

A Study to Find Out Cardiovascular Risk in Bus Drivers by Using Waist to Height Ratio and WHO/ISH Risk Prediction Chart

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ABSTRACT: Bus drivers in the transportation industry are at greater risk of an incorrect diet, sedentary behaviour, high mortality, morbidity and absenteeism sickness due to obesity. The objective of the study are 1. To find cardiovascular risk in bus drivers by using WHtR and WHO/ISH risk Prediction charts. 2. To find out the main causative risk factor of CVD in bus drivers. 3. To create awareness about importance of exercises in maintaining their health and cardiovascular fitness. Bus drivers (n=200) examined for WHtR and WHO/ISH risk prediction chart which include age, blood pressure, and smoking. Data on risk factors like alcohol consumption, diabetes and family history of cardiac disease were collected. Waist measurement was taken at the midway point between iliac crest and the lower rib at the end of a normal expiration. The clinical characterization of professional bus drivers revealed a moderate level of cardiovascular risk factors such as obesity, hypertension and smoking as well as other contributing functional characteristics, such as a low-intensity physical activity, long duration in a sitting position and irregular eating habits which lead to excessive weight gain and associated comorbidities.

KEYWORDS: Cardiovascular risk; Waist to height ratio (WHtR); World Health Organization/International Society of Hypertension (WHO/ISH) & Bus drivers.

I INTRODUCTION

The occupation of driving is associated with an increased risk of cardiovascular disease.[1]. Studies in recent decades have demonstrated that workers in the transportation industry are at greater risk because of an incorrect diet and sedentary behaviour [2]. Bus drivers particularly have high mortality, morbidity, and absenteeism sickness rates due to obesity. [3], [4].

The clinical characterization of Professional bus drivers revealed a high frequency of cardiovascular risk factors such as obesity, high blood pressure, high cholesterol, and hyperglycemia, as well as contributing functional Characteristics, such as a low-intensity physical activity, sedentary behavior, long time in a sitting Position, and irregular eating habits, abnormal sleeping timings which all lead to excessive weight gain and associated Co- morbidities[5]. The work shift in bus drivers is also a risk factor of chronic disease, including cardiovascular disease and metabolic disorders due to their altered circadian rhythm, changes in lifestyle, tension, and stress at work[6].

A study carried out by researchers in the United States involving more than 600 thousand workers found that obesity to be the highest prevalence among male 10 employees who work in highway transportation services (31.7%) [7]. In other study, done on professional bus drivers the prevalence of overweight and obesity was even higher, as majority of the population of drivers (57.5%) was characterized as overweight and approximately 20% was considered obese, totaling 77.5% of the sample [8]. Similar results are reported in another study involving Brazilian truck drivers, which found prevalence values of 47.8% and 16.2% for overweight and Obesity respectively [9]. Besides increasing cardiovascular risk, obesity as major cause in this group of individuals which leads to an increase in health costs related to traffic

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accidents [10]. Obesity as a coronary heart disease risk factor has been implicated along with driver’s irregular eating habits and low levels of physical activity during work and at leisure[11].

Carbon monoxide, sulphur dioxide and nitrogen oxides present in vehicle fumes, have been confirmed in increasing Coronary heart Disease risk for bus drivers [12]. In a study 69% of bus drivers rated traffic as a main cause of job stress which is regular and to be major problem[13]. Not only has psychological strain been noted for general drivers in traffic congestion, but physiological reactions in bus drivers have been also established[15]. Indeed, it is time pressure and impediments to the driver's primary task that makes congestion such a stressor especially where time urgency is apparent[16]. Prolonged job strain is said to predict high levels of coronary heart diseases[14]. Waist to height is an important surrogate marker of the distribution of adiposity in the abdominal region in men. Accordingly, we propose that Waist to height is probably the most convenient and reliable clinical measure of abdominal fat compartments [17]. The World Health Organization/International Society of Hypertension (WHO/ISH) risk prediction charts enable the estimation of total cardiovascular risk of people. The evidence-based recommendations guidelines provide guidance on which specific preventive actions to initiate, and with what degree of intensity. Measurement of total CVD risk offers a unique advantage to monitor impact of multi-factorial interventions overtime and to assess total preventive treatment needs.

The present study is to find out cardiovascular risk in Indian bus drivers who travel from medium to long distance in different work shifts by using waist to height ratio and World Health Organization and International Society of Hypertension (WHO/ISH) cardiovascular risk prediction charts. Bus drivers are provided with handouts which contains exercise programmed for their risk factor modification.

