

Prevalence of Modifiable Cardiovascular Risk Factors among Coffee Estate Workers in Rural South India (CARE)

Sir,

Cardiovascular (CV) disease is associated with high disability-adjusted life years and lifelong treatment expenditure. It disproportionately affects lower socioeconomic strata, who develop CV disease 10 years earlier, receive inferior treatment, and suffer higher short-term mortality than higher-income groups.^[1] The labor-intensive coffee industry is an important component of the Indian export sector. Coffee's specific plantation requirements (shade, altitude, and moisture) often result in secluded plantations lacking adequate transport facilities. This leads to limited urban exposure, education (formal and informal), and access to health information and services. The resulting lack of awareness of diseases and the need for regular check-ups, follow-ups, and adherence to medication predisposes their employees to the consequences of unchecked CV risk factors. The further lack of access to health-care services—routine and emergency—compounds this issue leading to potentially higher rates of mortality and morbidity, especially among permanent workers, who reside on the estates all-year. Studies on tea plantation workers have demonstrated a high burden of CV risk factors,^[2] yet, no data exist on coffee plantation workers. Furthermore, due to different employment environments and prevalent cultural norms, a direct extrapolation of results from tea workers to their coffee counterparts is implausible. This pilot study is aimed to assess the burden of CV risk factors among rural South Indian coffee workers.

After obtaining approval from the Institutional Ethical Committee (IEC no. 192/2015) and necessary authorizations by all estate owners, this cross-sectional study was conducted over 4 months, in 12 coffee estates across 4000 sq. km in rural South India. Informed consent was obtained from all workers ≥ 30 years and with ≥ 6 months of work experience, irrespective of their retirement status and permanent/migratory contract status. Six trained interviewers collected data on prior noncommunicable diseases (NCD) diagnoses (hypertension, diabetes, CV disease, strokes, Chronic lung and kidney disease and trauma resulting in permanent disability), treatment adherence (drug intake frequency $>80\%$), and prevalence and awareness of risk factors (tobacco, alcohol, unhealthy diet, and physical activity), using an adapted WHO STEPS questionnaire.^[2] Standardized implements and techniques were used to measure blood pressure (BP, mean of 2 readings), body mass index (BMI, mean of 2 readings), and waist: Hip circumference ratio (WHR). The WHO recommended sex-specific limits for Asians were used to determine raised waist circumference (80 cm for men, 90 cm for women) and

raised WHR (0.85 for men, 0.90 for women). Framingham risk scores (FRS) were calculated, and the workers were classified as having either low ($\leq 10\%$) or intermediate-high risk ($>10\%$). Data were compiled and analyzed using R version 3.4.4 (R Core Team 2013. A language and environment for statistical computing. R foundation for statistical computing, Vienna, Austria. (expressed as percentages) and associations (Chi-squared test and Student's *t*-test for categorical and continuous data, respectively) were calculated and considered statistically significant at $P < 0.05$.

Overall, 516 consenting workers were recruited. Of this, 305 (59.1%) were women. In addition, 236 (45.7%) were permanent workers. They were relatively young (median age 38 years; IQR 32.0–46.8) with a median monthly income of INR 8000 per person. Many lacked any formal education (64.0%) and most (98.8%) had at least one CV risk factor. Among the 58 (11.2%) workers with prior NCD diagnoses, hypertension (49, 9.5%) was most frequently reported. Nonadherence rates were high (56.9%-including 59.1% of hypertensives). Most of those nonadherent cited inaccessible/unavailable healthcare (42.8%) or equated symptomatic relief with cure and subsequently discontinued their medication (31.4%). Use of smokeless tobacco (69.3%) was higher than alcohol (27.1%) and smoked tobacco (16.3%). Among smokers, 90.4% used bidis. Dietary evaluation showed 16.8% consumed fruits and vegetables <5 times/week and 91.5% reported consumption of additional salt and/or processed/packaged salty food >2 times/week. All workers reported no physical activity outside work. Elevated BP readings (systolic blood pressure >139 or diastolic blood pressure >89) were found in 187 (36.2%), 92 (17.9%) were overweight (BMI ≥ 23), 151 (29.3%) had increased waist circumference, and 414 (80.2%) had raised WHR. Although the mean FRS for all workers was 5.5 (± 7.7), 16.6% had an intermediate–high FRS. Men and permanent workers were more likely to have intermediate-high risk than women (29.2% vs. 7.1%, $P < 0.001$), and migratory workers (20.8% vs. 12.9%, $P = 0.02$), respectively. Risk factor prevalence and awareness based on gender and contract status are shown in Table 1.

