Factors Associated with 10 year Risk of Myocardial Infarction and Stroke in Rural Areas of Varanasi, India

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ABSTRACT

Introduction: Cardiovascular diseases (CVD) are a group of diseases that involves mainly Coronary Artery Disease (CAD) also known as Myocardial Infarction (MI) and Stroke. This may be caused by both Physiological and behavioural risk factors. High blood pressure, hyperglycaemia, dyslepidemia and obesity are physiological risk factors, while smoking, lack of exercise, unhealthy dietary practices and excessive alcohol consumption are behavioural risk factors. Study objective was to find out the risk factors associated with occurrence of 10 year total risk of cardiovascular events (MI and Stroke) in rural areas of Varanasi District.

Material and methods: This was a community based cross sectional study conducted in Varanasi district of Uttar Pradesh. All population aged 40 years and above of both genders were included in this study. Interview schedule was used to collect the baseline data and an anthropometric measurement and World Health Organization/ International Society of Hypertension (WHO/ISH) risk prediction chart for Indian people was used for risk assessment of MI and Stroke.

Results: The prevalence of various risk factors among participants was as obesity, 32.5% (95% CI: 30.4%-34.7%); hypertension, 29.0% (95% CI: 27.0%-31.1%); diabetes 6.1% (95% CI: 5.1%-7.3%) and smoking, 18.3% (95% CI: 16.6%-20.1%). The overall prevalence of 10 year risk of MI and Stroke was found 26%. Out of these 16% (95% CI: 14.0%-17.3%) and 6% (95% CI: 4.9%-7.1%) respondents were in moderate and high risk respectively. While 4% (95% CI: 3.5%-5.3%) respondents had very high risk of MI and Stroke. Age and sex were found significantly associated with the risk of MI and Stroke. Risk factors like hypertension (*P*<0.05, χ2=516.39), diabetes (*P*<0.05, χ2=53.74) and smoking (*P*<0.05, χ2=41.06), were also significantly associated with the development of MI and Stroke.

Conclusion: This study shows the positive significant association between several risk factors (i.e. age, gender, hypertension, diabetes and smoking) with 10 year risk for developing MI and Stroke.

Keywords: Cardiovascular Events, MI and Stroke, WHO/ISH Risk Prediction Chart, Behavioural Risk Factors, Obesity.

INTRODUCTION

Cardiovascular disease (CVD) is a major, growing; worldwide problem. It comprises a group of diseases having heart and vascular system. Major disease conditions are Coronary heart disease (CHD), Systemic arterial Hypertension, Cerebrovascular disease (Stroke) and congenital heart diseases.[1] CHD is defined as "impairment of heart function due to inadequate supply of blood to heart as per needs caused by obstructive changes in the coronary circulation to heart". The debilitating and often fatal complications of cardiovascular diseases are usually seen in middle-aged or elderly men and women. However, atherosclerosis is the main pathological process leads to coronary artery disease, cerebral artery disease and peripheral artery disease. It begins early in life and progresses gradually through adolescence and early adulthood. It is usually asymptomatic for a long period.[2] The rate of progression of atherosclerosis is influenced by cardiovascular risk factors such as use of tobacco, elevated blood pressure, abnormal elevated blood glucose and obesity. Continuing exposure to these risk factors leads to further progression of atherosclerosis, resulting in unstable atherosclerotic plaques, narrowing of blood vessels and obstruction of blood flow to vital organs, such as the heart and the brain. The clinical manifestations of these diseases are angina, MI, transient cerebral ischemic attack (TIA) and stroke.[3] It is important that individuals at risk of developing MI and Stroke can be effectively identified and appropriately stratified according to risk.[4] With this assumption present study was carried out to find out the factors associated with occurrence of 10 year total risk of MI and Stroke among 40 year and above in rural areas of Varanasi District.

MATERIAL AND METHODS

This was a community based cross sectional study conducted in Varanasi district of Uttar Pradesh, India. According to Census (2011), the total population 40 year and above was approximately 27.4%.[5] In this area about 30% of the population aged 40 year and above is in any of the risk category (mild to severe) of MI and Stroke.[6] Among five major risk factors (age, sex, hypertension, diabetes and smoking) of 10 year risk for developing MI and Stroke, considering minimum prevalence of diabetes 12.7% with 1.5 times design effect and 10% non-response rate the sample size was calculated 2000. Out of eight blocks two