Figure (a) - WHO/ISH risk prediction chart for people with diabetes.

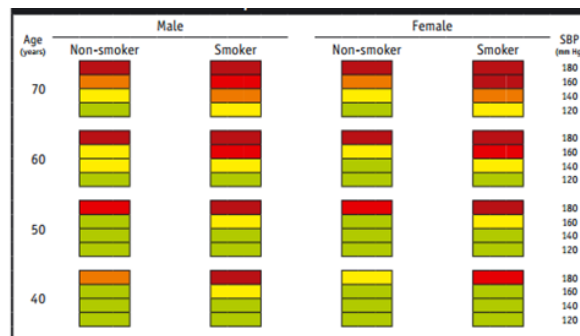


Figure (b) - WHO/ISH risk prediction chart for people without diabetes



Risk Level ■ <10% ■ 10% to <20% ■ 20% to <30% ■ 30% to <40% ■ ≥40%

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II. RELATED WORK

There is an ideal opportunity to screen the baseline health status of drivers to detect the risk factors for CVD early and to help control better. C. Bigert, J. Hallqvist et al, [23] M. A. Winkleby, D. R. Ragland, et al, [24] C. Bigert, K. Klerdal et al, [25] P. D. Wang and R. S. Lin, [26] J. P. Despres, B. J. Arsenault, et al [27] Hedberg G, Jacobsson K A, et al. [28], Morris, Heady et al. [29] have conducted study on increased risk of CHD in bus drivers. The study conducted by Dalton M, Cameron AJ et al, [30] Schneider HJ, Klotsche J, et al, [31] Browning LM, Hsieh SD, Ashwell M [32] shows that waist-to-height ratio as a screening tool for the prediction of cardiovascular disease. The study conducted by Dugee Otgontuya, Sopha Oum et al, [33] Mendis, Shanthia; Lindholm, Lars H [34] shows that WHO/ISH cardiovascular risk prediction chart as assessment tool for prevention and control of cardiovascular disease. Very few studies have been undertaken on cardiovascular risk prediction in bus drivers in India. With this background, the present study was taken up among bus drivers to study their cardiovascular risk. The best part of this study is if the risk factors for CHD are deducted, it can be prevented at the earliest.

III. METHODOLOGY

Study design is Cross sectional survey study. The population used in this study is male bus drivers from KSRTC (Karnataka State Road Transport Corporation). The study sample is 200 subjects. Subjects who fulfilled the inclusion and exclusion criteria were selected through simple random sampling.

Inclusion criteria:

- All bus drivers engaged in active service.
- Male bus drivers of age 40-60 years.
- Bus drivers willing to participate in the study.

Exclusion criteria:

- Bus driver who do job of conductors.
- Bus drivers with known cardiovascular disease.

Procedure:

Permission to conduct study in bus depot premises has been obtained from the KSRTC management Bangalore division prior to the study. From each subject, Informed consent has been obtained for health screening. Driver's health screening had been conducted at bus depot premises in liaison with the KSRTC management.

Bus drivers were interviewed in person to elicit information on selected demographic and socio-economic characteristics like tobacco and alcohol use, dietary intake, physical activity, and history for diabetes and hypertension along with any family history of cardiac disease.

Elements of examination and their measurements:

The health examination elements of the bus drivers include measurements of height, waist circumference, blood pressure. Waist circumference measurement is taken in mid-way between the lower rib and the iliac crest as recommended by the World Health Organization guidelines. Subjects were asked to remove shoes while measuring height using non elastic metric tape in centimetres. Blood pressure measurements are taken at rest with the subject remaining seated for 10 minutes by sphygmomanometer.

Waist-to-height ratio:

The Waist-to-Height ratio is determined by dividing the waist circumference by the height. Waist-to-Height ratios of 0.5 [18] or greater is indicative of high intra-Abdominal fat for both men and women and are associated with a greater risk of cardiovascular disease risk and values above 0.6 indicate substantially increased risk [17]. Waist to height is measured to find out cardiovascular risk according to the ratio obtained. It is Calculated by dividing the waist (in cms) by height (in cms). A value of 0.5 is Considered as global boundary cutoff value [18]

The following chart used in men to helps to determine if the Waist to height falls in a healthy range (these ratios are in percentages) [15].

