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Transport sector and cardiovascular disease risk estimation: cross-sectional analysis based on WHO/ISH chart.

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ABSTRACT

Introduction: Cardiovascular Diseases (CVDs) has emerged as one of the leading causes of morbidity and mortality among Non-Communicable Diseases (NCDs). Compared to occupational social class, very few studies have focused on work economic sectors. Bus drivers work conditions favour the development of a set of cardiovascular risk factors. **Objectives:** 1. To assess the cardiovascular disease risk among Cuddalore road transport corporation workers. 2. To find the factors associated with higher cardiovascular disease risk among the same population. **Methods:** An analytical cross-sectional study was done among all the workers of Cuddalore Road Transport Corporation (CRTC) from the month of March to May 2017. About 164 workers were interviewed using a pre-designed questionnaire. The total CVD risk of the workers was calculated using WHO/ISH (World Health Organization/International Society of hypertension) risk prediction charts. Ordinal regression analysis was done using STATA to study the factors associated with higher cardiovascular risk among the workers. **Results:** Among the workers, 29.9% were smokers, 42.7% were alcoholics, 23.2% and 28.9% were known diabetics and hypertensives respectively and 34.8% had family history of cardiovascular disease. As per WHO/ISH risk prediction chart, 21% of the workers had higher cardiovascular risk.On adjusted regression analysis, smoking and alcohol consumption, presence of diabetes and hypertension, family history of CVDs, reduced fruit and vegetable consumption, inadequate physical activity and higher body mass index were significantly associated to higher risk of CVD's among the workers. Work related factors like driving occupation and more than 10 years work experience contributed to higher cardiovascular risk. **Conclusion:** More than one-fifth of CRTC workers had high cardiovascular risk. Driving work conditions significantly contributed to higher CVD risk. Work place preventive and educational actions directed at changes in lifestyle regarding diet and physical activity could be beneficial to this occupation.

Key Words: Cardiovascular risk, transport workers, WHO/ISH charts

INTRODUCTION

With the turn of the century, cardiovascular diseases (CVDs) have become the leading cause of morbidity and mortality among non-communicable diseases (NCDs) in India.[1] In comparison with the western population, CVD affects Indians at least a decade earlier and in their most productive midlife years.[2,3] Work economic sectors, even considered on a broad scale, may be of importance, because numerous exposures may vary in prevalence from one sector to the other. Recent studies in India have demonstrated an increased trend of cardiovascular disease risk factors, such as obesity, smoking and hypertension is seen among professional drivers.[4,5,6] Considering the inherent risks associated with the profession of driving, the importance of transport workers to the country's economy and the job responsibility they carry, this study aimed to assess the cardiovascular disease risk and the factors associated among transport workers of Cuddalore Road Transport Corporation. We have adopted WHO/ISH cardiovascular risk prediction charts in the current study.

MATERIALS AND METHODS

To attain the objectives of the study an analytical cross-sectional study was carried out among the transport workers of Cuddalore Road Transport Corporation. The study was conducted during the period of March and May 2017. The transport workers comprised of bus drivers and conductors. Transport workers aged above 18 years and below 60 years who have completed at least twelve months of service in CRTC were included and workers with known history of cardiovascular disease or stroke were excluded for the analysis. After obtaining the informed consent, the study participants were subjected to a structured interview schedule capturing the following parts: Socio demographic profile, Work-related information, Cardiovascular disease risk factor profile, Lifestyle profile

The interview schedule was followed by general health examination of the workers which included measurements of weight, height, waist circumference and blood

pressure. The measurements were taken by trained field staffs using standardised methods. Since the studied involves general examination and risk factor profile, all CRTC workers were evaluated and only those fitting the inclusion criteria were included for the analysis. **WHO/ISH cardiovascular risk prediction charts:** The total CVD risk of the sampled individuals was calculated by using WHO/ISH risk prediction charts. In this study, the chart for SEAR-D region which includes India has been used as reference.[7,8] Operational definitions are given in box1.

