Original Research Article

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A study of 10 years risk prediction of CAD – applying "Framingham risk scores" among the coal mine employees of the Singareni Collieries company ltd, Telangana state, India

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ABSTRACT

Background: Cardiovascular Disease (CVD) has become the leading cause of death. Many tools for CVD risk assessment have been devised. While it is relatively easy to identify those who are obviously at high risk, the health expenditure can be predicted and necessary high risk based preventive care programmes can be introduced. The study has been taken up with an objective of assessing "10 years risk prediction of CAD, Among the Coal Mine Employees by applying "Framingham Risk Scores."

Methods: Study population: coal mine employees (30-60 years of age). Study area: Singareni Collieries Company Limited (SCCL), Telangana State, India. Study design: cross-sectional observational study. Sample size: 53367coal mine workers. Sampling methods: All coal mine employees (30-60 years) working atleast of 10 years duration and those who have given consent for the study have been included. Data collection: collected from the periodic medical examination records from 2008 to 2012. Analysis: By using Micro soft Excel 2007 and SPSS version 19.

Results: Majority of the workers were in the age group of 51-60 years of age, followed by 41-50 years (31.5%). 11.9% has mild risk, 3.2% has moderate risk and 0.6% has severe risk of CAD. Mining Surface labourers has marginally higher risk of CAD than "Mining Supervisory and Managerial Staff", Opencast mining staff were found to at higher risk of CAD.

Conclusions: Mining Surface labourers and opencast mining staff were found to at higher risk of CAD.

Keywords: Underground Mining, Open cast mining, Framingham heart score

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death and disability worldwide. It is expected that by 2020, CVD would prevail as the leading cause of death and disability over infectious diseases globally. Cardiovascular disease encompasses atherosclerotic vascular disease like coronary heart disease (CHD),

cerebrovascular disease (CBVD), and peripheral arterial diseases. In recent years, demographics and health surveys have reported increasing malaise of CVD among individuals of all socioeconomic strata. According to recent statistics, incidences of CVD-related death and disability in low-income countries have grown at an alarming pace. In 2008, Gupta et al reported that India alone is burdened with approximately 25% of

cardiovascular-related deaths and would serve as a home to more than 50% of the patients with heart ailments worldwide within next 15 years.² The seriousness of current scenario could be gauged by the fact that most CVD sufferers in India happens to be in their productive age which may potentially impose huge socioeconomic burden and devastating consequences over the coming years. In 2005, Reddy et al reported that India has incurred the highest loss in productive years of life worldwide.³ Presently, the greatest public health challenge to developing countries is to control epidemics of chronic non-communicable diseases, specifically CVD, CHD, diabetes and stroke which have caused almost doubled mortality rates than other communicable diseases in India.⁴

Over past three decades, the field of medicine has made drastic progress in diagnosis, prevention and treatment of CVD. The Framingham Heart Study and the Seven Countries' Study were the two major studies that made significant contribution in identifying major risk factors for CVD. ^{1,5} Framingham risk score is a widely recognized tool used by clinicians worldwide to calculate 10-year cardiovascular risk in an individual and classify them for risk of coronary death or myocardial infarction (MI). ⁵

The present study is done on Singareni Collieries Company Limited (SCCL), which is a Government coal mining company jointly owned by the Government of Telangana and Government of India on a 51:49 equity basis. The Framingham risk score has been utilized effectively to portend major CAD events across ethnic groups and races. The present review focuses on emerging risk factors for CAD as per Indian context of mining industry.

All the employees of SCCL are divided into six groups depending on their Position, Rank and place of work. The official categorization goes on par with the grouping.

Table 1: Grouping of study population according to type of job profile.

