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Original Article

Ethics Section

A Ten-year Risk Assessment Study of Cardiovascular Events Among Adults Visiting a Tertiary Care Institution in Northern India

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ABSTRACT

Introduction: Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels, including Myocardial Infarction (MI) and stroke. Risk factors included are both modifiable and non modifiable, like age, sex, blood pressure, smoking status, total blood cholesterol and presence or absence of diabetes mellitus. In the above background it is important to find out the risk of CVDs among patients visiting Urban Health Training Centre (UHTC) of a tertiary care institute. Early detection of risk probability will alert them to modify the involved risk factors to avert the CVDs.

Aim: To find out the risk of CVDs among adult patients in a duration of 10 years, who visited the Outpatient Department (OPD) of UHTC, using World Health Organisation/International Society of Hypertension (WHO/ISH) risk prediction Chart.

Materials and Methods: A cross-sectional observational study was conducted in the Department of Community Medicine, of a tertiary care institution in Northern India, from August 2017 to January 2018. A total of 400 subjects were enrolled. Data were collected using the WHO/ISH 10-years risk prediction chart. Chi-square test was applied and level of significance were obtained at p-value <0.05.

Results: Majority (58.75%) of the population belonged to the young adult age group (30-50 years). There were 216 males and 184 females. Overall, 7.75% people were diabetic, and 11.25% were smokers. Majority (69.5%) of the people had less than 10% risk for CVD, and 5.75% people had ≥40% risk. With respect to total serum cholesterol, 9% had high level of cholesterol. Statistically significant association was observed between Socio-economic Status (SES) (modified Kuppuswami scale) and cardiovascular event (p<0.001). Middle income group were more at risk compared to others (p<0.001).

Conclusion: Middle income group people and young age group had more risk of developing CVDs in future, compared to low-income group and other age groups. So, an early intervention in the lifestyle may avoid CVDs. Also, this study gives way for further research on the weightage of the individual risk factors for CVDs.

Keywords: Cholesterol, Diabetes mellitus, International society of hypertension, Smoking, Smoking chart

INTRODUCTION

The global burden and threat of non communicable diseases constitutes a major public health challenge that undermines social and economic development throughout the world. Strong leadership and urgent action are required at the global, regional and national levels to mitigate them. Cardiovascular Diseases (CVDs) are the leading cause of death globally. An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke. Out of the 17 million premature deaths (under the age of 70) due to Non Communicable Diseases (NCD) in 2019, 38% were caused by CVDs [1]. The prevalence of CHD varies from 1.6 to 13.2% in different epidemiological studies conducted in various part of the country between 1968 to 2016 [2]. In 2016, the estimated prevalence of CVDs in India was estimated to be 54.5 million. One in four deaths in India are now because of CVDs with ischaemic heart disease and stroke responsible for >80% of this burden [3].

Non communicable diseases often originate from unhealthy lifestyles, and adverse physical and social environments. The risk factors include poverty, poor or incorrect diet intake, lack of physical inactivity, consumption of tobacco, excessive use of alcohol, and stress. An adept health system must identify, treat, and prevent these diseases. The effects of behavioural risk factors may show up in individuals as raised blood pressure, raised blood glucose, raised blood lipids, and overweight and obesity. Cessation of tobacco use, reduction of salt in the diet, eating more fruit and vegetables, regular physical activity and avoiding harmful use of alcohol have been shown to reduce the risk of CVDs.

A 30-year-old individual has a one-fourth chance of dying from any of the four major NCDs before the age of 70 years [4]. The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular diseases and Stroke (NPCDCS) has an important component wherein, the examination of all individuals' 30 years of age and above who come to the health care facilities for hypertension, diabetes and selected cancers are screened. This is known as 'opportunistic screening' [4]. Prediction of risk to develop CVDs at 10 year using just a simple and internationally valid tool will be a golden opportunity to prevent premature mortality. In view of the above background, the present study was conducted to estimate risk of CVDs among people visiting the urban health and training centre of a tertiary care institute.

MATERIALS AND METHODS

A cross-sectional observational study was conducted on 400 adults, aged 30 years and above from the catchment area of an UHTC, of a tertiary care institution, in Northern India, from August 2017 to January 2018. Ethical clearance was obtained from Institutional Ethical Committee (IEC) Major S.D. Singh Medical College, Farrukhabad, Uttar Pradesh via letter no (N– ADMIN/371-B/2017) dated 20/07/2017, and written informed consent was obtained from the participants.

Inclusion criteria: Adult patients aged 30 years and above visiting UHTC and willing to participate in study were included in the study.

Exclusion criteria: patients with history of myocardial infarction or stroke were excluded from study.

Sample size calculation: Sample size was calculated using statistical formula 4 pq/d^2 with 95% confidence level, where, absolute precision (d) is 5% percentage point, prevalence (p) of problems taken as 50%, (no study from Uttar Pradesh could be found) [5].