Box 1. Operational definitions and Data Collection:

Smoking was defined as the use of any smoke form of tobacco product in the last six months. Alcohol use was defined as consumption of any type of alcohol in the last one year. Study participants were classified as diabetics if they were under treatment with oral hypoglycaemic agents/insulin. Subjects were labelled hypertensive if systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg or taking antihypertensive medication. Height was measured using adult portable stadiometer.

One serving of vegetable was one cup of raw green leafy vegetables or 1/2 cup of other vegetables (cooked or chopped raw). One serving of fruit was one medium size piece of apple, banana or orange, 1/2 cup of chopped, canned fruit or 1/2 cup of fruit juice. At least 2 servings of fruits or vegetable per day was considered adequate consumption in this study. Participants were also classified as sufficiently active if they exceed the minimum duration of physical activity per week recommended by WHO i.e. 150 min of moderate intensity physical activity or 75 min of vigorous intensity physical activity.[9]Body Mass Index (BMI) was calculated by obtaining the ratio of weight (kg)/height^2 (m) and study subjects were classified as underweight (<18.5 kg/m^2), normal (18.5–22.99 kg/m^2), overweight (23–24.99 kg/m^2) and obese (≥25 kg/m^2).[10] Cardiovascular disease in this study context refers to the coronary artery disease, stroke, arrythmias and valvular heart diseases.

Procedure: This study was approved by the Institutional Ethical Committee. After establishing rapport with the workers, the purpose and procedure of the study was explained. Informed written consent was obtained from the participants and the interview schedule was administered to the participants. The identity of the participant was kept anonymous from the stage of data collection. The data was entered twice in Epidata Entryclient (v 4.2) to check for data entry errors and analysed using STATA (v 14). The significant exposure variables at p=0.2 were then used for model fitting. Effect of each exposure variables on high cardiovascular risk was studied after adjusting for other variables in ordinal logistic model and was expressed as adjusted odds ratio.A p-value of 0.05 was considered significant for adjusted analysis.

RESULTS

All 171 transport workers of CRTC participated in the study. Among them, 7 were known cases of coronary artery disease and were excluded for analysis. All 164 eligible workers were malesand their mean age was 45.6 ±7.5 years. About three-fourth (73.7%) of the workers had education up to higher secondary, majority (62.8%) employed as drivers and nearly half of them had more than 10-yearwork experience as transport workers (Table1).

Table1: Baseline socio-demographic characteristics of CRTC workers (N=164)

Variables	Summary statistics
Age in years, mean(±SD)	45.6 (±7.5) years
Gender,n(%)	
male	164 (100%)
Education, n(%)	
up to higher secondary	121 (73.7%)
bachelor's degree or more	43 (26.3%)
Occupation, n(%)	
driver	103 (62.8%)
conductor/others	61 (37.2%)
Work experience, n(%)	
1-10 years	93 (56.7%)
>10 years	71 (43.3%)

Based on the workers age, gender, smoking status, presence of diabetes and systolic blood pressure, each individual's CVD risk was assessed using WHO/ISH charts. The charts shows the percentage risk of a major cardiovascular outcome in the next ten years. The percentages obtained were finally interpreted into three risk categories, low (<10%), moderate (10-≤20%) and high (>20%). Among the workers, majority (63%) had low CVD risk and about one-fifth (21%) had high cardiovascular risk

Among the CRTC workers, 29.9% were smokers, 42.7% were alcoholics, 23.2% and 28.9% were known diabetics and hypertensives respectively and 34.8% had family history of cardiovascular disease. Table 2 and 3 shows the various factors (socio-demographic, known cardiovascular disease risk factors, work-related and lifestyle) associated with high cardiovascular disease risk as assessed by WHO/ISH charts. On unadjusted analysis, all known risk factors of CVD viz., smoking and alcohol consumption, presence of diabetes and hypertension, family history of CVD and higher body mass index were significantly associated with high CVD risk among the workers (Table 2). Moreover, work related factors (occupational position, work experience), reduced physical activity and junk food consumption were also significantly associated with high CVD (Table 3). All factors significantly associated with high CVD risk in unadjusted analysis except junk food consumption were also significant associated in adjusted analysis. Additionally, inadequate fruit and vegetable consumption per day were also significantly associated to high CVD risk in adjusted analysis.