To the best of our knowledge, this is the first study on CV risk factors among coffee plantation workers. The workers were young and demonstrated a mixed burden of modifiable risk factors, including lower rates of smoked tobacco and alcohol use and a higher burden of smokeless tobacco and excessive salt consumption. Men had a higher prevalence of risk factors (alcohol and smoked tobacco use) despite higher awareness rates, making their higher burden of hypertension (reported and

Table 1: Risk factor distribution and awareness by gender and labor status

Parameter	Total	Male, n (%)	Female, n (%)	P	Total	Permanent, n (%)	Migratory, n (%)	P
n	516	211 (40.9)	305 (59.1)		514	236 (45.7)	278 (53.9)	
Previous NCD	58 (11.2)	25 (11.8)	33 (10.8)	0.8	58 (11.3)	33 (14.0)	25 (9.0)	0.1
Nonadherence to medication	33 (56.8)	17 (68.0)	16 (48.5)	0.9	33 (56.9)	16 (48.5)	17 (68.0)	0.9
Any tobacco	399 (77.3)	168 (79.6)	231 (75.7)	0.4	398 (77.4)	172 (72.9)	226 (81.3)	0.03
Smoked tobacco	84 (16.3)	78 (40.0)	6 (2.0)	<0.01	84 (16.3)	33 (14.0)	51 (18.3)	0.2
Smokeless tobacco	358 (69.4)	129 (61.1)	229 (75.1)	<0.01	357 (69.5)	150 (63.6)	207 (74.5)	<0.01
Alcohol use	140 (27.1)	113 (53.6)	27 (8.9)	<0.01	140 (27.2)	70 (29.7)	70 (25.2)	0.4
Unhealthy diet	478 (92.6)	192 (91.0)	286 (93.8)	0.3	476 (92.6)	225 (95.3)	251 (90.3)	0.04
Inadequate fruit/vegetables	87 (16.9)	33 (15.6)	54 (17.7)	0.6	87 (16.9)	40 (16.9)	47 (16.9)	1.0
Excessive salt/processed food intake	472 (91.5)	188 (89.1)	284 (93.1)	0.1	470 (91.4)	223 (94.5)	247 (88.8)	0.03
Raised BP	187 (36.2)	92 (43.6)	95 (31.1)	<0.01	187 (36.3)	105 (44.5)	82 (29.5)	<0.01
HTN (raised BP + diagnosed hypertensives)	204 (39.5)	96 (45.5)	108 (35.4)	0.02	204 (39.7)	112 (47.5)	92 (33.1)	<0.01
Raised BMI	108 (20.9)	51 (24.2)	57 (18.7)	0.16	108 (21.0)	61 (25.8)	47 (16.9)	<0.01
Raised waist circumference	151 (29.2)	26 (12.3)	125 (41.0)	<0.01	150 (29.2)	65 (27.5)	85 (30.6)	0.5
Raised waist: Hip ratio	414 (80.2)	155 (73.5)	259 (84.9)	<0.01	413 (80.4)	190 (80.5)	223 (80.2)	1.0
Tobacco awareness	257 (49.8)	117 (55.5)	140 (45.9)	0.03	257 (50.0)	131 (55.5)	126 (45.3)	0.02
Salt awareness	241 (46.7)	103 (48.8)	138 (45.2)	0.9	240 (46.7)	126 (53.4)	114 (41.0)	<0.01

BMI: Body mass index, BP: Blood pressure, HTN: Hypertension, NCD: Non-communicable diseases

measured) conceivable. This, together with higher rates of smokeless tobacco use among women, implicates the influence of prevailing societal norms on substance use, particularly sex-specific social groups. Significantly higher central adiposity markers among women (raised waist circumference and WHR) are a cause for concern since both groups had similar rates of unhealthy diet and physical activity.

Permanent workers enjoy more financial stability by way of provident funds and monetary benefits, although these benefits may vary across plantations. While health insurance is not often part of their benefits, this financial stability and attachment to the plantation may result in access to some health services, in the form of transportation or allowances as organized by plantation owners. Thus, despite their limited urban exposure compared to migratory workers, the resources available to permanent workers may be more reliable than that of their counterparts. This explains the higher levels of tobacco consumption and lower awareness of the ill-effects of tobacco and excess salt consumption among migratory workers. The high rates of unhealthy diet and excess salt intake may be linked to traditional culinary habits, thus explaining the higher prevalence of elevated BP and BMI among permanent workers.

A study on tea plantation workers^[2] revealed similar rates of known hypertensives (11.6% vs. 9.5% of coffee workers) and lower rates of smokeless tobacco use when compared with the coffee plantation workers (7.3% vs. 69.4%). This is concerning for the coffee workers in this study, as they were largely younger than the tea plantation population (mean age 38 vs. 46 years) and lack the local Assamese customs of drinking salted tea and using “khaini” (contains smokeless tobacco). An international study on hypertension in low- and middle-income countries revealed a prevalence (unstandardized) of 32.1% in India,^[3] with 33.5% aware of it and 89.8% of those aware, on

treatment. Our population had a higher prevalence (39.5%) and lower awareness (9.5%) and treatment rates (40.9%), implicating inaccessible healthcare and a poor understanding of the disease, contributing further to their CV risk. The largest reported impediment (82.6%) to treatment adherence in another study was limited health-care accessibility,^[4] similar to ours (42.8%). The low frequency of diagnosed NCDs is by itself, not a marker of inaccessible healthcare. Yet, discrepancies between rates of reported (9.5%) and measured hypertension (31.1%) and high rates and reasons for medical nonadherence warrant further evaluation of barriers to healthcare, especially in light of their low awareness and limited access to emergency services.

