Cardiovascular Risk Assessment and Profiling among Employees of Tertiary Care Rural Hospital: Central India

Anjalee Chiwhane[1], Gajendra Agrawal[2], Joel Joy Thomas[3], Saurbh Hadke[4]

[1]Professor Dept. of Medicine Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi Meghe Wardha-442001, [2]Associate Professor Dept. of Cardiology Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi Meghe Wardha-442001, [3]UG Student Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi Meghe Wardha-442001, [4]Assistant Professor Dept. of Medicine Datta Meghe Medical College, SMHR Hospital Nagpur-441110

Abstract

Background: Cardiovascular risk factors are the major cause of mortality and morbidity. WHO STEPS instrument is a standard tool proposed for surveillance of Non-Communicable Diseases (NCD) risk factors. The study was aimed to assess risk factors for cardiovascular diseases in the employees of tertiary care hospital using WHO STEPS instrument.

Materials and Method: WHO "STEPwise approach to surveillance of non-communicable diseases" methodology was used to conduct a cross-sectional survey among 290 employees aged 20-60 years.

Results: The mean age of the study population was 39.05 out of which men constituted 52.06%. There were the almost equal proportion of males and females with a slight male preponderance (52.06% vs. 47.93%). Family history of hypertension 22.07%, diabetes 20%, history of CVD deaths 10%, current smokers 15.52%, alcohol intake 38.28%, tobacco consumption 41.03 %, obese & overweight (≥23 kg/m^2) 44.49% were the prevalent major cardiovascular risk factors. 3.08% had a >10% risk of developing CVD in next 10 years.

Conclusion: High prevalence of cardiovascular risk factors was seen which can lead to increased morbidity and mortality. Regular health checkup camps should be conducted to combat the disease burden and create awareness.

Keyword: *Cardiovascular Risk, Hospital employee, Tertiary care.*

Introduction

Cardiovascular diseases (CVDs) are the number one cause of death globally. An estimated 17.7 million people died from CVDs in 2015, representing 31% of all global deaths. Out of this, 82% are in low- and middle-income countries.[1] According to the 2012 Global Health Observatory report for India, the age-standardized mortality rate for CVD was 306.3/100 000 population.[2] Currently India experience CVD deaths at least a decade earlier than their counterparts in countries with established market economies (EME).[3] It is predicted that by 2020, 2.6 million people will die in India due to coronary heart disease constituting 54.1 % of all CVD deaths.[3,4] With the current burden of CVD, India would lose $237 billion over the period of 10 years due to loss of productivity and spending on health care.[5]

Much of this burden is already evident due to the increased lifespan and adaptation to the adverse lifestyle in urban as well as in semi-urban population. This can be attributed to inadequate preventive health behavior

Corresponding Author:
Dr. Gajendra Agrawal
Associate Professor Dept. of Cardiology, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi Meghe Wardha-442001

among the Indian population. Along with this, lack of health awareness and low detection and control rates plays a major role.[6] Most of the behavioral risk factors such as poor nutrition, stress, physical inactivity, smoking, and alcohol consumption are potentially modifiable and preventable, cessation of which have been shown to reduce the risk of cardiovascular disease.[7-9]

Nowadays, health promotion and preventive health activities are increasingly being carried out in workplaces. These have dual benefits as they not only help to prevent occupational diseases but also helps in assessing and improving worker's overall health.[10,11] Such types of initiatives create conducive environments for motivating people to adopt and sustain healthy behaviour. Such initiatives for health promotion have been proposed by the World Health Organization for improving the population health. One of the components of this approach is to conduct risk factor surveillance.[12]

Tertiary care hospitals with adequate healthcare infrastructure are ideal settings for initiating these preventive and promotional activities and various studies have already been conducted so far in employees of urban setups.[6,13,14] On the similar ground we planned this study to assessed risk factors for cardiovascular diseases amongst the employees of rural tertiary care hospitals using the WHO STEPS approach (STEPs 1, 2 and 3) to understand the prevalence of risk factors and risk factor profiling.