Table 2: Association of socio-demographic and known CVD risk factors with high CVD risk assessed by WHO/ISH charts among CRTC workers(N=164)

Factors	n (%)	Unadjusted Odds ratio (95% CI)*	p-value*	Adjusted Odds Ratio (95% CI)*#	p-value*
Education					
higher secondary	121 (73.7%)	1	0.177	1	0.322
bachelor's degree or more	43 (26.3%)	1.3 (0.7-2.6)		0.7 (0.3-2)	
Family income			0.015		0.196
≤20,000	86 (52.4%)	1		1	
>20,000 and above	78 (47.6%)	3.7 (1.3-9.7)		1.1 (0.6-2.5)	
Smoking					
yes	49 (29.9%)	6.4 (3.2-10.5)	<0.001	3.4 (1.9 -5.8)	<0.001
no	115 (70.1%)	1		1	
Alcohol consumption					
yes	70 (42.7%)	3.7 (1.8- 6.7)	0.003	2.2 (1.1-4.6)	0.036
no	94 (57.3%)	1		1	
Diabetes					
yes	38 (23.2%)	4.6 (2.3-8.1)	<0.001	3.1 (1.7-5.4)	<0.001
No	126 (76.8%)	1		1	
Hypertension					
yes	47 (28.9%)	4.9 (2.7- 8.8)	<0.001	3.9 (1.7- 6.5)	<0.001
no	117 (71.1%)	1		1	
Family history of CVD					
yes	57 (34.8%)	2.9 (1.3- 5.9)	0.024	1.8 (1.1- 4.9)	0.044
No	107 (65.2%)	1		1	
Body mass index					
normal	73 (44.5%)	1	<0.001	1	0.021
overweight	68 (41.5%)	3.2 (1.7- 5.4)		1.9 (1.2 -3.9)	
obese	23 (14%)	4.7 (2.2- 7.3)		2.6 (1.5- 5.3)	

*****- Unadjusted and adjusted odds ratio calculated using ordinal logistic regression
#- Adjusted to age and all factors with p value <0.2 in unadjusted analysis (factors from table 2 & 3)

Table 3: Association of work-related and lifestyle factors with high CVD risk assessed by WHO/ISH charts among CRTC workers(N=164)

Factors	n (%)	Unadjusted Odds ratio (95% CI)*	p-value*	Adjusted Odds Ratio (95% CI)*#	p-value*
Occupational position					
Conductor	61 (37.2%)	1	<0.001	1	<0.001
Driver	103 (62.8%)	10.2 (5.6 -16.1)		3.3 (1.3- 5.7)	
Work experience					
1-10 years	93 (56.7%)	1	<0.001	1	<0.001
>10 years	71 (43.3%)	16.1 (7.2-17.8)		4.1 (1.5- 5.7)	
Adequate fruit consumption					
yes	57 (34.5%)	1	0.196	1	0.025
no	107 (65.5%)	1.45 (0.7 -2.8)		2.9 (1.1-7.3)	
Adequate vegetable consumption					
yes	113 (68.9%)	1	0.192	1	0.041
no	51 (31.1%)	1.4 (0.7 -2.6)		1.8 (1.1-5.4)	
Adequate physical activity					
yes	59 (36%)	1	0.007	1	0.039
No	105 (64%)	3.6 (1.6-6.2)		1.9 (1.2-4.6)	
Junk food consumption					
yes	117 (71.3%)	2.6 (1.2-5.7)	0.038	1.1 (0.8-1.4)	0.148
no	47 (28.7%)	1		1	

