Original Research

A PROFILE OF STRESS, DEPRESSION AND SLEEP DEPRIVATION AMONG BUS DRIVERS IN PERAMBALUR DISTRICT – A CROSS-SECTIONAL STUDY

Dr. Maniprabhu.S[1], Dr.Karthikeyan.K[2], Dr. Parthasarathi.R[3*]

[1]Assistant Professor, Department of Community Medicine, KAP. Viswanatham Government Medical College, Trichy, Tamil Nadu.

[2]Professor, Department of Community Medicine, Dhanalakshmi Srinivasan Medical College And Hospital, Perambalur, Tamil Nadu.

[3*]Associate Professor, Department of Community Medicine, KAP, Viswanatham Government Medical College, Trichy, Tamil Nadu.

Email: [1]drsmaniprabhu88@gmail.com, [2]karthikspm@gmail.com, [3]dr.parthasarathi03@gmail.com

Corresponding Author: Dr. Parthasarathi.R

Associate Professor, Department Of Community Medicine, KAP. Viswanatham Government Medical College, Trichy, Tamil Nadu.

ABSTRACT

Introduction: Bus drivers are a vulnerable population due to their unhealthy lifestyle and poor sleeping habit. Bus driving is a responsible skilled job which requires keen attention to the immediate surrounding which makes them stressed physically and mentally every day. Stress is inevitable among bus drivers and the sleep, stress, and depression form a vicious cycle which leads to serious health impact among the drivers. With this view, this study was conducted with the aim of assessing the impact of stress on health status among Tamilnadu State Transport Corporation (TNSTC) bus drivers in the Perambalur district.

Materials and Methods: A cross-sectional study was done from 1st March 2019 to 30th July 2020, with universal sampling in Perambalur bus depot among 203 Tamil Nadu State Transport Corporation (TNSTC) bus drivers. The data was collected by using a semi-structured questionnaire. The stress was assessed by using Perceived Stress Scale (PSS-10), Depression assessed by using Patient Health Questionnaire-9 (PHQ-9), and sleep deprivation assessed by using Epworth Sleepiness Scale (ESS).

Results: The prevalence of perceived stress, depression, and daytime sleepiness among government bus drivers is 23%, 26%, and 25% respectively. The risk factors that have a statistically significant association with increased perceived stress are using spectacles while driving, smoking more than five cigarettes per day, having Driver-Conductor conflict, not received the non-accident certificate, poor sleep, and moderate depression.

Conclusion: The prevalence of stress, depression, and sleep deprivation are very high among government bus drivers. Preventing stress and promoting mental health is essential to reduce the vulnerability among government bus drivers.

Keywords: Bus Drivers, Depression, Sleep Deprivation, Stress Epworth Sleepiness Scale, Patient Health Questionnaire-9, Perceived Stress Scale.

INTRODUCTION

Bus driving is a job involving stress and it is a skilled work to ensure the safety of passengers.[1] Bus driving makes them stressed physically and mentally. The factors such as seat comfort, climate change, fixed bus timings, passenger dispute, and driver conductor conflicts also have an impact on their psychological stress.

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Job strain and psychological stress have a direct association with the comorbidities[2],[3] of bus drivers most commonly chronic respiratory illness, gastrointestinal illness, hypertension, type 2 diabetes, and cardiovascular illness.[4],[5] It is observed that bus drivers took leave to duty more frequently than other workforces.[6] In India, about 80 percent of drivers have a varying degree of psychological stress. The reaction to this stress reflects in racing and speeding of the vehicles and incapability in reacting to the immediate surrounding[7]. This may lead to road traffic accidents that endanger all the passenger's life[8]. Constant psychological stress over a period of time has a direct effect on sleeping habits and vice-versa. In India, about 62 percent of bus drivers have day-time sleepiness while driving. About 15 percent of drivers have trouble in initiating sleep. As a coping

strategy, about 19 percent of drivers addicted to smoking or tobacco chewing[9]. Chronic stress and reduced leisure time with family and friends lead to the development of depression. Thus, decreased sleep, stress, and depression form a vicious cycle which leads to serious health impacts among the drivers.