Groups	Description of the nature of the Activity	In Short
A	Coal filler, Badli coal filler, Coal cutter, Roof bolter, Timber man, Tyndal, General mazdoor (UG) etc.)	Mining Underground Labourer
В	Gen. Mazdoor, (surface), Boring mazdoor, Bunker mazdoor, Furnace man, Boiler attender, Bit sharpener, Blacksmith, Chainman, Hammer man etc.).	Mining Surface Labourer
C	Fitters, Electricians, Maistry, carpenter, Drivers, Lineman, Lamp room in charge, Security guards, Ward boy, Ayah etc.)	Non-Mine Surface Labourer
D	Shot-firer, Mining sirdar, Overman, Head Overman, Workman inspector, Charge H and , Munshi, Under manager, etc.	Mining Supervisory and Managerial Staff
E	Pump operators, Fan operators, Masons, Conveyer belt operators, Cook etc.)	Non-Mining Supervisory and Managerial Staff
F	Open cast mine technicians with blasting operations, working with heavy machinery, dusty and noisy environments, are included in this group. (Dumper operators, Shovel operators, Dozer operators, EP Fitters etc.)	Opencast mines Staff

Aims and objectives

- To study the prevalence of risk of CVD basing on "Framingham Risk Scores" among singareni coal workers
- To identify risk groups among the mining, nonmining staff and open cast staff.

METHODS

The data has been collected from the study subjects based on periodic medical examination. The recorded data of all 10 Health centers are captured from 2008 to 2012.

The following study was conducted to identify high risk individuals by using Framingham risk score^{[6].} Depending on the score, each individual has been categorized as Mild, Moderate and Severe risks of CAD

Study population

Coal mine employees (30-60 years of age).

Study area

Singareni Collieries Company Limited (SCCL), [Bellampally, Mandamarri, Ramakrishnapur, Srirampur, Bhupalapally, Ramagundam, 8 Incline colony, Kothagudem, Manuguru, Yellandu areas of Telangana State, India].

Study design

Cross-sectional observational study.

Sample size

53367 coal mine workers.

Study population

All coal mine employees (30-60 years) working at least of 10 years duration and those who have given consent for the study have been included.

Inclusion criteria

Study subjects who have given consent for the present study.

Exclusion criteria

Existing CAD cases were excluded. Females are not eligible to work in underground mines; hence all women workers working in surface are excluded from the study and those who are less than 30 years and not having at least 10 years of service.

Limitations of the study

Age of study subjects go as per PME records. Habit of Smoking is also not standardized as there is not objective evidence and recorded as per their statement.

Data collection

Collected from Periodic Medical Examination reports (from 2008 to 2012).

Data compilation and analysis

Data collected from Periodic Medical Examination records from 2008 to 2012 and risk prediction of CAD was done by applying "Framingham Risk Scores" was entered and analyzed with Micro soft Excel 2007 and SPSS version 19.

RESULTS

Majority of the workers were in the age group of 51-60 years of age, followed by 41-50 years (31.5%). It was found that as the age increases, the risk of CAD also increased. Out of total study population, 11.9% has mild risk, 3.2% has moderate risk and 0.6% has severe risk of CAD (Table 2 and 3).

Mining Surface labourers (B) (15%) has marginally higher risk of CAD than Underground labourers (A) (14.3%), though it is not statistically significant (Table 4a).

Table 2: Age wise distribution of the study population (n=53367).

Age in years	No (%)					
30-40	4228 (7.90%)					
41-50	16833 (31.50)	16833 (31.50%)				
51-60	32306 (60.50%)					
Table 2 (i) Ag	Table 2 (i) Age-wise Framingham's risk score distribution					
	Normal (%)	Mild (%)	Moderate (%)	Severe (%)	Total	
30-40	4084 (96.6%)	124 (2.9%)	20 (0.5%)	0 (0.0%)	4228	
41-50	15420 (91.6%)	1205 (7.2%)	194 (1.2%)	14 (0.1%)	16833	
51-60	25503 (78.9%)	5015 (15.5%)	1485 (4.6%)	303 (0.9%)	32306	
Total	45007 (84.3%)	6344 (11.9%)	1699 (3.2%)	317 (0.6%)	53367	

Table 3: Framingham's risk score distribution according to occupational groups.