*****- Unadjusted and adjusted odds ratio calculated using ordinal logistic regression
#- Adjusted to age and all factors with p value <0.2 in unadjusted analysis (factors from table 2 & 3)

DISCUSSION

The main finding of our study is that more than one-third (37%) of the CRTC had moderate to high cardiovascular disease risk i.e. >10% chance of a major cardiovascular disease outcome in the next ten years. This level of CVD risk is alarmingly high when compared to a similar study done among Karnataka state transport corporation workers in 2015 where only 10% of the drivers had moderate to high CVD risk as assessed by the same WHO/ISH charts.[11] Similarly, a study done by *Thiyagarajan P et al* among workers of Chidambaram road transport corporation (which is in close proximity to CRTC) in 2015 revealed that only 15.5% of the workers had moderate to high CVD risk which was well below the current study's estimate.[12,13,14]In the current study, different socio-demographic, work-related, and lifestyle factors have been assessed to identify their association with cardiovascular disease risk. It has been found that smoking and alcohol consumption, presence of diabetes and hypertension, family history of CVD, higher body mass index, driving occupation, higher work experience in transport industry, reduced fruit and vegetable intake and inadequate physical activity were independently associated with high cardiovascular disease among the CRTC workers. Since all workers were males, the association between gender and CVD risk could not be established.

The alarmingly high cardiovascular disease risk in this study population is mostly attributed to the presence of excessive unhealthy behavioural and lifestyle factors, high prevalence of central obesity, diabetes and hypertension. Nearly one-third (29.9%) were smokers, 42.7% were alcoholics, 23.2% and 28.9% were known diabetics and hypertensives respectively and 34.8% had family history of cardiovascular disease. All the above prevalence estimates of known cardiovascular disease risk factors are significantly higher than the national and state prevalence estimates.[15,16,17] On comparison with studies done among similar population, the prevalence of alcohol consumption, diabetes and hypertension were two times higher in the current study.[11,12,18,19]However, the prevalence of overweight (41.5%) and obesity(14%) were in par with studies done by *Kartikeyan S et al* and *Zulkifle MD* among transport workers in Andhra Pradesh and Bangalore respectively.[20,21]

Driving occupation was a strong independent predictor of CVD risk among the workers.Additionally increased work experience as driver was also significantly correlated to high CVD risk.*Chen et al*(2005) reported that haematological markers of increased cardiovascular risks are associated with long driving time independent of conventional risk factors in drivers.Further exploration of inflammatory markers associated with hours of driving and/or exposure to environmental pollutants and its association with CVD is needed.[22,23]

Finally, it should be highlighted that no transport worker at CRTC refused to participate in this study. The study is reported according to the STROBE checklist for cross-sectional studies. The major strength of this study is the incorporation of WHO/ISH charts which is available for the specific region and encompasses a wide range of factors for CVD risk prediction. Other strengths include the use of ordinal regression modelling to identify the independent effect of each factor on the total cardiovascular disease risk, especially the effect of work related factors.

However, our study does not allow the determination of causal associations, since we used a cross-sectional study design, and there was no control group and no followup. Since the current study aimed at identifying a cluster of cardiovascular risk factors and CVD risk in this population, one other limitation of this study would the lack of measurements on lipid profiles or inflammatory biomarkers. System-level or worksite interventions include offering healthy food at bus depots, creating a work culture of frequent walking breaks, and interventions focusing on smoking and alcohol cessation, improving physical activity, and weight management could be beneficial to this occupational category, which will require future prospective studies to verify these outcomes.

CONCLUSION

The study found that one in five transport workers had high cardiovascular disease risk. The prevalence of known Cardiovascular Disease risk factors were higher among CRTC workers. Work conditions and few lifestyle factors were also major independent contributors to high CVD risk among the workers.

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DECLARATIONS

Ethical approval: The study was approved by the Institutional Human Ethics Committee of Mahatma Gandhi Medical College & Research Institute

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