Material and Method

A cross-sectional study was conducted in the 290 employees at Acharya Vinobha Bhave Rural Hospital (AVBRH), Sawangi (M), Maharashtra during a period of 2018 to 2020. Written informed consent was taken from all employees prior to their enrollment. The study was approved by the Institutional Ethics Committee. All the employees of both gender of 18 to 60 years of age, in administrative and non-administrative positions like electricians, plumbers, carpenters, typists, clerks, computer operators, engineers, civil contractors, ground staff, public relation officers and willing to give informed consent were included in the study. Medical and paramedical employees and those who were not willing to give consent were excluded from the study.

Participants of the study were approached individually and the purpose and conduct of the study was explained to them. The data for the study was collected using the adapted STEPS instrument.[15] STEPS instrument is a standard tool proposed by WHO for surveillance of non-communicable diseases (NCD) risk factors. It consisted of 3 steps. STEP 1 (Questionnaire) involved the implementation of a validated questionnaire that is suitably modified for the easy understanding of the subjects. It seeks information on core socio-demographic information (education, occupation, and income); core behavioral measures (self-reported tobacco use, alcohol intake, diet, and physical activity). STEP 2 (Physical measurements) involved the recording of blood pressure, heart rate and anthropometric measurements like height, weight, hip, and waist circumference as per standard protocols. STEP 3 (Biochemical measurements) involved biochemical measurements such as blood glucose, blood lipids, urinary sodium and creatinine, triglycerides and HDL cholesterol levels.

Data were collected using "Cardiovascular Disease Risk Factor Surveillance Questionnaire" which consisted of four sections (i) Demographic information section (ii) behavioral measurement section (iii) physical measurement section and (iv) biochemical measurement section.

To complete STEP 1 participants were interviewed as per the questionnaire and the data was entered in the data sheet. The subjects were interviewed under adequate privacy. To complete STEP 2, anthropometric and clinical measurements were taken. All the equipment (like weighing machine, electronic blood pressure machine) used for measurements were calibrated. Weight was measured (to the nearest 0.5 kg) with the participants standing motionless on a bathroom weighing scale without shoes or any heavy outer garments, and weight equally distributed over each leg. Height, waist circumference and hip circumference were measured (to the nearest 0.1 cm) using a standard non-elastic tape. Height was measured with the participant standing erect against a wall, without shoes, and the head looking straight. To measure waist circumference participant was asked to stand with the arms by the sides and to breathe out normally. Standing to the side of the participant, the inferior margin (lowest point) of the last rib and the crest of the ileum (top of the hip bone) was located and marked with a fine pen. The midpoint between the two was marked and measurement for waist circumference was then taken at the level of this midpoint. Hip circumference was measured around the maximum circumference of the hips. Clinical parameters like sitting blood pressure were measured using an

electronic blood pressure machine (to the nearest 1 mm Hg). Two readings were taken at an interval of 10 min. If the difference between the two readings was more than 10 mmHg, a third reading of BP was also recorded. The mean of 2 (or 3) readings was taken as the final measurement.

To complete STEP 3 date and time was fixed with the participant as per his/her convenience for biochemical investigations. Blood and urine samples were collected and sent to a central laboratory for further investigations. Urinary sodium and creatinine were analysed in XD Electrolyte Analyser and blood glucose, lipids, triglycerides and HDL cholesterol levels were analysed using RX Daytona and RX Imola.

Risk factor profiling of the individuals above 40 years of age was done using WHO/ISH risk prediction chart. **(Figure 1)** WHO/ISH risk prediction charts indicate 10-year risk of a fatal or non-fatal major cardiovascular event (myocardial infarction or stroke), according to age, gender, blood pressure, smoking status, total blood cholesterol, and presence or absence of diabetes mellitus. The charts provide approximate estimates of CVD risk in people who do not have established coronary heart disease, stroke, or other atherosclerotic diseases. [14, 16]

Statistics: Statistical analysis was performed using the IBM SPSS statistics version 17.0. Quantitative data was expressed in Mean and Standard deviation and qualitative data was expressed in number and percentage. Chi-square test and Fisher's exact test were used to analyse qualitative data. The p values <0.05 were considered as statistically significant.

