Original Research Article

Evaluation of risk factors of cardiovascular diseases among patients at RIMS hospital in Ranchi, Jharkhand

Anushil Anand[1], Deepra Ghosh[2], Prakash Kumar[3], Pritam Lenka[4], Bappa Biswas[4], Sajalendu Ghosh[4]*

[1]Department of Environmental Science, Dr. Shyama Prasad Mukherjee University, Ranchi, Jharkhand, India
[2]Department of Statistics, Fox School of Business, Temple University, Philadelphia, USA
[3]Department of Cardiology, Rajendra Institute of Medical Science, Ranchi, Jharkhand, India
[4]Department of Zoology, Dr. Shyama Prasad Mukherjee University, Ranchi, Jharkhand, India

*Correspondence:
Dr. Sajalendu Ghosh,
E-mail: ghosh.sajal@gmail.com

ABSTRACT

Background: The substantial death toll and disability caused by the global rise in cardiovascular diseases (CVDs) can be largely reduced by assessing and managing the associated risk factors. The 40-69 years age group is most vulnerable to CVDs, accounting for 45% of all deaths. Data on this context for the state of Jharkhand is lacking and the present study was initiated to bridge the gap.
Methods: Risk assessment of common people and patients of CVD was done following WHO's STEP-wise approach to the surveillance of chronic disease risk factors (WHO 2001) using a structured questionnaire, measurement of anthropometrical parameters, and biochemical analysis of blood samples.
Results: The incidence of CVD is higher in men than in women (8:2), and common risk factors were abnormal lipid parameters and obesity. Compared to asymptomatic common people not under any treatment, CVD patients not under therapeutic intervention to lower lipid levels had a 48-, 34-, and 17-fold higher chance of having aberrant total cholesterol (TC), low-density lipoprotein (LDL), and cholesterol ratio (CR), respectively. Low serum levels of HDL are 3.37 times more likely to occur in females than males. The majority of female patients develop CVD between the ages of 40 and 69; however, 89% of all patients were in the 30-50-year-old age range.
Conclusions: Males are more prone than females to develop CVD mainly due to deranged lipid profiles; nevertheless, between 40 -69 ages, the occurrence of female (68%) patients outnumbers male (63%) patients mainly due to menopause and related metabolic syndromes.

Keywords: CVD, Patients, Lipid parameters, Risk factors, Obesity, Hypertension

INTRODUCTION

In 2019, CVDs were responsible for 38% of all non-communicable disease (NCD)-related fatalities worldwide.[1] CVD has mostly affected low- and middle-income countries (~75%). Most of Asia and Eastern Europe had the highest rate of CVD-related mortality registered in 2020.[2] In every European nation except for France, Netherlands, and Spain, CVD is the most frequent cause of death for women and the greatest cause of death for men.[3] The age-adjusted CVD mortality rate for men and women in India is 386 and 283 per lakh respectively which are comparable to other South Asian countries but much higher than in the US and most of Europe.[4] In India, 63% of total deaths were due to NCD in 2016 of which 27% were attributed to CVDs. Here the 40-69 age group is especially vulnerable to CVDs which account for 45% of deaths.[5] Within India, high mortality was reported in Goa,

Tamil Nadu, Andhra Pradesh, and Punjab but Uttar Pradesh, Madhya Pradesh, and Rajasthan had low mortality rates.[6] Over the last 60 years, the registrar general of India stated that the prevalence of coronary heart disease has increased simultaneously in both rural and urban populations of India.[7] A recent survey revealed the highest risk of CVD in Kerala (19.5%) and the lowest in Jharkhand (13.2%).[8] Major modifiable and non-modifiable risk factors of CVDs include high blood cholesterol, high blood pressure (Hypertension), high body mass index (BMI), Diabetes, alcohol consumption, smoking, physical inactivity, gender, heredity, age, stress, birth control pills, sex hormones, extra oil and salt consumption, diet preference, etc.[9,10]