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Ratio less than 35: Abnormally lean to Underweight
Ratio 35 to 43: Extremely slim
Ratio 43 to 46: Slender and Healthy
Ratio 46 to 53: Healthy, Normal, or Attractive Weight
Ratio 53 to 58: Overweight
Ratio 58 to 63: Extremely Overweight or Obese
Ratio over 63: Highly Obese

WHO/ISH cardiovascular risk prediction charts:

To calculate the total CVD risk of the sampled individuals by using WHO/ISH risk prediction charts. It consists of two sets of risk prediction charts with and without blood cholesterol [19]. The later requires data on gender (male/female), age (measured in single years), systolic blood pressure (in mmHg), and current smoking status (yes/no) and diabetes status (yes/no) is used in this study for all cases with the data available.

Table 1: The risk categories for fatal or non-fatal total CVD event are

PERCENTAGE SCORE	RISK LEVEL
<10%	LOW
10 TO <20%	MODERATE
20 TO <30%	HIGH
≥30%	VERY HIGH

IV. RESULT & INTERPRETATION

The study has been conducted in a sample of 200 subjects in view to find out cardiovascular risk in bus drivers by using waist to height ratio and WHO/ISH cardiovascular risk prediction charts. The data were carefully elicited through a standard tool. The data collected were carefully examined and more emphasis has been given to analysis through suitable statistical tool. Descriptive analysis is performed with the results expressed as either mean and standard deviation values or absolute number and percentage, when appropriate.

All participants were male bus drivers with a mean age of 44.53 ± 4.4 years, mean waist circumference of 92.45 ± 9.4 cm, mean height of 168.75 ± 8.53 cm, mean WHtR of 0.54 ± 0.05 . 78% of subjects were found to be on risk as per their WHtR which is above the boundary cut off value of 0.5.

As per WHO/ISH risk prediction chart, the risk categories are 90% are with <10% risk, 6% with 10 to <20%, 3% with 20 to <30% risk and 1% with $\geq 40\%$ risk.

- 29% were smokers
- 35% of the samples were hypertensive
- 24% are alcoholic
- 14% were diabetic
- 5.5% with positive family history of CVD
- 64% of the subjects were physically inactive

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Table 2: Mean and standard deviation values of demographic, clinical and functional variables of the population:

VARIABLE	MEAN	STANDARD DEVIATION
AGE (YEARS)	43.5 (± 4.4)	4.43
WAIST (CM)	92.4 (± 9.4)	9.46
HEIGHT (CM)	168.7 (± 8.5)	8.53
SYSTOLIC BLOOD PRESSURE (MM OF HG)	132.6 (± 15.7)	15.79
DIASTOLIC BLOOD PRESSURE (MM OF HG)	82.2 (± 10.1)	10.12
WAIST TO HEIGHT RATIO	0.54 (± 0.05)	0.055

Table 3 Risk prediction of population based on Waist to Hip Ratio

Total samples	No of no risk	No of moderate risk	No with high risk
200	44	132	24

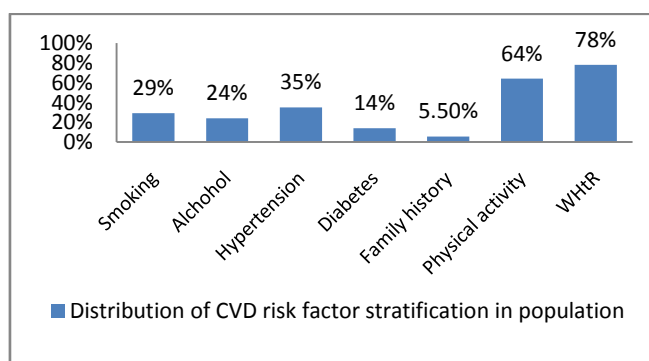
The above table shows that among 200 population, 44 sample comes under the category of no risk, 132 sample comes under the category of moderate risk and 24 sample comes under the category of no risk. Major population falls under the moderate risk category.

Table 4: Distribution of population based on WHO/ISH CVD risk prediction chart

Total Population	<10%	10% to <20%	20% to <30%	30% to 40%	$\geq 40\%$
200	180	12	6	0	2

The above table shows % distribution of population based on WHO/ISH CVD- it reveals that major population 180 falls under <10% risk, 12 samples falls under 10 to < 20% risk, 6 samples falls under 20 to < 30% risk, no sample under 30 to <40% risk, 2 sample falls under $\geq 40\%$ risk.