Results

Total of 290 employees participated in the survey and completed all the three steps of STEPS program.

Demographics: Mean age of the participants in our study was 40.08 ± 8.94 years (range 20-60 years), with a maximum number of participants in the age group of 30 to 50 years. 52.07% were male and 47.93% were female. Most of the participants had completed secondary school (37.59%) or high school (31.03%). 76.55% of participants were married. Detailed demographics are given in **Table 1**.

Prevalence of major cardiovascular risk factors:

Behavioural measurements: 15.52% of participants had a habit of regular smoking, 41.03% had a habit of tobacco chewing and 38.28% had a habit of alcohol consumption. All these habits were observed in male participants of the study. Only one female participant had a habit of chewing tobacco (**Table 2**).

There was an inadequate intake of fruits and vegetables in the diet. 22.76% did not eat fruits at all in a week while 3.45% of the subjects ate it on all days. On an average, participants consumed fruits for 1.52±1.48 days and vegetables for 6.43±0.79 days. 13.79% participants reported that they took extra helpings of salt in their meals.

56.12% women participants in the study were physically inactive as compared to 37.75% of male participants. A family history of; hypertension was present in 22.07%, diabetes mellitus in 20%, hypercholesterolemia in 2.41%, and CVD in 10%. 7.59% of the participants were already a known case of hypertension, 1.72 % was known case of diabetes, 6.55% were known case of hyperlipidemia and 2.41% were known cases of cardiovascular diseases (**Table 2**).

Physical measurements: On blood pressure measurement, 16% of the studied participants were found to be hypertensive and 30% to be pre-hypertensive with a slight preponderance in male participants (**Table 3**). BMI measurements show that 26.20% of participants were obese with BMI ≥25 kg/m^2, 18.28% were overweight with BMI of 23-24.9 kg/m^2 and 8.97% were underweight with BMI of <18.5 kg/m^2. Central Obesity was noted in 62% males and 58% of females. The range and mean of various bio-physiologic parameters were as elaborated in **Table 4**.

The mean body mass indices of both males and females were greater than 25 (the cut-off limit for obesity as per Indian guidelines). The mean waist circumference and mean waist-hip ratio in both male and female groups, i.e. 96.3 cm and 1.0 respectively in males, and 89.2 cm and 0.9 respectively in females, were greater than the cut-off limits for abdominal obesity as per Indian guidelines.

The mean height, weight, waist circumference and waist hip ratio in both male and female are 66.10 ± 3.40, 65.68 ± 11.52, 87.02 ± 10.93, 0.92±0.05 and 62.13 ± 2.92, 55.96 ± 9.64, 82.09 ± 9.65, 0.86±0.05 respectively (**Table 5**).

Biochemical measurements: Biochemical measurements demonstrated that blood glucose, total

cholesterol, serum sodium, serum creatinine and triglycerides were within normal limits for both male and females except for HDL cholesterol which were lower for both male and female (**Table 5**).

Risk Profiling: CVD risk was assessed by using WHO risk assessment chart in 48.9% participants who were above 40 years of age. Accordingly, it was observed that 95% of participants had CVD risk below 10%, 2.81% had CVD risk of 10 to 20% while only 2% participants had risk level above 20% (**Table 6**).

Table 1: Demographic characteristics of the study subjects

Demographic characteristics	Males n(%)	Females n(%)	Total n(%)
Age group (years)			
20-29	31(20.53%)	15(10.79%)	46(15.86%)
30-39	53(35.10%)	48(34.53%)	101(34.83%)
40-49	52(34.44%)	50(35.97%)	102(35.17%)
50-59	15(9.93%)	26(18.71%)	41(14.14%)
≥60	0(0%)	0(0%)	0(0%)
	151 (52.06%)	139 (47.93)	290 (100%)
Educational Qualification			
Illiterate	0(0%)	14(10.07%)	14(4.83%)
Primary school	1(0.66%)	14(10.07%)	15(5.17%)
Secondary school	47(31.13%)	62(44.60%)	109 (37.59%)
High school	70(46.36%)	20(14.39%)	90 (31.03%)
College	22(14.57%)	15(10.79%)	37 (12.76%)
Post-graduation	11(7.28%)	14(10.07%)	25 (8.62%)
Religion			
Hindu	127(84.10%)	105(75.54%)	232(80%)
Other	24(15.89%)	34(24.46%)	58(20%)
Marital status			
Married	118(76.15%)	104(74.82%)	222(76.55%)
Separated/Divorced/widowed/unmarried	33(21.85%)	35(25.17)	68 (23.44%)