In India, Government bus drivers are working under organized administrative infrastructure that they are easily accessible and studied, and any preventive intervention or a program can be easily carried out. They have poor knowledge of their health status that leads to poor health-seeking behavior which makes them more vulnerable to the complications of co-morbidity.[10] Despite the knowledge about stress among bus drivers, in India, only a few studies discussed the prevalence, risk factors, and impact of stress. Thus, it is necessary to study stress, quality of sleep, mental health, comorbidities, and accidents comprehensively to find the risk factors and its impact. The objective of this study is to estimating the prevalence of stress, depression, and sleep deprivation and its associated risk factors among the Tamilnadu State Transport Corporation (TNSTC) government bus drivers in the Perambalur district.

MATERIALS AND METHOD

Study Design and Study Setting- This is a cross-sectional study done between 1st march 2019 to 30th july 2020 among government bus drivers working under tamilnadu state transport corporation (tnstc) in perambalur municipality.

Sample Size and Sampling Technique- With the previous prevalence of stress among bus drivers in India noted 80 percent (Bathija GV et al, in 2013)[7] and allowable error 6%, the minimum sample calculated as 170 bus drivers. All bus drivers of age between 18 to 58 years who are now working in Perambalur municipality were included in the study and those who are on long medical leave at that time of data collection and who are not willing to participate were excluded from the study (Convenient sampling).

Ethical Clearance- The study protocol was approved by the Institutional Ethics Committee of Human Subjects (IECHS) at DSMCH, Perambalur. Participants were enrolled only after receiving a detailed information sheet and providing documented informed consent to take part in the research.

Data Collection- After getting the required permission from the authorities, data collection was done by the primary investigator through direct interview. The study procedure, purpose, risk, confidentiality, and benefits have been explained to the participants before their recruitment. Written informed consent was obtained from all the study participants and the subject information sheet was provided to the participants. For the benefits of the participants, a sound referral system was ensured. A pilot study was conducted with 20 bus drivers to study the feasibility and ensure the validity of the questionnaire.

Data Tool- Data was collected by using a semi-structured questionnaire, which consists of nine parts i.e. socio-demographic variables, job-related factors, comorbidity (Overweight were classified according to Body Mass Index[11]), habits (Cigarette smokers are classified into non-smoker, very light smoker, light smoker, and heavy smoker[12]), attitude towards driving, physical examination, stress assessed by using Perceived Stress Scale (PSS-10)[13], Depression assessed by using Patient Health Questionnaire-9 (PHQ-9)[14], and sleep deprivation assessed by using Epworth Sleepiness Scale (ESS)[15].

Statistical Analysis- The data were entered in the Microsoft Excel sheet and the analysis was done using SPSS software trial version 16.0. All quantitative variables were expressed as mean with a standard deviation and Median with the inter-quartile range as appropriate. All qualitative variables were described in frequencies and percentage. To find the test of significance for assessing the association between the qualitative variables Pearson Chi-square test was used (Fisher exact test was used appropriately). To find the relationship between quantitative variables Pearson's correlation and Spearman's correlation were used appropriately. By using Binary Logistic regression adjusted Odds ratio was calculated among the risk factors for developing risk of stress and depression.

RESULTS

About 203 study participants were included in the study. All the participants were males and the mean age of the participants was 47 years (47.10±6.296), with a minimum age of 33 years and the maximum age of 58 years. About 43 percent and 42 percent have the habit of drinking alcohol and habit of smoking respectively. Almost 60 percent of the study participants sleep for about 4 to 6 hours a day and about 11 percent have less than 4 hours of sleep. The median (Inter-quartile range) year of experience as a heavy vehicle driver among study participants is 19(15 - 25) years with minimum and maximum experience as 5 and 38 years respectively. Most of the study participants (75 percent) were Overweight. Table 1 shows the distribution of baseline characteristics of the study participants.

Table 1: Distribution of General Characteristics of the Study Participants (N = 203)