As per a cohort study in the United States, comparison between the years 1970 and 1950, significant improvements were found in CVD risk factors like serum cholesterol levels, systolic blood pressure, hypertension management, and lowering cigarette smoking.[11]

In the adult population, multiple modifiable risk factors like alcohol use, hypertension, dyslipidemia, cigarette smoking, diabetes, etc. become additive to render greater risk that can be managed by lifestyle modification.[12]

Despite significant regional variations in CVD incidence, the epidemic spreads in India mainly due to the reversal of social gradients, smoking, and taking fewer fruits and vegetables in the diet. Furthermore, the majority of the population with lower socioeconomic backgrounds frequently does not receive proper therapy, which worsens the disease outcomes.[13] Among Indian adults, within 25 years, the percentage of age-adjusted hypertension prevalence increased from 29.5 to 36.1 by 2016.[14] It was reported from our group that the non-tribal urban people of Jharkhand showed an almost 2-fold increase in obesity and hypertension than tribal-dominated rural people.[15]

The main objective of this work was to identify the primary risk factor(s) associated with CVD patients and compare their intensity and existence (if any) to those of the general asymptomatic population of the state.

METHODS

Study design and setting

This investigation was designed to determine the type of risk factor prevalence among hospitalized CVD patients with chest discomfort and breathing trouble. The survey was done between July 2022 and June 2023 in the cardiology department of the main tertiary care government hospital in Ranchi, Rajendra institute of medical science (RIMS).

The study was conducted following WHO's (World health organization) STEP-wise approach to the surveillance of chronic disease risk factors.[16] These steps involve:

Step 1: questionnaire

Using a structured questionnaire, the demographic and socio-economic information including age, gender, address, medical history of co-morbidity, and risk factors for CVD, etc. was accessed.

Step 2: Measurement of anthropometric parameters

A digital weighing machine of (error±0.1 kg) and a non-elastic measuring tape fixed on a wooden board were used to obtain weight and height measurements for calculating BMI.

A manual sphygmomanometer was used to collect the blood pressure measurement of the patient completely at rest after the instrument was tested for reliability. Mean arterial pressure (MAP) was calculated by the formula:

MAP=DP+1/3 (SP-DP) {where DP=diastolic pressure and SP=systolic pressure}.

Step 3: Blood sample

The patient's blood sample was drawn from the antecubital vein (after a 10–12 hour fast) by trained personnel to obtain lipid profiles like high-density lipoprotein (HDL), low-density lipoprotein (LDL), triglyceride (TG), total cholesterol (TC), and cholesterol ratio (CR). For the study, high plasma of TC >200 mg/dl, triglycerides >150 mg /dl, high-density lipoprotein cholesterol ≤40 mg/dl in males and ≤50 mg/dl in females, and low-density lipid cholesterol >130 mg/dl, cholesterol ratio >5 were defined abnormal lipid parameters. Similarly, >25 BMI and >100 MAP values were considered abnormal for non-lipid risk factors.

Ethical clearance

Ethical approval for the proposed study was obtained from Rajendra institute of medical sciences, Ranchi (Protocol no. R94/22, IEC registration No. ECR/769/INST/JH/2015/RR-21). Also, a duly signed written consent and a filled-up questionnaire were obtained from each participant after giving explanatory information.

Study population and sample size

The target population includes all symptomatic adult males and females aged 18 to 69 years who came to the cardiology department of RIMS, Jharkhand, India for treatment. People from three districts (Ranchi, Khunti, Bokaro) usually come for consultation in the RIMS, the main tertiary care government hospital of Jharkhand. The required sample size was calculated as 960 at a 95% confidence level of z score (1.96) with a 3.1% margin of error for the total population of 5.56 lacks-of the three adjoining districts catered by this main government hospital RIMS at Ranchi. The sample size for this survey was set at 1000 to be on the safe side to evaluate the prevalence rate of CVD risk factors.