Table 2: Prevalence of major cardiovascular risk factors and morbidities

Risk factor	Males n (%)	Females n(%)	Total n(%)
Smoking	45(29.80%)	0(0.00%)	45(15.52%)
Chewing Tobacco	118(78.15%)	1(0.72%)	119(41.03%)
Alcohol	111(73.51%)	0(0.00%)	111(38.28%)
Physical Inactivity	57(37.75%)	78(56.12%)	135(46.55%)
Family history of Hypertension	39(25.83%)	25(17.99%)	64(22.07%)
Family history of diabetes mellitus	29(19.21%)	29(20.86%)	58(20.00%)
Family history of Cholesterol	4(2.65%)	3(2.16%)	7(2.41%)
Family history of CVD deaths	18(11.92%)	11(7.91%)	29(10.00%)
K/c/o hypertension	14(9.27%)	8(5.76%)	22(7.59%)
K/c/o diabetes	2(1.32%)	3(2.16%)	5(1.72%)
K/c/o Cholesterol	14(9.27%)	5(3.60%)	19(6.55%)
K/c/o CVD	5(3.31%)	2(1.44%)	7(2.41%)

Table 3: Blood pressure of the study subjects

Blood Pressure (mmHg)	Males n(%)	Females n(%)	Total n(%)
Normal	69(45.70%)	88(63.31%)	157(54.14%)
Pre-Hypertension	60(39.74%)	27(19.42%)	87(30%)
Grade I	10(6.62%)	14(10.07%)	24(8.28%)
Grade II	8(5.30%)	6(4.32%)	14(4.83%)
Grade III	4(2.65%)	4(2.88%)	8(2.76%)

Table 4: BMI and central obesity of subjects

BMI (kg/m^2)	Males n(%)	Females n(%)	Total n(%)
Underweight (<18.5)	9(5.96%)	17(12.23%)	26(8.97%)
Normal (18.5-22.9)	71(47.02%)	64(46.04%)	135(46.55%)
Overweight (23-24.9)	23(15.23%)	30(21.58%)	53(18.28%)
Obese (≥25)	48(31.79%)	28(20.14%)	76(26.20%)
Total	**151 (52.06%)**	**139 (47.93%)**	**290 (100%)**
Central Obesity (using W-H ratio)	93(61.59%)	80(57.55%)	173(59.66%)

Table 5: Physical and biochemical measurements of subjects

Parameters	Males (mean ± SD)	Females (mean ± SD)	Total (mean ± SD)
Physical measurement			
Systolic BP (mmHg)	123.52 ±13.54	121.92 ±14.53	122.76 ± 14.02
Diastolic BP (mmHg)	82.95 ± 10.97	79.39 ±10.64	81.24 ± 10.94
Height (Inches)	62.13 ± 2.92	62.13 ± 2.92	64.20 ± 3.74
Weight (kg)	65.68 ± 11.52	55.96 ± 9.64	61.02 ± 11.70
Waist Circumference (cm)	87.02 ± 10.93	82.09 ± 9.65	84.66 ± 10.61
Hip Circumference (cm)	94.64 ± 10.44	95.16 ±10.21	94.89 ± 10.32
Heart Rate (bpm)	78.79 ± 12.42	80.71 ± 12.00	79.71 ± 12.24
Biochemical Measurements			
Random Blood glucose (mg/dl)	108.47 ± 22.09	113.88 ± 36.68	111.07 ± 30.05
Total cholesterol (mg/dl)	169.75 ± 28.88	173.55 ± 32.34	171.57 ± 30.59
Serum sodium (mmol/l)	141.26 ± 2.83	141.39 ± 3.40	141.33 ±3.11
Serum creatinine (mg/dl)	0.97 ± 0.15	0.89 ± 0.15	0.93 ± 0.15
Triglycerides (mg/dl)	148.02 ± 62.81	147.06 ± 68.67	147.56 ± 65.57
HDL Cholesterol (mg/dl)	35.74 ± 5.21	37.40 ± 5.97	36.53 ± 5.64