Study Procedure

The WHO/ISH 10-years risk prediction tool for CVD was used in this study, with little modification [6]. Age group limit was lowered from 40 years to 30 years in first age group block in the given chart, in view of the current guidelines as per National Programme of prevention and control of Cancer, Diabetes, Cardiovascular diseases and stroke (NPCDCS) for screening of non communicable diseases [4]. Before applying the chart to estimate the 10-year cardiovascular risk of an individual, the following information was collected:-

Presence or absence of diabetes, gender, smoker or non-smoker, age, Systolic Blood Pressure (SBP) and total blood cholesterol (if in mg/dL divide by 38 to convert to mmol/L) [6]. A total cholesterol level of less than 200 mg/dL (5.17 mmol/L) has been considered normal [7]. When all the above information was collected, following steps were taken to estimate 10 years cardiovascular risk:

Step 1- Appropriate chart was selected based on the presence or absence of diabetes.

Step 2- Selected male or female tables.

Step 3- Selected smoker or non smoker boxes.

Step 4- Selected age group boxes (if age is 50-59 years select 50, if 60-69 years select 60 etc).

Step 5- Within this box we found out the nearest cell (small square) where the individual's systolic blood pressure (mmHg) and total blood cholesterol level (mmol/L) crossed. The colour of the cell indicates the 10-year risk of combined myocardial infarction and stroke risk (fatal and non fatal) in percentage as shown below. If the colour of the cell is green, risk is <10%, if yellow risk is 10% to <20%, orange 20% to <30%, red 30% to <40%, deep red ≥40%.

Operational definition [6]:

1. Diabetes was defined as someone taking insulin or oral hypoglycaemic drugs, or with a fasting plasma glucose concentration above 7.0 mmol/L (126 mg/dL) or a postprandial (approximately two hours after a main meal) plasma glucose concentration above 11.0 mmol/L (200 mg/L) on two separate occasions).
2. Systolic blood pressure was taken as the mean of two readings five minutes apart.
3. All current smokers and those who quit smoking less than one year before the assessment were considered smokers.
4. The one non fasting laboratory measurement was taken for total cholesterol estimation.

Socio-economic status was obtained using modified Kuppuswami scale [8].

STATISTICAL ANALYSIS

Statistical Package for the Social Sciences (SPSS) Software version 25 was used. Chi-square test was applied and level of significance were obtained at p-value <0.05.

RESULTS

There were 216 males and 184 females. The majority (58.75%) belonged to the young adult age group, although a small but significant proportion (12.75%) belonged to the elderly group. Overall, 7.75% of people were diabetic, and 11.25% were smokers. With respect to the total serum cholesterol, 9% had a high level. The majority (67.25%) had SBP between 120-140 mmHg [Table/Fig-1]. A total of 5.75% of people faced a ≥40% risk. With respect to SES, the middle class had the maximum risk (60.86%) followed by the upper class (34.78%). Considering the age, middle age group (51-60 years and 61-70 years) had more risk compared to others age group. While considering gender, males had more risk (56.52%) than females (43.47%) [Table/Fig-2].

Variables	Number (%)
Gender	
Male	216 (54%)
Female	184 (46%)
Age (years)	
30-50	235 (58.75%)
51-60	114 (28.5%)
61-70	36 (9%)
>70	15 (3.75%)
Diabetes Mellitus	
Present	31 (7.75%)
Absent	369 (92.25%)
Smoking	
Yes	45 (11.25%)
No	355 (88.75%)
Total cholesterol (mmol/L)	
4	168 (42%)
5	196 (49%)
6	27 (6.75%)
7	6 (1.5%)
≥8	3 (0.75%)
SBP (In mmHg)	
120-140	269 (67.25%)
>140-160	81 (20.25%)
>160-180	41 (10.25%)
>180	9 (2.25%)

[Table/Fig-1]: Distribution of variables among study subjects as per criteria of WHO/ ISH for CVD; (N=400).

Vari-ables	CVD Risk					Total, n (%)
	<10%, n (%)	10-20%, n (%)	21-30%, n (%)	31-40%, n (%)	>40%, n (%)	
SES						
Upper	40 (14.38)	6 (14.28)	4 (12.5)	5 (20)	8 (34.78)	63 (15.75)
Middle	207 (74.46)	19 (45.23)	6 (18.75)	8 (32)	14 (60.86)	254 (63.5)
Lower	31(11.15)	17 (40.47)	22 (68.75)	12 (48)	1 (4.3)	83 (20.75)
χ^2=95.344, df(8), p<0.001						
Age group (in years)						
30-50	191 (68.70)	20 (47.61)	14 (43.75)	7 (28)	3 (13.04)	235 (58.75)
51-60	73 (26.25)	13 (30.95)	12 (37.5)	8 (32)	8 (34.78)	114 (28.5)
61-70	10 (3.59)	4 (9.5)	5 (15.62)	9 (36)	8 (34.78)	36 (9)
>70	4 (1.4)	5 (11.9)	1 (3.1)	1 (4)	4 (17.39)	15 (3.75)
χ2=91.603, df (12), p<0.001						
Gender						
Male	148 (53.23)	24 (57.14)	17 (53.12)	14 (56)	13 (56.52)	216 (54)
Female	130 (46.76)	18 (42.85)	15 (46.87)	11 (44)	10 (43.47)	184 (46)
χ^2 =0.341, df(4), p=0.98						

[Table/Fig-2]: Risk stratification based on SES, age group and gender (N=400).