Inclusion and exclusion criteria

All adults below 70 years came for treatment to the cardiology department of RIMS, Ranchi, with a complaint of chest discomfort and shortness of breath were included. Pregnant females, mentally retarded persons, and those not willing to participate were excluded.

Data collection and statistical interpretation

As per the guidelines of WHO, a questionnaire was prepared and completed by the interviewer taking information from the willing participants. The biochemical parameters like HDL, LDL, TG, TC, CR, MAP, and BMI data were collected from the participants.

The statistical analysis was performed using the program 'R' Studio Server 2023.09.0 Build 463, and each questionnaire was assigned a code.[17] Multivariate logistic regression analysis (MLRA) was performed to compare risk factors within the 1000 patients and gender and age-wise change in CVD incidence rate.[18] A MLRA was performed to compare the risk factors of the CVD patients with the previously reported data (lipid profile, BMI, and MAP value) of the common asymptomatic people of this area.[15,19] P<0.05 was considered statistically significant.

Clinical trial registration

This prevalence study of CVD risk of patients did not entail any clinical trial to perform and thus no registration was required.

RESULTS

In this CVD risk assessment study carried out in the cardiology department of RIMS, Ranchi, 1000 patients were included. Male and female shares of total participants were (79.9%) and (20.1%) respectively. Risk factors like lipid profiles, obesity (BMI), and hypertension (MAP) were mainly considered to assess the probable contribution of the risk factor(s) of the CVD patients.[20] From the LDL, HDL, and triglyceride data, two important parameters i.e., cholesterol ratio (CR), and TC were calculated and considered as major deciding factors in recent reports, to render cardiovascular abnormalities in any given population.

Patients with abnormal HDL, LDL and TG levels

Most strikingly it was observed that HDL (good cholesterol) levels in the patients were especially at abnormal range. Almost 88% of the male and 96% of female patients had low levels of HDL (<40 for males and <50 mg/dl for females) in their blood constituting almost 88% of the total patient population showed less than the required level of HDL (Table 1). Unlike HDL, an increased level of LDL (more than 130mg/dl) is considered harmful to the heart and almost 55% of the patients under the survey had more than the required level

of LDL in their blood. Female patients showed comparatively less severity of abnormal LDL levels (46%) than males (56%) (Table 1). 28% of surveyed patients in RIMS Hospital showed more than the required amount (>150 mg/dl) of TG in their blood. The female share of patients with more than 150 mg/dl of TG was a little more (36%) than the male share (30%). Except for HDL, neither LDL nor TG separately could be assigned as responsible for making a person experience CVD as evidenced by the results of the present study (Table 1).

Gender-wise distribution of patients with abnormal TC and CR levels

TC was calculated by adding the values of LDL, HDL, and 20% of the triglycerides. Almost equal percentages of male (47) and female (45) patients were shown to have high levels of TC (>200 mg/dl) in their blood. However, TC levels in the patient's blood alone were not found responsible for imposing CVD in more than half of the total symptomatic (Table 1).

In recent times, as CR has been proven as the potent indicator (Predictor) of CVD, this parameter was also included to evaluate its significance in this particular demography. CR was calculated by dividing the TC value (TC) by the HDL value; CR= TC/HDL. Almost 85% of patients in our study showed the increased value of the CR where the male share is a little higher (85.73%) than the female (82.09%).

TC value may increase with the changes in all three parameters LDL, HDL, and TG. But in our case, it was the value of HDL (less than the optimum value) that maximally affected the value of CR to become >5 than the set standard (5 or less) (Table 1).

BMI and MAP status of the patients

The percentage of female patients showing overweight (BMI >25 and <30) was a little higher than that of male patients. While considering obese patients (BMI >30), males were more in number (28%) than females (18%). Thus, BMI levels including both overweight and obese patients (65.1%) play a crucial role in making a person more vulnerable to CVDs (65.83% males and 62.19% females) (Table 1).