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blocks were selected randomly as primary sampling unit (PSU) namely Cholapur and Sewapuri. From each selected block three Gram Panchayats were also selected randomly as secondary sampling unit (SSU). Finally probability proportional to size sampling (PPS) procedure was adopted to select participants from each selected gram panchayat. The study was approved by Institute Ethical Committee. Following inclusion and exclusion criteria, a written consent was taken from each participant. Predesigned and pre tested interview schedule was used to collect the baseline data in step manners. In 1st step socio demographic and behavioural information was collected. In 2nd step physical measurement such as blood pressure, weight and height was recorded. In 3rd step biochemical measurements such as random blood sugar was measured. OMRON digital arm blood pressure monitor hbp-1100 was used in left arm in sitting position thrice for blood pressure measurement and the mean value of the 2nd and 3rd measurement was used for the analysis. Hypertension was defined as blood pressure ≥140/90 mmHg. WHO/ ISH risk prediction chart for Indian people was used for risk measurement of MI and Stroke.[7] OMRON digital body weight scale (HN-283) was used for weight measurement and Stadiometer was used for height measurement. Accu-check active glucometer was used for measuring blood sugar level. At initial stage random blood sugar (RBS) was done for every participant to measure blood sugar level. In 2nd stage all listed participants were informed one day before to keep stomach empty in morning on next day to confirm diabetes. A person is defined as diabetic if she/he taking insulin or oral hypoglycaemic drug or with a fasting capillary blood glucose concentration ≥126 mg/dl. In analysis 144 respondents were excluded from study because they deny for fasting blood sugar test. The socio-economic class of the family is classified according to BG Prasad Classification (Revised for 2018).[8]

STATISTICAL ANALYSIS

The statistical analyses were carried out, using SPSS software (trial version 22.0). Frequency tables, cross-tables and correlation analysis were done to analyze the data. WHO/ISH risk prediction chart for Indian people was used for risk measurement of MI and Stroke.[8] χ^2 square test was applied to find out significant risk factors at 5% level of significance at two tailed.

RESULTS

Out of 1856 respondents 39.4% and 60.6 % were male and female respectively. The mean ±SD of age of the respondents was 55.19±11.92 years. More than one third (36.4%) respondents belonged to the age group of 40-49 years. More than half of the respondents belonged to lower class of Socio Economic Status (SES). [Table 1:] reveals that the prevalence of overweight and obesity was 32.5% (95% CI: 30.4%-34.7%) and 15.5% (95% CI: 13.9%-17.2%) respectively. The prevalence of diabetes and smoking was found and 6.1% (95% CI: 5.1%-7.3%) and 18.3% (95% CI: 16.6%-20.1%) respectively. The overall prevalence of hypertension was 29% (95% CI: 27.0%-31.1%). [Table 2:] shows that 74.1% respondents had less than 10 % risk for developing MI and Stroke within 10 year, while 4% (95% CI 3.5%-5.3%) respondents had very high risk.[Table 3:] shows that respondent's age was found significantly associated with development of risk of MI and Stroke (*P*<0.05).

Variables under study	Frequency (N-1856)	Proportion %	95% CI
Smoking			
Non smoker	1516	81.7	79.9 - 83.3
Smoker	340	18.3	16.6 - 20.1
BMI			
Underweight (<18.5 0)	262	14.1	12.6 - 15.8
Normal (18.50-22.99)	703	37.9	35.5 - 40.1
Overweight (23.00-24.99)	288	15.5	13.9 - 17.2
Obese (>25.00)	603	32.5	30.4 - 34.7
Diabetes			
Non diabetic	1742	93.9	92.7 - 94.9
Diabetic	114	6.10	5.10 - 7.30
Hypertension			
Non hypertensive	1317	71.0	68.9 -72.9
Hypertensive	539	29.0	27.0- 31.1
Table-1: Distribution of study subjects according to Behavioral and physiological risk factors			

Variables under study	Frequency (N=1856)	Proportion (%)	95% CI
10 years risk of MI and Stroke			
Low Risk (<10%)	1375	74.1	72.0 - 76.0
Moderate Risk (10% to 20%)	290	15.6	14.0 - 17.3
High Risk (20% to <30%)	111	6.0	4.9 - 7.1
Very High Risk (>30%)	80	4.3	3.5 - 5.3
Table-2: 10 year total risk of MI and Stroke of study subject			

