB's, pesticides). Subjects are exposed to these pollutants through the traditional diet of sea mammals (mercury, cadmium, persistent organic pollutants) and through smoking (cadmium). Afore mentioned pollutants have a significant relation with the cardiovascular diseases. Since the pollutants, however, are found in the traditional diet together with n-3 polyunsaturated fatty acids, monounsaturated fatty acids, and selenium which are believed to promote cardiovascular health there is an indirect link between

the pollutants and cardiovascular disease (Bjerregaard 1996). There are some toxic compounds e.g. oxides of nitrogen, sulfur dioxide and suspended particles which are involved in air pollution, are powerful pro-oxidants that enhance the oxidation of lipoproteins; and oxidized lipoproteins, particularly LDL cholesterol, are powerful inducers of atherosclerosis (Chadha et al. 1997).

High level of triglycerides present in blood stream is directly associated with risk of CAD. Previous studies already explained that high level of LDL Cholesterol and low HDL cholesterol are independent risk factors of CAD (Dalal et al. 2006; Da Silva 1999). High level of LDL Cholesterol increases the risk of CAD by narrowing or blocking arteries that carry blood to the heart. A study carried out in Rajasthan has reflected that Total cholesterol, Low density lipoprotein levels are low in a rural population (Gupta et al. 1994). This study supports the findings of current study i.e. Triglycerides, Total cholesterol, Low density lipoprotein all of these three are significantly high in urban population than rural (Table 2).

In conclusion, risk factors such as family history of coronary heart disease, smoking and addiction to tobacco, alcohol intake, hypertension, and diabetes mellitus, lipid profile are more prevalent in urban than in rural areas. All of these risk factors have become a major public health problem in India and the present study showed that the risk is 2-3 times greater in urban compared to rural subjects.

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REFERENCES

- Beegom R, Singh RB 1995. Prevalence of coronary heart disease and its risk factors in south and north India. *Acta Cardiol*, 50: 227-240.
- Bjerregaard P 1996. Cardiovascular disease and environmental pollutants: the Arctic aspect. *Arctic Med Res*, 55(1): 25-31.
- Chadha SL, Gopinath N, Shekhawat S 1997. Urban-rural differences in the prevalence of coronary heart disease and its risk factors in Delhi. *Bulletin of the World Health Organization*, 75(1): 31-38.
- Da Silva PM 1999. The genetic contribution to coronary disease: The genetic factors related to lipid metabolism. *Rev Port Cardiol*, 18: 735-747.
- Dalal AB, Tewari D, Tewari S, Sharma MK, Pradhan M, Gupta UR, et al. 2006. Association of coronary artery disease with polymorphisms of angiotensin converting enzyme and methylenetetrahydrofolate reductase gene. *Indian Heart J*, 58: 330-335.
- De S, Ghosh S, Chatterjee R, Chen Y-Q, Moses L, Kesari A, Hoffman PE, Dutta SK 2010. PCB congener specific oxidative stress International 36:907-917. response by microarray analysis using human liver cellline. *Environmental International*, 36: 907-917.
- Dockery DW, Pope CA 3rd, Xu X, Spengler JD, Ware JH, Fay ME, Ferris BG Jr, Speizer FE 1993. An Association between Air Pollution and Mortality in Six U.S. Cities. *N Engl J Med*, 329: 1753-1759.
- Ghosh S, De S, Chen Y-Q, Sutton DC, Ayorinde FO, Dutta SK 2010. Polychlorinated biphenyls (PCB-153) and (PCB-77) absorption in human liver (HepG2) and kidney (HK2) cells in vitro: PCB levels and cell death. *Environment International*, 36(8): 893-901.
- Gupta R, Gupta HP, Kumar N, Joshi AK, Gupta VP. 1994a. Lipoprotein Lipids and the Prevalence of Hyperlipidaemia in Rural India. *European Journal of Cardiovascular Prevention and Rehabilitation*; 1(2): 179-184.
- Gupta R, Gupta VP, Ahluwalia NS 1994b. Educational status, coronary heart disease and coronary risk factors prevalence in a rural population of India. *Br Med J*, 309: 1332-1336.
- Gupta R, Prakash H, Majumdar S, Sharma S, Gupta VP 1995. Prevalence of coronary heart disease and coronary risk factors in an urban population of Rajasthan. *Ind Heart J*, 47: 331-338.
- Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S 2008. Epidemiology and causation of coronary heart disease and stroke in India. *Heart*, 94: 16-26.
- Gupta SP, Malhotra KC 1975. Urban rural trends in the epidemiology of coronary heart disease. *J Asso Phys India*, 23: 885-893.
- Homer M, Spencer G 2008. International effort finds new genetic variants associated with lipid levels, risk for coronary artery disease. From <<http://www.nih.gov/news/health/jan2008/nia-13.htm>> (Retrieved January 13, 2008).
- Mahajan H, Chaturvedi M, Lal P, Saha R, Grover VL 2012. Urban-rural differences in prevalence of CHD: A populationbased Study. *Indian Journal of Public Health Research and Development*, 3(2): 53-55.
- Mandal S, Saha JB, Mandal SC, Bhattacharya RN, Chakraborty M and Pal P 2009. Prevalence of Ischemic Heart Disease among Urban Population of Siliguri, West Bengal. *Indian J Community Med*, 34(1): 19-23.
- Mishra MP 2010. Problems in the urban environment. From <<http://www.ecosensorium.org/2010/01/problems-in-urban-environment.html>> (Retrieved January 12, 2010).
- Mohan V, Deepa R, Rani SS, Premalatha G 2001. Prevalence of coronary artery disease and its relationship to lipids in a selected population in South India. *J Am Coll Cardiol*, 38: 682-687.

- Rose GA, Blackburn H, Gillum RF, Princes RJ 1982. *Cardiovascular Survey Methods*, 2nd Edition. WHO Monograph Series, No. 56. Geneva: World Health Organization.
- Singh RB, Sharma JP, Rastogi V, Raghuvanshi RS, Moshiri M, Verma SP, Janus ED 1997. Prevalence of coronary artery disease and coronary risk factors in rural and urban populations of north India. *European Heart Journal*, 18:1728-1735.
- Singh RB, Ghosh S, Niaz MA et al. 1995a. Epidemiologic study of diet and coronary risk factors in relation to central obesity and insulin levels in the rural and urban populations of north India. *Int J Cardiol*, 47: 245-255.
- Singh RB, Niaz MA, Ghosh S et al. 1995b. Epidemiological study of coronary heart disease and its risk factors in an elderly urban population of north India. *J Am Coll Nutr*, 14: 628-634.
- Singh RB, Niaz MA 1995c. Coronary risk factors in Indians. *Lancet*, 346: 778-9.
- Singh Kulwant and Florian Steinberg (Eds.) 1996. *Urban India in Crisis*. New Delhi: New Age International Ltd.
- Wander GS, Khurana SB, Gulati R et al. 1994. Epidemiologic of coronary heart disease in a rural Punjab population. Prevalence and correlation with various risk factors. *Indian Heart J*, 46: 319-339.