Table 6: 10-year risk of cardiovascular disease according to WHO/ISH risk prediction chart

Risk Level (% risk)	n(%)
<10%	135(95.07%)
10 to <20%	4 (2.81%)
20 to <30%	1 (0.7%)
30 to <40%	1 (0.7%)
≥40	1(0.7%)
Total	**142 (100%)**

Discussion

This cross-sectional survey was planned to study the prevalence of cardiovascular risk factors and to study the health practices among the administrative and non-administrative employees of the tertiary care rural hospital. These employees were chosen for the study as they constitute the least health-conscious population in a hospital set up in spite of having proximity to health care facilities, health care programs and even to healthcare professionals.

The survey revealed the prevalence of various CVD risk factors in the study population which comparatively belongs to the young age group. Nearly 30% of male in our study were smokers and 74% were consuming alcohol. This prevalence was higher compared to other studies conducted in a similar hospital setting.[11,12] Tobacco chewing was found to be a very common practice among the study participants with nearly 80% male chewing it on a regular basis. This can be attributed to the customary habit of people of this part of India.

A higher number of women were physically inactive as compared to men. This may be because they were more involved in table jobs. Prevalence of overweight and obesity including abdominal obesity were observed in 18 to 26% of our participants. Though these levels were lower as compared to other similar studies,[11, 12] some studies done in Asians had observed a higher susceptibility to cardiovascular risk factors at lower BMIs.[17] Only 7.59% of the participants knew that they were hypertensive and only 20% knows that they had a family history of hypertension and diabetes. On the measurement of their blood pressure during the study, 30% of the study participants were found to be pre-hypertensive and 16% as hypertensives. Surprisingly, they all were unaware of this fact before participation in the study. Blood sugar levels, total cholesterol, and triglyceride levels were found to be in normal range on measurement, but mean HDL levels were found to be below 40 mg/dl in the study participants which indicates increase risk of CVD in them. Findings of our study were comparable to similar cross-sectional studies conducted in other hospital set-ups.[15, 16]

Risk profiling done in our participants shows that 95% belongs to the low-risk group and only 5% participants had >10% risk of developing cardiovascular diseases in the next 10 years. But as our study population is very small, 5% participants with >10% risk becomes an alarming finding. Low risk does not really mean that these participants would not develop the disease in near future and hence preventive and conservative management focusing on lifestyle and dietary modifications should be advised to all irrespective of the severity of the risk[18].

This study helped us to understand the knowledge and attitudes of the employees towards cardiovascular diseases and their implementation of preventive health behavior. Findings suggest that our participants, who are employees in a hospital-setups constitutes the least health-conscious population. They were not concern about the regular check-ups and screening programs which can help them in the early detection and initiation of steps to curb the morbidity and mortality related to CVDs.

Necessary steps have to be initiated to increase awareness among the employees by implementing low-cost programs at workplaces. Regular check-up camps need to be organized for employees as part of hospital policy. Health check-up in these camps can reveal the risk factors, management of which help lowering the risk of cardiovascular diseases. Routine medical appointments should strictly include measurements of body weight and blood pressure which can help in early detection of risk factors of CVDs. Also, policy measures that restrict chewing and smoking of tobacco at work should be implemented. Employees should be encouraged to involve more in physical activity and to have a balanced and nutritious diet. Health education programs should be implemented to increase awareness of healthy lifestyle. As workplaces can serve as an effective environment for conducting similar studies and spreading awareness such studies should be planned in more numbers. This can help in bringing down the morbidity and mortality rates of CVDs by early detection of risk factors.