MAP value as an indicator of hypertension and is considered one of the contributors to CVD and an indicator of perfusion pressure. MAP values between 70-100 mmHg are considered normal and above that value marks hypertension. With almost equal contribution of males and females, a total of 33% of patients had MAP values above 100 mmHg, which was a little higher than the value in the Indian perspective but almost equal to the proportion of the common people of America where every third person has been reported as hypertensive. So, the contribution of hypertension, confirmed through MAP values, in making people of Jharkhand more vulnerable to CVD stands unreal at least from the results of this study (Table 1).

Table 1: Gender-wise distribution of the number of patients showing normal and abnormal categories of lipid parameters.

Lipid parameters	Category as per concentration in the serum	No. of male (M) patients (%)	No. of female (F) patients (%)	Total patients (%)
HDL	Good: M>40 mg/dl, F>50 mg/dl	109 (13.64)	9(4.48)	118 (11.8)
	Bad: M≤40 mg/dl, F≤50 mg/dl	690 (86.36)	192 (95.52)	882 (88.2)
LDL	Good: ≤130 mg/dl	364 (45.56)	91 (45.27)	455 (45.5)
	Bad: >130 mg/dl	435 (54.44)	110 (54.73)	545 (54.5)
TG	Good: ≤150 mg/dl	584 (73.09)	133 (66.17)	717 (71.7)
	Bad: >150 mg/dl	215 (26.91)	68 (33.83)	283 (28.3)
TC	Good: ≤200 mg/dl	229 (28.66)	58 (28.86)	287 (28.7)
	Bad: >200 mg/dl	570 (71.34)	143 (71.14)	713 (71.3)
CR	Good: ≤5	114 (14.27)	36 (17.91)	150 (15)
	Bad: >5	685 (85.73)	165 (82.09)	850 (85)
BMI	Normal weight: ≤25	273 (34.17)	76 (37.81)	349 (34.9)
	Overweight and obese: >25	526 (65.83)	125 (62.18)	651 (65.1)
MAP	Normotensive: <100	534 (66.83)	129 (64.18)	663 (66.3)
	Hypertensive: ≥100	265 (33.17)	72 (35.82)	337 (33.7)

mg/dl = milligram per deciliter. Table 1: Illustrating gender-wise prevalence of different risk factors among the CVD patients of RIMS, Ranchi. Considering the lipid parameters, 88% of the total patients showed an abnormal level of HDL and at the same time, 85% of patients were shown to have a bad cholesterol ratio. A comparative look into the prevalence of risk factors (non-lipid) in both genders among the patients of CVD admitted to the cardiology department of RIMS, Ranchi. When BMI was considered almost 65% of the total subjects were seen to be obese and overweight whereas only ~34% of patients were hypertensive even after developing CVD.

Table 2: Gender-wise number of CVD patients with % (in the parenthesis) and four major risk factors corresponding to different age groups.

Age group	No. of male (%)	The most prevalent risk factors with no of patients	No. of female (%)	The most prevalent risk factors with no of patients	Total (%)
Below 30	24 (3)	CR-18, HDL-18, TC-17, LDL-16,	0	NA	24 (2.4)
30-40	225 (28.17)	CR-196, HDL-180, TC-163, LDL-128	19 (9.45)	CR-17, HDL-17, TC-15, LDL-10,	244 (24.4)
41-50	505 (63.20)	CR-433, HDL-422, TC-356 LDL-263	138 (68.66)	CR-144, HDL-137, TC-97, LDL-78	643 (64.3)
51- 69	45 (5.63)	CR-38, HDL-35, TC-34, LDL-28	44 (21.89)	HDL-38, CR-34, TC-31, LDL-22,	89 (8.9)
Total	799		201		1000

Table 2: Illustrates the age-wise distribution of female and male patients with their corresponding four main prevalent risk factors. The maximum number of CVD patients was in the 30-50 age groups i.e., ~92% of males, and 78% of females covering 89% of the total subjects surveyed.