The low mean FRS and BMI prevalence seem discrepant when compared with the large proportion of workers with ≥ 1 CV risk factor (98.8%), central adiposity markers, and elevated BP readings. While FRS inherently under-estimates the overall CV risk in Indians,^[5] this population's CV risk could have been further under-estimated by their lower age and low rates of reported hypertension (determinants of FRS). The high prevalence of raised WHR, which is a more reliable indicator of increased CV risk among South Asians (more visceral fat than Europeans)^[5] indicates that the true prevalence of a high 10-year risk of developing a CV event could be higher than 16%. Thus, prevention is critical for this isolated population, made vulnerable by its lack of access to healthcare and emergency services.

Our study has certain limitations. First, the proportion with a previous NCD diagnosis could under-estimate the true prevalence due to limited access to regular healthcare. Second, excessive salt consumption was assessed through food practices and not defined quantitatively. Finally, as blood tests were not included, accurate prediction of CV risk

through the diagnosis of diabetes and metabolic syndrome was not possible.^[5]

Plantation workers are vulnerable to higher morbidity and mortality from CV risk as their largely isolated working conditions result in limited access to healthcare, emergency services and low awareness levels. Cultural practices and social dogmas further compound these issues. Under these circumstances, prevention of CV events and risk reduction becomes key in reducing poor outcomes. Estate owners are recommended to organize and ensure access to health information and sensitization of workers toward chronic diseases, prevention, treatment, and regular follow-up. Owners are also encouraged to enable better access to healthcare through providing transport facilities and annual medical tests for high-risk workers. Studying this population is logistically challenging due to the rough terrain, large distances between estates, as well as high labor turnover, especially during harvest (picking) season. Yet, evaluating the determinants of risk factors and barriers to healthcare, and accurately quantifying the risk of these workers are essential to designing appropriate and culturally acceptable interventions to lower mortality and morbidity rates and increase the productivity of the workers and the industry.

Financial support and sponsorship

It was funded by the Division of Clinical Research and Training, St. John's Research Institute, Bangalore, India.

Conflicts of interest

There are no conflicts of interest.

Sitarah Mathias, Akhil Xavier Joseph¹, Tanvi Jadhav, Denis Xavier^{2,3}

St. Mary's Hospital, Malur, Kolar, ¹St. Joseph's Health Centre, Martalli, ²Department of Pharmacology, St. John's Medical College and Hospital, St. John's National Academy of Health Sciences, ³Division of Clinical Research Trials, St. John's Research Institute, St. John's National Academy of Health Sciences, Bengaluru, India

Address for correspondence: Dr. Denis Xavier,
St. John's National Academy of Health Sciences, Sarjapur Road,
Bengaluru - 560 034, Karnataka, India.
E-mail: denis.xavier@stjohns.in

REFERENCES

1. Xavier D, Pais P, Devereaux PJ, Xie C, Prabhakaran D, Reddy KS, *et al.* Treatment and outcomes of acute coronary syndromes in India (CREATE): A prospective analysis of registry data. *Lancet* 2008;371:1435-42.
2. Mahanta TG, Joshi R, Mahanta BN, Xavier D. Prevalence of modifiable cardiovascular risk factors among tea garden and general population in Dibrugarh, Assam, India. *J Epidemiol Glob Health* 2013;3:147-56.
3. Irazola VE, Gutierrez L, Bloomfield G, Carrillo-Larco RM, Prabhakaran D, Gaziano T, *et al.* Hypertension prevalence, awareness, treatment, and control in selected LMIC communities. *Glob Heart* 2016;11:47-59. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27102022>. [Last accessed on 2017 Jun 22].
4. Dennis T, Meera NK, Binny K, Sekhar MS, Kishore G, Sasidharan S. Medication adherence and associated barriers in hypertension management in India. *CVD Prev Control* 2011;6:9-13. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1875457010001294>. [Last accessed on 2019 May 12].
5. Khanna R, Kapoor A, Kumar S, Tewari S, Garg N, Goel PK. Metabolic syndrome Framingham risk score: Observations from a coronary angiographic study in Indian patients. *Indian J Med Res* 2013;137:295-301.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Access this article online	
Quick Response Code: 	Website: www.ijcm.org.in
	DOI: 10.4103/ijcm.IJCM_237_20

How to cite this article: Mathias S, Joseph AX, Jadhav T, Xavier D. Prevalence of modifiable cardiovascular risk factors among coffee estate workers in rural South India (CARE). *Indian J Community Med* 2021;46:331-3.

Received: 14-04-20, **Accepted:** 07-12-20, **Published:** 29-05-21

© 2021 Indian Journal of Community Medicine | Published by Wolters Kluwer - Medknow