Variables under Study	Total (N=1856)	10 years risk of MI and Stroke							
		Low Risk		Moderate Risk		High Risk		High Risk	
Age (in years)									
40-49	675	639	97.4	23	3.4	7	1.0	6	0.9
50-59	454	398	87.7	29	6.4	9	2.0	18	4.0
60-69	443	232	52.4	126	28.4	56	12.6	29	6.5
> 70	284	106	37.3	112	39.4	39	13.7	27	9.5
		P value = 0.00,		df = 9,		χ2 = 511.31			
Gender									
Male	731	494	67.6	141	19.3	55	7.5	41	5.6
Female	1125	881	78.3	149	13.2	56	5.0	39	3.5
		P value = 0.00,		df = 3,		χ2 = 26.77			
Religion									
Hindu	1765	1298	73.5	281	15.9	111	6.3	75	4.2
Muslim	91	77	84.6	9	9.9	0	0.0	5	5.5
		P value = 0.02,		df = 3,		χ2 = 9.48			
Caste									
SC/ST	440	346	78.6	55	12.5	24	5.5	15	3.4
OBC	1061	774	73.0	177	16.7	61	5.7	49	4.6
Others	355	255	71.8	58	16.3	26	7.3	16	4.5
		P value = 0.26,		df = 6,		χ2 = 7.75			
Marital Status									
Married	1579	1214	76.9	213	13.5	86	5.4	66	4.2
Others	277	161	58.1	77	27.8	25	9.0	14	5.1
		P value = 0.00,		df = 3,		χ2 = 47.54			
Education									
Illiterate	1125	824	73.2	190	16.9	65	5.8	46	4.1
Primary and Middle	368	275	74.7	58	15.8	19	5.2	16	4.3
High School and Intermediate	266	203	76.3	30	11.3	20	7.5	13	4.9
Graduate and Above	97	73	75.3	12	12.4	7	7.2	5	5.2
		P value = 0.057,		df = 9,		χ2 = 7.64			
Occupation									
Homemaker	886	697	78.7	113	12.8	46	5.2	30	3.4
Unskilled Labour	675	466	69.0	132	19.6	46	6.8	31	4.6
Skilled Labour	229	166	72.5	39	17.0	9	3.9	15	6.6
Govt. /Pvt. Service	66	46	69.7	6	9.1	10	15.2	4	6.1
		P value = 0.00,		df = 9,		χ2 = 36.14			
Type of Family									
Nuclear	549	423	77.0	78	14.2	24	4.4	24	4.4
Joint	1307	952	72.8	212	16.2	87	6.7	56	4.3
		P value = 0.15,		df = 3,		χ2 = 5.30			
Socio-Economic Status (SES)	S)								
Upper Class	27	15	55.6	5	18.5	4	14.8	3	11.1
Upper Middle Class	93	66	71.0	14	15.1	9	9.7	4	4.3
Middle Class	159	113	71.1	24	15.1	11	6.9	11	6.9
Lower Middle Class	609	478	78.5	84	13.8	13.8	4.3	21	3.4
Lower Class	968	703	72.6	163	16.8	16.8	6.3	41	4.2
		P value = 0.04,		df = 12,		χ2 = 21.36			
Table-3: Demographic factors associated with 10 year risk of MI and Stroke of study subject									

Person with higher age group >70 years were more likely to have higher risk of MI and Stroke (9.5%) than the person with younger age group (0.9%). Gender was also found significantly associated with development of risk of MI and Stroke (*P*<0.05). Male were more likely to have the higher risk of the development of MI and Stroke (5.6%) than the female (3.5%). Religion, occupation and Socio-economic class of the family were also significantly associated with MI and Stroke (p<0.05). Respondent caste and education was not significant with MI and Stroke. [Table 4:] shows that risk factors related to diabetes hypertension and smoking were significantly associated with the development of MI and Stroke (*P*<0.05). Obesity was not significant with MI and Stroke; however it shows the increasing trend with the increasing BMI. Respondents who were smoker, diabetic and hypertensive they had very high risk of developing MI and Stroke than the non smoker, non diabetic and non hypertensive.

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Variables under Study	Total (N=1856)	10 years risk of MI and Stroke							
		Low Risk		Moderate Risk		High Risk		High Risk	
Smoking									
Non smoker	1516	1168	77.0	216	14.2	74	4.9	58	3.8
Smoker	340	207	60.9	74	21.8	37	10.9	22	6.5
		P value = 0.00,		df = 3,		$\chi 2$ = 41.06			
BMI (Wt in Kg/ Ht in M^2)									
Underweight	262	180	68.7	55	21.0	17	6.5	10	3.8
Normal	703	534	76.0	106	15.1	39	5.5	24	3.4
Overweight	288	220	76.4	39	13.5	19	6.6	10	3.5
Obese	603	441	73.1	90	14.9	36	6.0	36	6.0
		P value = 0.13,		df = 9,		$\chi 2$ = 13.89			
Diabetes									
Non diabetic	1742	1317	75.6	63	15.1	100	5.7	62	3.6
Diabetic	114	58	50.9	27	23.7	11	9.6	18	15.8
		P value = 0.00,		df = 3,		$\chi 2$ = 53.74			
Hypertension									
Non hypertensive	1317	1150	7.3	150	11.4	11	0.8	6	0.5
Hypertensive	539	225	41.7	140	26.0	100	18.6	74	13.7
		P value = 0.00,		df = 3,		$\chi 2$ = 516.39			