Age and gender-based prevalence of major risk factors

Despite all the mentioned biochemical factors, age, and gender also play vital roles in rendering a person affected by one of the other forms of CVD. In the present study, few notable trends were observed among the participants. No female patient was found in the below 30 years age group out of a total of 201 subjects while 3% of the total 799 male participants exhibited CVDs. In the 30-40 age groups, only 9.45% of females showed CVD complications compared to 28.17% of males. Interestingly female share (68.66%) of CVD patients exceeds that of males (63.20%) in the 41-50 age groups; together contributed 64.3% of the total patients surveyed from all age groups. The number of male patients drastically decreased in the 51-69 age group to 5.6% only, while an intermediate percentage of patients were recorded from females (~22%). Thus, most of the CVD patients of RIMS, Ranchi were aged between 30-50 years covering ~89% of the total subjects surveyed as shown in (Table 2, Figure 1). The percentage of male and female patients aged 41-69 years revealed that, at this age range, more females (90.5%) than men (68.8%) were at risk for CVD (Figure 2). A common trend of four major risk factors in patients of all age groups was CR > HDL > TC > LDL (Table 2).
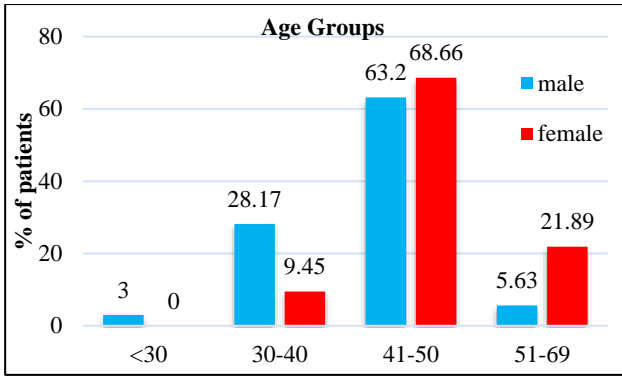
Figure 1: Bar diagram of age-wise distribution of male and female patients.
Gender-wise distribution of number of CVD patients present in hospital. Bar blue and red represent males and females respectively and % of patients is given at top of respective bars.
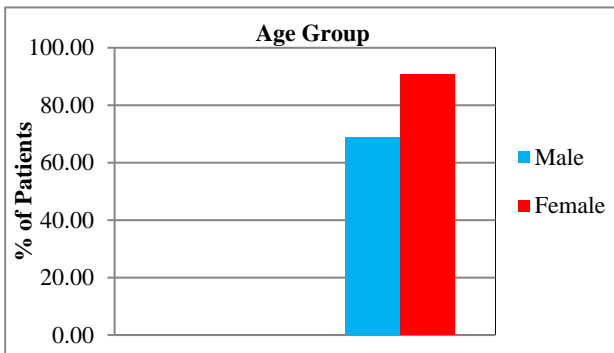

Figure 2: Gender-wise % of CVD patients of middle and above age groups (41-59).
Percentage of male and female patients between 41-69 years of age as blue and red bars respectively. More females (90%) than males (68.8%) were prone to CVD in this age group.

Odds of incidence of female CVD patients over males in different age groups

Multiple logistic regression analysis (MLRA), it was found that odds of more than 4-fold significant increase of female than male CVD patients were observed in 40-69 and also in 51-69-year-old hospitalized patient groups. In the less than 30-year-old patient group, the odds of not being a female were 0.266 times less than being a male with a p-value less than 0.0001. In patients between 40 and 50 years, there was a small (1.3) increase in the odds of being female over male (Table 3).