Variables	Frequency	Percentage
General characteristics		

Age (in years)	less than 29 years	0	0
	29 to 38 years	12	5.9
	39 to 48 years	109	53.7
	49 to 58 years	82	40.4
Place of residence	Urban	71	35
	Rural	132	65
Religion	Hindu	193	95
	Christian	10	5
Educational qualification	Primary	1	0.5
	Secondary	107	52.7
	Higher secondary	84	41.4
	Degree holder	11	5.4
Body Mass Index	Underweight	5	2.5
	Normal weight	45	22.2
	Pre-obese	116	57.1
	Obese class 1	30	14.8
	Obese class 2	7	3.4
Habits			
Use of spectacles	Yes	46	23
	No	157	77
Smoking	No such habit	118	58.2
	Very light smoker	28	13.8
	Light smoker	35	17.2
	Heavy smoker	22	10.8
Alcohol	Yes	87	43
	No	116	57
Sleep pattern			
Duration of sleep per day	Less than 4 hours	22	10.8
	4 to 6 hours	121	59.6
	More than 6 hours	60	29.6
Duration of sleep after a night-shift duty	Less than 3 hours	117	57.6
	3 to 5 hours	68	33.5
	More than 5 hours	18	8.9
Duration of time to take to fall asleep	Less than 30 minutes	126	62.1
	30 to 60 minutes	51	25.1
	More than 60 minutes	26	12.8
Variables related to the job of study participants			
Years of experience as heavy vehicle driver	Less than 10 years	14	6.9
	10 to 19 years	91	44.8
	20 to 29 years	74	36.5
	30 years and above	24	11.8
Years of experience in Shift-work	Less than 10 years	49	24.1
	10 to 19 years	97	47.8
	20 to 29 years	47	23.2
	30 years and above	10	4.9
Distance traveled (in kilometers)	200 to 299	26	12.8
	300 to 399	16	7.9
	400 to 499	65	32
	500 to 599	51	25.1
	600 to 699	30	14.8
	700 and above	15	7.4
Number of leave avail in the past 3 months	Less than 3 days	65	32
	3 to 6 days	80	39.4
	More than 6 days	58	28.6
Driver conductor conflict	Yes	18	8.9
	No	185	91.1
	Less than 60 km/hour	118	58.1

The maximum speed attained while driving a bus	60 to 80 km/hour	85	41.9
Awarded with a non-accident certificate in the past 2 years[$]	Yes	83	40.9
	No	120	59.1
Comfortable with their vehicle	Yes	192	94.6
	No	11	5.4

[$]An award given to TNSTC bus drivers every year for those who didn't involve in any road traffic accidents in each depot.

About 79 percent of the bus drivers prefer tea or coffee as a break time refreshment. The preferences of break-time refreshment by the bus drivers are shown in figure 1. Almost 49 percent of the study participants suffer from at least one co-morbidity. About 35 percent of drivers suffer from type 2 diabetes, while 25 percent have Hypertension. Figure 2 describes the pattern of co-morbidity among bus drivers.

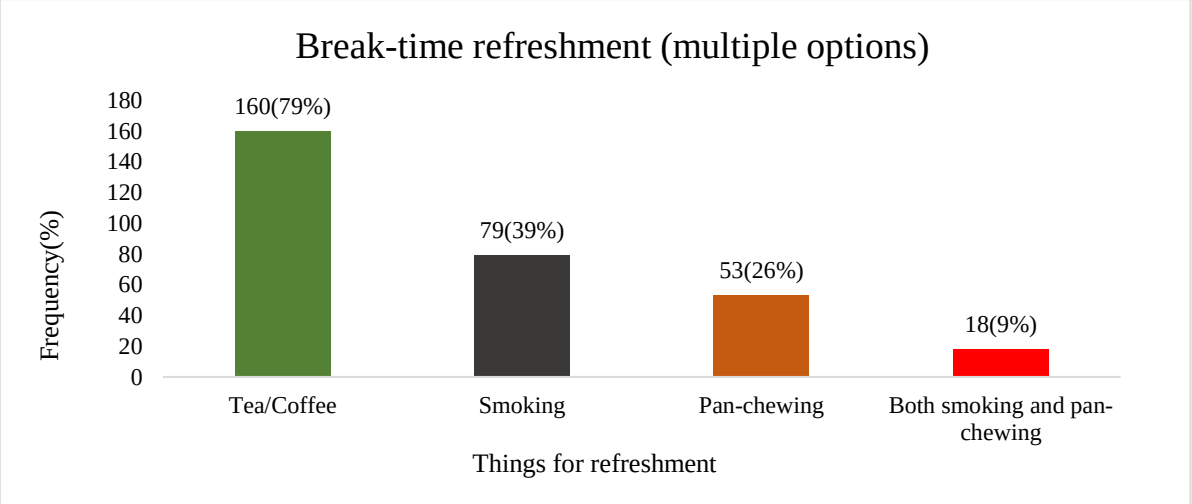

Figure 1: Preferences of Break-Time Refreshment by the Study Participants (N = 203)