Table-4: Behavioural and physiological risk factors associated with 10 years risk of MI and Stroke of study subject

DISCUSSION

Cardiovascular disease (CVD) is a major contributor to the global burden of chronic diseases accounting for 29.3% of all deaths and 9.9% of total disease burden (The World Health Report, 2004).[9] The burden of CVD is predicted to increase substantially in developing countries by the year 2020, largely due to rising rates of CVD risk factors (Murray et al. 2004, Hazarika et al, 2002 and Misra A. 2002).[10,11,12] Risk factors for CVD are multifactorial. The INTERHEART study showed that nine risk factors (abnormal lipids, smoking, hypertension, diabetes, abdominal obesity, psychosocial factors, consumption of fruits, vegetables, and alcohol, and regular physical activity) account for nine out of ten cardiovascular events (Yusuf et al, 2004).[13] In present study the mean ± SD of respondent's age was 55.19±11.92 years. The total study population comprised of 1856 subjects including 39.4% males and 60.6% females. In another study the mean (SD) age of the cohort was found as 60.8±11.8 years and 994 of 4227 patients (23.5%) were female (Wang et al 2018).[14] In this study the prevalence rate of major risk factors of cardiovascular disease was found as obesity 32.5%, smoking 18.0%, diabetes 6.1% and hypertension 29.0%. Another study conducted in residents of Saronikos municipality (Attica region) in 2014 found the prevalence of major risk factors as obesity 21.6%, current smoking 38.9%, diabetes 11.1%, and hypertension 28.8%. Based on measured blood pressure, and previously known hypertension, a total of 45.2% of all participants were hypertensive. This showed a higher prevalence of hypertension as compare to present study. Multivariate analysis shows that age, gender, education level, obesity, diabetes, hypertension and ever smoking were strongly associated with coronary heart disease (Mahant et al, 2013).[15] Study showed increasing trend of occurrence of 10 year total risk of MI and Stroke with increase in age. Similar findings were also shown by a study in which the occurrence

of MI are very low in younger adults and increased markedly after the age of 50 (Gikas et al, 2016).[16]
In line with these findings, found the prevalence of known diabetes found to be 9.8% (Andrikopoulos et al, 2012).[17] Another study conducted by Joshi et al, 2013) among 2424 elderly found that out of total 51% respondents were women and the mean age of them was 67 years, the prevalence of smokeless tobacco use was 50.8% (95% CI: 48.1–52.8); smoking 10.5% (95% CI: 9.3–11.8); and the prevalence of hypertension was found as 46.3% (95% CI: 44.3–48.4). Previously known hypertension was found in 10.2% participants, while remaining 36.1% were detected to be hypertensive during their survey. A total of 8.2% (95% CI: 7.0–9.5) participants were overweight and 4.1% (95% CI: 3.3–4.9) had central obesity.[18] Another study conducted by (Islami et al,2011) stated that more than half of participants (51.5%) had ever smoked tobacco products, 75% of participants were overweight or obese, 38.4% were hypertensive and 5.9% were diabetic. Age was strongly associated with MI and Stroke (p<0.05). Ever smoking was also associated with MI and Stroke (OR= 1.25; 95% CI: 1.00-1.55). Body mass index was associated with MI and Stroke. Both hypertension (OR= 1.33; 95% CI: 1.05-1.68) and diabetes (OR= 1.33; 95% CI: 1.05-1.68) were also associated with the risk of MI and Stroke.[19]

CONCLUSION

Study shows that those respondents who were exposed with obesity, diabetes hypertension and smoking, were more likely to have occurrence of 10 year risk of MI and stroke than those who were not exposed with these risk factors. Hence strategy to reduce the occurrence of 10 year risk of MI and stroke should be focused on life style modification such as stop smoking, weight reduction and early detection and optimal control of hypertension and diabetes when individuals reach 40 year and above.

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