Synergistic effect of 2 lipid parameters among patients

Lipid parameters of blood in the derailed range have been considered one of the major factors affecting cardiovascular health. The combination of two lipid parameters maximally associated with disease burden in our study was shown to be HDL-CR which was common in ~75% of the patients and should be considered as the cornerstone of the CVD diagnosis strategy. Intermediate association of TC-HDL / CR-LDL risk factor

combinations and 59% or 52% of the total subjects were detected in this study. However, a combination of low HDL and high LDL was also found in an intermediate number of patients (~50%) both in males (43%) and females (50%). These three combinations of two lipid parameters can be utilized for diagnosing probable CVD vulnerability at least in the Jharkhand population. An insignificant association was noticed between CVD patients and the rest of the 4 combinations of abnormal lipid parameters.

Synergistic effect of 3 lipid parameters among patients

Could low HDL and high LDL and TG values in combination have exerted more vulnerability for CVDs in the participants of our study? Only 13.7% of the patient population showed abnormal levels of all three lipid parameters (HDL, LDL, and TG) and cannot be taken as a major risk factor combination for CVD at least in Jharkhand. Nevertheless, the contribution of delimited values of all three lipid parameters might have significance in female patients only as 20% of this gender showed the aforementioned trend. On the other side, a combination of abnormal levels of HDL, TC, and CR or LDL, TC, and CR was shown to happen in 48.4% and 47% of patients respectively, and could be considered for diagnosis.

Synergistic effect of lipid and non-lipid risk factors

A combination of HDL, CR, and BMI abnormal values was shared by half of the total patients studied which together showed maximum association between mixed risk factor parameters and CVD patients and could also be considered for diagnosis. However, adding either abnormal values of BMI or MAP with the aberrant values of HDL and LDL could only include 29% and 14% of patients respectively. Again, a combination of abnormal values of HDL, CR, and MAP together was common for only ~25% of the studied subjects and cannot be taken as a strong association as well.

MLRA of CVD risk factors in patients and asymptomatic people of Jharkhand

To calculate the odds ratio of different available risk factors between CVD patients of RIMS hospital and the asymptomatic common people of Jharkhand, data from two published papers along the patient's data of this study were compared).[15,19]

The odds of being a patient are 6.4 times more likely than an asymptomatic person of Jharkhand of having an abnormal value of BMI. Patients are 34, 2.26, and 1.2 times more likely than asymptomatic Jharkhand residents to have unhealthy levels of LDL, HDL, and triglycerides respectively. In comparison to asymptomatic Jharkhand locals, patients are 48.22 and, 16.64 times more likely to have harmful levels of TC and cholesterol ratio respectively.

Table 3: MLRA to show the odds ratio of occurrence of female over male CVD patients at different age groups.

Subject	Category	30-40 years age O.R. CI (95%)	41-50 years age O.R. CI (95%)	51-69 years age O.R. CI (95%)	41-69 years age O.R. CI (95%)
CVD patients of RIMS	Males	1	1	1	1
	Females	0.266 (0.162-0.437)*	1.275 (0.916-1.775)	4.695 (2.995-7.362)*	4.336 (2.641-7.119)*

*p<0.0001. Table 3: Shows the statistical interpretation of the patient data to derive the odds of being a female than being a male within different age groups, a 4-fold increase was noted in females than males within the 51-69 and also in the 51-69 age group.

Table 4: Odds ratio of different risk factors between asymptomatic common people and patients and within patients.

Subjects	Category	High BMI OR CI (95%)	High MAP OR CI (95%)	Low HDL OR CI (95%)	High LDL OR CI (95%)	High TG OR CI (95%)	High TC OR CI (95%)	High CR OR CI (95%)
MLRA to show the Odds Ratio of CVD risk factors between patients and asymptomatic people of Jharkhand								
People of Jharkhand	Asymptomatic	1	1	1	1	1	1	1
	CVD patients	6.4 (5.25-7.80)****	1.08 (0.903-1.31)	2.26 (1.77 - 2.88)****	34.03 (23.65-48.97)****	1.24 (1.02-1.5)*	48.22 (35.08 - 66.28)****	16.64 (13.30 - 20.83)****
MLRA to show the Odds Ratio of CVD risk factors based on age and gender within patients								
Age (in years)	≤ 40	Reference	Reference	Reference	Reference	Reference	Reference	Reference
	> 40	2.2 (1.66-2.94)***	0.63 (0.46-0.86)**	1.04 (0.70-1.55)	0.84 (0.64-1.12)	1.56 (1.12-2.17)*	0.90 (0.66-1.23)	0.88 (0.58-1.31)
Gender	Male	Reference	Reference	Reference	Reference	Reference	Reference	Reference
	Female	0.85 (0.61-1.17)	0.88 (0.64-1.22)	3.37 (1.67-6.77)**	1.01 (0.74-1.38)	1.39 (0.99-1.93)	0.99 (0.70-1.4)	0.76 (0.50-1.15)