Figure c: Distribution of CVD risk factor stratification in population:



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The main risk factors as per the above figure are Obesity (WHtR) and not having physical activity. These two are the main contributors in this approach for our study. As we can see, 78% of the population is under risk based on obesity and 64% of the population is not having any physical activity other than the regular physical movements as part of the work.

V. DISCUSSION

The Bus drivers chosen for the study are from Karnataka State Road Transport Corporation. Population size considered for the study is 200. The mean age of the sample is 43.5 (± 4.4). Mean waist of the sample is 92(± 9.5). Mean height of the individual is 169 (± 8.53). WHtR is calculated by measuring the waist and height in centimeters and taking their ratio.

Our results showed the mean WHtR is 0.54(± 0.05). According to the WHtR risk stratification for cardiovascular and based on the boundary value, 22% of the population showed no risk, 66% of the population showed moderate risk and 12% of the population are under high risk. This shows that majority of the population come under moderate risk category. Mean age 43.5 years (± 4.4), mean waist circumference is 92.4 (± 9.5) are the main factors for majority of the population to come under moderate risk. Majority of the population are at an age around 40 years which is the age to start detecting the health risks. Population whose age is around 50 years showed higher WHtR than those of population whose age is around 40 years.

This provides us the information that the more number of years a person works as a bus driver, the risk will become higher. This analysis of the WHtR helps us to assess the cardiovascular risk of the bus driver and would be able to provide the information about the factors which will increase the risk in future. However WHtR represents body fat more than BMI and appears to be at least as efficient in identifying adults who may require follow-up.[20]

Risk scores that estimate an individual's total CVD risk can help clinicians to ensure that individuals who are at greatest risk receive treatment which is a more Cost-effective approach than treatment based on a single elevated risk factor and with overall low total CVD risk[21]

The other approach to assess cardiovascular risk used in this study is WHO/ISH risk prediction chart. WHO/ISH risk prediction chart considers various risk factors such as age, smoking, obesity, hypertension and diabetes. Based on these factors the cardiovascular risk of the subject is estimated. A subject could lie in any one of ranges such as <10%, 10-<20%, 20-<30%, 30-<40%, $\geq 40\%$. Based on the factors as mentioned, we can figure out in which range a subject would fit. This approach is very much helpful in estimating the cardiovascular risk as it takes many factors into consideration such as physical and habitual. [22]

The study showed that out of 200 subjects, 35% were hypertensive, 29% were smokers, 24% were alcoholic, 64% were with physical inactivity and 78% were having higher WHtR which indicates higher obesity, figure 9 depicts these.

The risk stratification based on WHO/ISH chart showed that 90% of populations are having less than 10% of risk. The main risk factors as per the above figure are Obesity (WHtR) and not having physical activity. These two are the main contributors in this approach for our study. As we can see, 78% of the population is under risk based on obesity and 64% of the population is not having any physical activity other than the regular physical movements as part of the work.

The results showed 90% of the population indicated less than 10% risk. There are multiple reasons for this result. The major factors we can see are smoking status, alcohol consumption and hypertension. There are only 29% smokers, 24% alcoholic and only 35% of the population showed hypertension.

This explains why most of the people are fewer than 10% risk category. We also need to remember that there are 10% of the populations which are coming under higher risk. As per the study, we can observe that the people of age greater than 50 years are showing higher risk. This clearly helps us to estimate the cardiovascular risk of the people whose risk level is low now. Suggestions have been given to the subjects to reduce various risk factors which might result in higher risk in future.

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However, emerging evidence from developed countries suggests that despite availability of guidelines advocating the use of total risk scores instead of focusing on single risk modification adoption has been slow in these countries. It is unfortunate; however, there is little documentation of the implementation of the use of total risk approach[21]

VI. CONCLUSION

The clinical characterization professional bus drivers revealed a moderate level of cardiovascular risk factors such as obesity, hypertension and smoking as well as other contributing functional characteristics, such as a low-intensity physical activity, sedentary behaviour, long duration in a sitting position and irregular eating habits which lead to excessive weight gain and associated comorbidities.

The high prevalence of obesity associated to smoking, diabetes and hypertension are reason for concern especially in the population of drivers carrying passengers. Thus, greater emphasis should be given to the prevention of obesity among individuals in the ideal weight range and those who are overweight. Preventive and educational actions are directed at changes in lifestyle with regard to diet and physical activity could be beneficial to this occupational category, which will require future prospective studies to verify these outcomes.

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BIOGRAPHY



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Ethical Clearance:

The study is approved by Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore, India.

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