Original Research Article

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

Ramakrishna Narashima Mahabhashyam*, Sunil Pal Singh, Archana Carolin, Maruti Sarma Mannava Varaprasada

Department of Community Medicine, Kamineni Academy of Medical Sciences and Research Centre, Hyderabad, Telangana, India

Received: 19 April 2017
Revised: 09 May 2017
Accepted: 10 May 2017

*Correspondence:
Dr. Ramakrishna Narashima Mahabhashyam,
E-mail: drrkmn@rediffmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

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: 53367 coal 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 Microsoft 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.1 Cardiovascular disease encompasses atherosclerotic vascular diseases 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. 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. 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.

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. 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).

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.

| 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 |
| B      | Gen. Mazdoor, (surface), Boring mazdoor, Bunker mazdoor, Furnace man, Boiler attendant, Bit sharpen, 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, non-
  mining 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
indivduals by using Framingham risk score. 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).
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 Microsoft 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).

| Age in years | No (%) |
|--------------|--------|
| 30-40        | 4228 (7.90%) |
| 41-50        | 16833 (31.50%) |
| 51-60        | 32306 (60.50%) |

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

| Age in years | 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 |

Table 2 (i) Age-wise Framingham’s risk score distribution

| Group | Normal (%) | Mild (%) | Moderate (%) | Severe (%) | Total |
|-------|------------|----------|--------------|------------|-------|
| A     | 22453 (85.5%) | 2973 (11.3%) | 710 (2.7%) | 120 (0.5%) | 26256 |
| B     | 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 3: Framingham’s risk score distribution according to occupational groups.

| Group/s | Normal (%) | Risk (%) | p value |
|---------|------------|----------|---------|
| A       | 22850 (85.7%) | 3803 (14.3%) | 0.064 |
| B       | 8379 (85.0%) | 1483 (15.0%) |       |

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

| Group/s | Normal (%) | Risk (%) | p value |
|---------|------------|----------|---------|
| A       | 31229 (85.6%) | 5241 (14.3%) | 0.0001 |
| D       | 2297 (79.4%) | 595 (20.6%) |         |
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.

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 CAD 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”. 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).

**ACKNOWLEDGEMENTS**

Dr. K. Prasanna Simha, Chief medical officer, M/S Singareni Collieries Company ltd. (A Govt. Company, Telangana state).

**Funding:** No funding sources

**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the Institutional Ethics Committee

**REFERENCES**

1. Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990-2020: Global Burden of Disease Study. Lancet. 1997;349(9064):1498-504.
2. Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. Epidemiology and causation of coronary heart disease and stroke in India. Heart. 2008;94(1):16-26.
3. Reddy KS, Shah B, Varghese C, Ramadoss A. Responding to the challenge of chronic diseases in India. Lancet. 2005;366:1744-9.
4. Prasad DS, Kabir Z, Dash AK, Das BC. Cardiovascular risk factors in developing countries: A review of clinico-epidemiological evidence. CVD Prev Control. 2010;5:115-23.
5. Wilson PW, D’Agostino RB, Levy D, Belanger AM, Silbershatz H, Kannel WB. Prediction of coronary heart disease using risk factor categories. Circulation. 1998;97:1837-47.
6. Framingham Heart study. Available at: http://www.framinghamheartstudy.org/risk/gencardio.htm laccessedHeartStudy:http://www.framinghamheart study.org/risk/gencardio.html Accessed on 30 July 2010.
7. Parikh S, Patel M, Tiwari H, Bala DV, Joshi B. Assessment of Cardiovascular Disease Risk by using Framingham Risk Equation amongst the Residents of Ahmedabad City. Natl J Community Med. 2013;4(3):392-7.
8. Kanjilal S, Rao VS, Mukherjee M, Natesha BK, Renuka KS, Sibi K, et al. Application of cardiovascular disease risk prediction models and
the relevance of novel biomarkers to risk stratification in Asian Indians. Vascu Health Risk Manag. 2008;4(1):199–211.
9. Mehrparvar AH, Mirmohammadi SJ, Mostaghaci M, Bahaloo M, Heydari M, Samimi E, et al. Prevalence of Cardiovascular Risk Factors among Tile and Ceramic Workers in Yazd, Iran” states. ISRN Prev Med. 2013;2013:921860.
10. Davis-Lameloise N, Philpot B, Janus ED, Versace VL, Laatikainen T, Vartiainen EA, et al. Occupational differences, cardiovascular risk factors and lifestyle habits in South Eastern rural Australia. BMC Public Health. 2013;13:1090.
11. Pereira MA, Kriska AM, Collins VR, Dowse GK, Tuomilehto J, Alberti KG, et al. Occupational Status and Cardiovascular Disease Risk Factors in the Rapidly Developing, High-risk Population of Mauritius. Am J Epidemiol. 1998;148(2):148-59.

Cite this article as: Mahabhashyam RN, Singh SP, Carolin A, Varaprasada MSM. 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. Int J Community Med Public Health 2017;4:2151-5.