****p<0.0001, ***p<0.0005, **p<0.005, *p<0.05. MLRA taking data of asymptomatic population of Ranchi as a reference to get odds ratio of being a patient considering different lipid and non-lipid risk factors. CVD patients were 34, 48.22, and 16.64 times more likely to have harmful levels of LDL, total cholesterol, and cholesterol ratio respectively when compared to asymptomatic Jharkhand locals. Simultaneously both age and gender-based odds of CVD patients among the subjects enrolled for this study. Based on age, odds of getting patients with high BMI and high TG were 2.2 and 1.56-fold more respectively in >40 age group than ≤40 age group. Also, there was a 3.37-fold significant increase in the odds of getting a female with an abnormal HDL than a male patient.

These variations in the lipid parameters of the patients were all statistically significant with p values much less than 0.05 (Table 4). MAP considered a potent risk factor was not found associated as CVD predictor in this Jharkhand population based on MLRA.

Comparison of risk factors within patients based OR

The odds of being a >40-year-old patient is 2.2 times more likely than <40-year-old patients having an abnormal value of BMI (>25). The odds of being a patient over 40 years of age were 0.63, 0.64, and 0.88 times less likely to

have abnormal MAP, LDL, and CR values respectively than a patient below 40 years of age. The odds of being a >40-year-old patient are 1.56 times more likely than <40-year-old patients having an abnormal value of TG. Female patients are substantially more likely than male patients to have an abnormal HDL value by a factor of 3.37 (Table 4).

DISCUSSIONS

As a leading cause of human death, the prevalence of various risk factors for CVD has been increasing in third-

world countries and India has been considered the core of these disasters.[21] Easy-to-follow accurate diagnostic information must be made available to physicians to combat the rising trend of CVD in India and elsewhere.[22] There are limited data on risk factor evaluation of CVD patients in the state of Jharkhand. No reports exist on the comparison of cardiovascular disease risk factors between CVD patients and asymptomatic common people of Jharkhand. This study has been conducted on CVD patients of RIMS hospital of Ranchi, Jharkhand to investigate the age and gender-wise incidence of CVDs and to determine the possible risk factors for the disease. The study also analyzed the odds ratios for the patient's risk factor(s) compared with the reported risk factor data of asymptomatic people of Jharkhand taken as a reference.

Out of 1000 CVD patients of RIMS, Ranchi, the reveals the fact that almost 79.9% share was from males and 20.1% from female subjects. In Jharkhand, this study reports, that the risk of having an abnormal value of TC was 48 times higher for patients compared to asymptomatic individuals. Patients also faced significantly higher risks of having harmful LDL and an unhealthy (>5) cholesterol ratio (CR), with odds being almost 34 and 17 times higher respectively than those for asymptomatic

common people. Symptomatic CVD patients aged 40 years or younger have a 7-fold increased inclination to develop obesity, while those over 40 years old have a 5-fold higher risk compared to their asymptomatic counterparts, as evidenced by greater than 25 BMI values. Thus, in Jharkhand, it was observed that obesity was much more below the age of 40 years people and were more prone to develop the risk of CVD than over 40 years aged people. Since male CVD patient has a 5.4-fold higher possibility of developing obesity than male asymptomatic common people and female CVD patients have a 6.74-fold more tendency to develop obesity than female asymptomatic common people, obesity of females makes them more likely to develop CVD than obese males of Jharkhand. Overall, the odds of developing obesity in symptomatic CVD patients were 4.25-times more than in asymptomatic common people of Jharkhand.