DISCUSSION

It the year 2019, out of the 17 million premature deaths due to non communicable diseases, CVDs alone were the aetiology in 38% of the cases [1]. These premature deaths can be averted if intervention were to be applied earlier. So, risk assessment at earlier stage may increase the lifespan and will also decrease the cost on health expenditure. India is moving fast towards urbanization, which

leads to an epidemiological transition from communicable to non communicable diseases. As such, people residing in the catchment area of the urban health centre of the department of community medicine were included in the study when they visited the Out Patient Department (OPD) for health concerns.

The current study observed that approximately 6% of people had a ≥40% risk for CVDs and that middle class people (60.86%) and males (56.52%) had the highest risk [Table/Fig-2]. In study from different authors [Table/Fig-3] [9-16], similar results were observed. In few studies, women were more at risk than men [11,12]. With respect to age, present study showed, middle age group people (50-70 years) had more risk compared to other age groups [Table/Fig-2]. Similar findings were observed in various other studies [Table/Fig-3].

Study	Region, and year of study	Mean age in years	Gender distribution	Risk stratification
Premanandh K and Shankar R, [9]	Salem, Tamil Nadu, 2018	40-70 years age group.	Majority were female (55.71%).	Overall, 2.5% population had >40% risk. Middle SES(71.42%) male (52.38%) and 60-69 years age group (57.14%)were more on risk.
Islam J et al., [10]	Bangladesh, 2020	52.9 (Mean) - men 53.5 - women 52.5	Majority of subject were female (54.69%).	Only one adult had (≥ 30%) risk. Male had more (1%) risk compared to female (0.1%) considering (20 to <30%) risk group.
Maharani A et al., [11]	Indonesia, 2019	54.9±10.7 years	Female were 56.6%	Overall, 0.06% had (≥30%) risk. 75+ age group had maximum risk (49.8%). Female were more (31.5%) on risk compared to male (26.3%).
Ghorpade AG et al.,[12]	Pondicherry, 2015	54.2±11.1 years	53.3% subject were women	About 10.1% had (>20%) risk. Women were more on risk (5.3%) compared to men (4.5%).
Vikramaditya B et al.,[13]	Punjab, 2017	59.1±13.2, and 56.3 +/- 11.4 for male and female.	About 50.3% females compared to males (49.7%).	Overall, 16% people had risk ≥20%. Male had 18% and female 15.3% respectively. Male in the age group of 60-69 years and females aged 70 years and above had 32.4% and 39.1% risk respectively.
Otgontuya D et al.,[14]	Mongolia, Malaysia, Cambodi, 2 013	48.9,49.2, and 50.7.	Male were 40.5%, 42.3% and 35%.	Risk of >20% in Mongolia, Malaysia and Cambodia was 33.3%, 20.8% and 10.4% respectively. The risk among both women and men increased significantly with age.
Mendis S. et al.,[15]	Nigeria, Iran, China, Pakistan, Gergia, Nepal, Cuba and Sri lanka, 2011	54.6	About 38.25% were men compared to women.	The percentage of the population with CVD risk ≥20% was less than 10% in all studied countries. Only 0.2-4.8% are in high risk (≥30%). risk was more in male compared to female.
Ndindjock R et al., [16]	Seychelles, Africa, 2011	40-64 years age group.	Women were more (54.16%) compared to men.	About 5.1% had ≥20% risk. Men were more affected than women when risk was ≥40%. Older age (55-64 years) had more risk compared to younger age (40-54 years).Total CV risk management is much more cost effective than single risk factor management.

[Table/Fig-3]: Findings of various different study [9-16].

As a result, policy makers may focus more on older adults, men, and middle class people compared to other groupings. Here the risk assessment is based on composite risk factors. Further research on the weight assigned to individual risk factors is required so that intervention can be tailored to individual risk factors.

Limitation(s)

Due to limited resources only percentage risk distribution of CVDs has been obtained based on the composite risk factors described in the WHO/ISH tool considering age, sex, smoking, diabetes mellitus, total cholesterol, and blood pressure. Individual risk factor has not been weighted against the CVDs risk. Although, sample was statistically significant, but it needs to be studied on a larger scale to get it generalized over wide range of population.

CONCLUSION(S)

It can be concluded that early intervention in the limited resources can be more efficiently used to target high-risk individuals who will benefit most. Males over 50 years of age and middle class families need more health education about modifiable risk factors and therpeautic life style changes focused at community level. Operational research and further study at a larger level may help to policy makers in strategy making. The launch of health and wellness centres as a part of comprehensive primary healthcare may be a golden step towards achieving the target of sustainable development goal.

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