The study has few limitations; the study subjects were employees, so they were not aged above 60 years. Sample size was small (n=290) and hospital based hence it does not represent the general population. This was a cross sectional survey, data collected here is only useful for characterizing the prevalence of a risk factor in a study population and is not able to infer any causation.

Ethical Clearance: Taken from institutional ethics committee.

Source of Funding: Self.

Conflict of Interest: Nil.

References

1. World Health Organization, Cardiovascular Disease-Key Facts. Link : http://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds).
2. Pednekar MS, Gupta R, Gupta PC. Illiteracy, low educational status, and cardiovascular mortality in India. BMC Public Health. 2011;11:567.
3. National Cardiovascular Disease Database. IC HEALTH. Supported by Ministry of Health & Family Welfare, Government of India and World Health Organization. http://www.searo.who.int/india/topics/cardiovascular_diseases/NCD_Resources_National_CVD_database-Final_Report.pdf
4. Reddy KS, Shah B, Varghese C, Ramadoss. Responding to the threat of chronic diseases in India. Lancet. 2005;366:1744–1749.
5. Global Atlas on Cardiovascular Disease Prevention and Control. Geneva, Switzerland: World Health Organization; 2011.
6. Prabhakaran D, Shah P, Chaturvedi V, Ramakrishnan L, Manhapra A, Reddy-KS. Cardiovascular risk factor prevalence among men in a large industry of northern India. Natl Med J India. 2005 Mar–Apr;18(2):59–65.
7. Reddy KK, Rao AP, Reddy TP. Socioeconomic status and the prevalence of coronary heart disease risk factors. Asia Pac J Clin Nutr. 2002;11(2):98-103. .
8. Gupta R, Gupta VP, Sarna M, et al. Prevalence of coronary heart disease and risk factors in an urban Indian population: Jaipur Heart Watch-2. Indian Heart J. 2002;54(1):59-66.
9. Sugathan TN, Soman CR, Sankaranarayanan K. Behavioural risk factors for non-communicable diseases among adults in Kerala, India. Indian J Med Res. 2008;127(6):555-563.
10. World Health Organization. Healthy Workplaces: A Model For Action: For Employers, Workers, Policymakers and Practitioners. Geneva: WHO; 2010. Available from: http://www.who.int/occupational_health/publications/healthy_workplaces_model_action.pdf.
11. World Health Organization. The Bangkok Charter for health promotion in a globalized world. Geneva: WHO; 2005. Available from http://www.who.int/healthpromotion/conferences/6gchp/hpr_050829_%20BCHP.pdf?ua=1.
12. World Health Organization. 2008-2013 Action plan for the global strategy for the prevention and control of noncommunicable diseases. Geneva: WHO; 2009.
13. World Health Organization. The WHO STEP Wise Approach to Chronic Disease Risk Factor Surveillance (STEPS)-Instrument v2.1.
14. World Health Organization. Prevention of Cardiovascular Disease-Guidelines for Assessment and Management of Cardiovascular Risk. Geneva: WHO; 2007.
15. Aswin K, Arun G. Ghorpade. et al. Cardiovascular Disease Risk Factor Profiling of Group C Employees in JIPMER, Puducherry. Journal of Family Medicine and Primary Care. 2014;(3):255–259.
16. Sharma D, Vatsa M, Lakshmy R, Narang R, Bahl VN, Gupta SK. Study of cardiovascular risk factors among tertiary hospital employees and their families. Indian Heart Journal. 2012;64:356-363.
17. Bahl VK, Prabhakaran D, Karthikeyan G. Coronary artery disease in Indians. Indian Heart J. 2001;53:707-713.
18. Dr. Dilip Ratnani and Dr. Ambad Ranjit prevalence of myocardial infarction in young adults at durg district chhattisgarh: clinical presentation and risk factors. European Journal of Pharmaceutical and Medical Research (ejpmr), 2018, 5(6), 760-763.