Additionally, the likelihood of developing abnormal plasma levels of HDL and triglycerides was only 2-fold and 1.24-fold higher respectively, in patients than in asymptomatic subjects of Jharkhand. Hypertension has not been found a decisive risk factor to render a person a CVD patient, since abnormal MAP values were quite comparable in both the asymptomatic and patient population, an uncharacteristic feature of Jharkhand compared to the global picture.[23] Again, compared to ≤40-year patients, > 40-year patients had a significantly lower risk (OR 0.63, 95% CI: 0.46-0.86) of having hypertension which was not usual in the rest of India.[24]

Maximum CVD patients (64.3%) irrespective of gender were reported in the 41-50 age group while 24% were in the 30-40 age group. Most female patients were between 41-69 years of age; the maximum (68.66%) was in the 41-50 age group. Heart disease was absent in women under the age of thirty since heart disease at least in females appeared to be influenced by sex hormones and it was reported that a woman's risk of having a heart attack increases significantly between the ages of 40 and 65, when most women experience menopause.[9] As per the report, premenopausal women have an estimated 18% prevalence of metabolic syndrome, but postmenopausal women have a frequency of 47%, indicating therefore, metabolic syndrome may be significantly predicted by menopause.[25,26] Results of this study on the comparison of the odds ratio between males and females for different risk factors were shown to differ drastically (Table 3, 4) and corroborated the US report stating that except for total cholesterol and BMI, significant differences in the temporal trajectories of cardiovascular risk factor values were observed between sexes.[27] The CVD risk factor profile of women in Australia was generally better than that of men concerning BMI and hypertension.[28] In this study, females showed the same lower range of BMI and hypertension but 3.37-fold more susceptibility to developing abnormal levels of HDL than males.

Statistical analysis of the CVD patients revealed that >40-year patients were significantly 2.2-fold more prone to develop obesity than ≤40-year patients. Increased triglyceride levels were 1.5-fold higher in over 40 years than in less than 40 years of age patients.

Irrespective of the age of the patients, four out of many risk factors were common and found to be present in the order of maximum to minimum CR, HDL, TC, and LDL. One of the main variables influencing cardiovascular health has been identified as serum lipid profiles in the derailed range.

Individually, abnormal HDL and CR level was found in 88% and 85% of patients respectively, while the combination of two lipid markers (HDL and CR) linked mostly with around 75% of patients and ought to be the mainstay of the CVD diagnosis approach. The strongest correlation between the presence of three mixed types of risk factors and 48.4% of total CVD patients was found with a combination of HDL, TC, and CR. This combination was found maximally in 64.68% of female patients.

CONCLUSION

Risk factor assessment of patients of a major hospital in the state of Jharkhand, India, and comparison of the same with asymptomatic common people revealed that males are 4-times more affected by CVD than females, and abnormal lipid parameters like CR, HDL, and TC with high BMI were the most likely causes. Unhealthy levels of TC, LDL, and CR were almost 48, 34, and 16 times more common in CVD patients not using any lipid-lowering drugs than in asymptomatic common people of Jharkhand not considered patients as neither under treatment nor showing any health issues. A person in Jharkhand with an abnormal BMI is 6.4 times more likely to be a patient than to be asymptomatic. Males made up more of the patient population (28%) than females (18%) when it came to obese patients (BMI>30). Hypertension though considered a major contributor to CVD is not present in a critically high percentage of patients and thus not operative at least for people of Jharkhand. The 90% of female CVD patients at a particular age above 40 years were due to menopause and its consequential metabolic abnormalities to delimit lipid parameters, especially high CR values due to low levels of HDL in the serum.

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