Group	Normal (%)	Mild (%)	Moderate (%)	Severe (%)	Total
A	22453 (85.5%)	2973 (11.3%)	710 (2.7%)	120 (0.5%)	26256
В	8352 (85.3%)	1079 (11.0%)	293 (3.0%)	64 (0.7%)	9788
C	6024 (83.3%)	889 (12.3%)	263 (3.6%)	58 (0.8%)	7234
D	2276 (79.3%)	413 (14.4%)	160 (5.6%)	22 (0.8%)	2871
E	3300 (80.5%)	609 (14.9%)	153 (3.7%)	35 (0.9%)	4097
F	2602 (83.4%)	381 (12.2%)	120 (3.8%)	18 (0.6%)	3121
Total	45007 (84.3%)	6344 (11.9%)	1699 (3.2%)	317 (0.6%)	53367

Table 4: Comparison between mining underground and surface labourers in respect of Framingham's risk score distribution.

4a. Comparison between mining under ground (A) and surface labourers (B)				
Group/s	Normal	Risk	p value	
A	22850 (85.7%)	3803 (14.3%)	0.064	
В	8379 (85.0%)	1483 (15.0%)	0.004	
4 b. Comparison between mining labourers (A and B) and mining supervisory – managerial staff (D)				
	Normal	Risk	p value	
A and B	31229 (85.6%)	5241 (14.3%)	0.0001	
D	2297 (79.4%)	595 (20.6%)	0.0001	

4c. Comparison between mining staff (A,B and D) and non- mining staff (C,E)				
	Normal	Risk	p value	
AB and D	33526 (85.1%)	5836 (14.9%)	<0.001	
C+E	9411 (82.4%)	2007 (17.6%)	<0.001	
4d.Comparison between mining staff (A,B and D) and opencast mines staff (F)				
	Normal	Risk	p value	
A+B+D	33526 (85.2%)	5836 (14.8%)	< 0.01	
F	2613 (83.4%)	519 (16.6%)	< 0.01	

Group-D "Mining Supervisory and Managerial Staff" have found to be at higher risk of CAD than Group A and B "Mining Underground Labourer and Mining Surface Labourer" this is found to be statistically significant (p <0.05) (Table 4b).

Non-Mining staffs (C and E groups) has significant higher risk of CAD than Mining staff (A, B and D groups) (p < 0.05) (Table 4c).

Significant difference (p <0.05) was found between Mining staff (A, B and D) and Opencast mining staff (group-F) who are having higher risk of CAD (Table 4d).

DISCUSSION

Majority of the workers (60.5%) were in the age group of 51-60 years of age, followed by 41-50 years (31.5%). It was found that as the age increases, the risk of CAD also increased. Out of total study population, 3.18% has moderate risk and 0.5% has severe risk of development of CAD in 10 years.

In the study 10.6% of population had CVD risk >10%, one third (33.4%) population above 30 years had CVD risk 20% or more and the median 10-year probability of CHD was 2.9%. Kanjilal et al reported 5.32% at high risk and 14.85% at intermediate risk for CVD in the forthcoming 10 years by the Framingham score. 8

The study shows that among all subjects, 731 individuals (68%) had at least one risk factor, and 52%, 12%, 3%, and 0.7% had one, two, three, and four risk factors, respectively."

Surface labourers (B) has higher risk of CAD than Mining Underground (A) (p<0.03).

Mining Supervisory – Managerial Staff (D) have found to be at higher risk of CAD than Mining labourers (A and B) (p<0.0001)

Non-mining Staff (C and E) has significantly higher risk of CVD than Mining Staff (A, B and D) (p<0.0001). Statistically significant difference was found between mining Staff (A, B and D) and opencast mines Staff (F) (p< 0.0004). Study says that "When adjusting for age, agricultural workers had lower CVD and CHD risk scores than the technicians (mean CVD risk score (95% CI) = 5.9 (5.26-6.53) vs. 7.1 (6.27-7.92), p value = 0.026)

but were not significantly different to the managers". ¹⁰ Pereira in their study found male unskilled workers had a more favorable metabolic CVD risk factor profile than did the other groups, but they reported more cigarette smoking and alcohol consumption (p < 0.01). ¹¹

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Institutional Ethics Committee

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