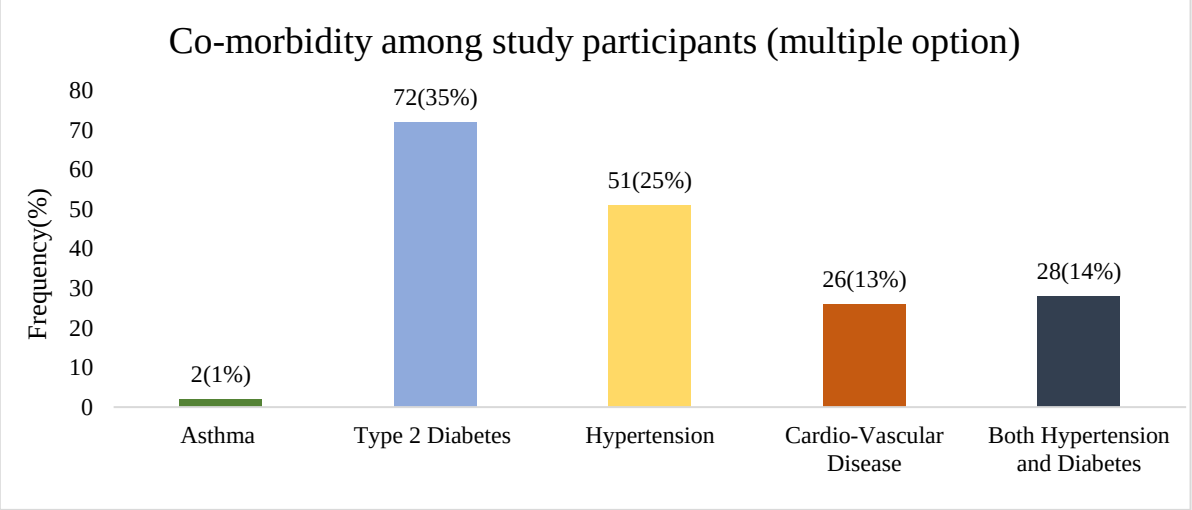

Figure 2: Distribution of Study Participants According to their Co-Morbidities (N=203)

The categories of no stress, average stress, and high stress are classified by PSS scores as less than 13, 13 to 20, and more than 20 respectively. The categories of good sleep, average sleep, and very poor sleep are classified by ESS scores as less than 6, 7 to 8, and more than 8 respectively. The categories of no depression, mild, moderate, and severe depression are classified by PHQ-9 scores as less than 5, 5 to 9, 10 to 14, and more than 14 respectively. The prevalence of stress, day time sleepiness, and depression among the study participants is shown in Figure 3, Figure 4, Figure 5 respectively.

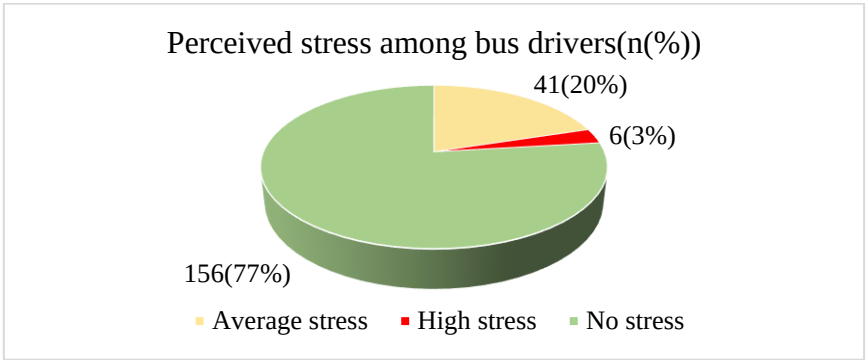

Figure 3: Prevalence of Perceived Stress among the Study Participants (N = 203)

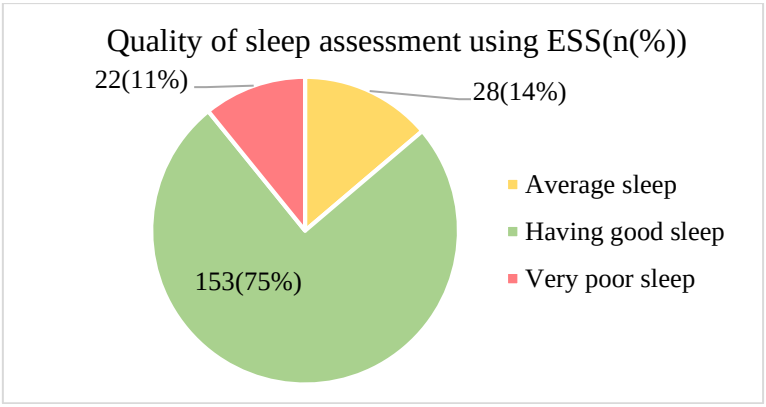

Figure 4: Distribution of the Study Participants According to their Quality of Sleep (N = 203)

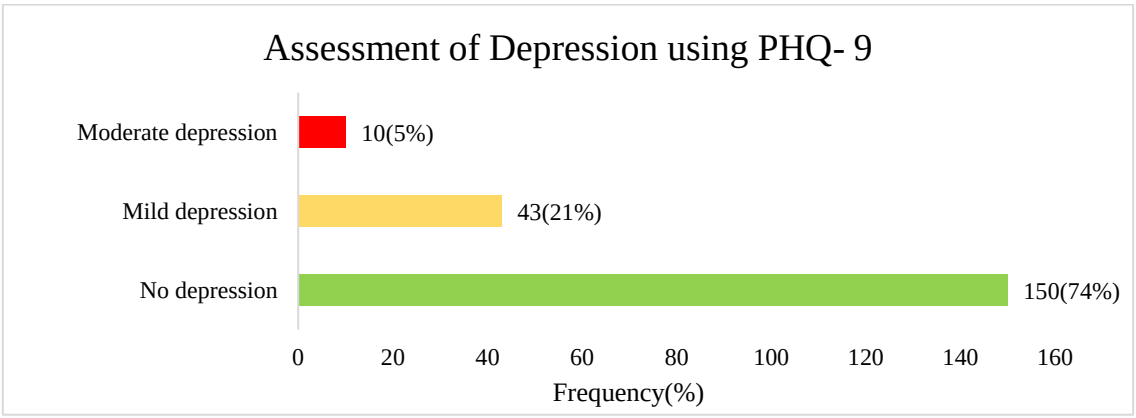

Figure 5: Prevalence of Depression among the Study Participants (N = 203)

The risk factors such as Travel-distance, Systolic blood pressure, ESS scores, and PHQ-9 scores are found to have a highly significant positive correlation with Perceived Stress Scores. The risk factors such as Years of experience, Systolic blood pressure, PSS scores, and PHQ-9 scores are found to have a highly significant positive correlation with Epworth Sleepiness Scale Scores. The Correlation coefficient value and the p-value are shown in the table 2.

Table 2: Correlation between Risk Factors with Stress, Sleep Deprivation, and Depression Scores (N=203)

Risk Factors	**Perceived Stress Scale Scores**		**Epworth Sleepiness Scale Scores**		**Patient Health Questionnaire – 9**	
	R^{2*}	**P-Value**	**R^{2*}**	**P-Value**	**R^{2*}**	**P-Value**
Age in years	- 0.29	0.685	0.075	2.288	0.013	0.850
Years of experience	0.066	0.325	0.145	0.039	0.005	0.949
Years of experience in shift-working	0.111	0.116	0.080	0.256	0.029	0.681
Total distance traveled per day	0.144	0.040	0.109	0.121	0.056	0.429
Systolic Blood Pressure	0.216	0.002	0.239	0.001	0.010	0.886

*Spearman Correlation coefficient value

Among bus drivers who are classified as light smokers (p=0.008), who have driver-conductor conflict (p<0.001), who have not received a non-accident certificate (p=0.011), who are wearing spectacles while driving (p=0.039), who have very poor sleep (p < 0.001) and who have moderate depression (11.4 percent) have statistically significant association with high perceived stress when compared to other groups of drivers by using chi-square test as represented in Table 3.

Table 3: Association between the Perceived Stress Scale and the Risk Factors of the Study Participants (N=203)

Variables		Perceived Stress Scale			Chi-Square Value	P-Value
		No Stress	Average Stress	High Stress		
		N (%)	N (%)	N (%)		
Socio-Demographic Variables						
Age	29 to 38 years	7(58.3)	4(33.3)	1(8.3)	6.180*	0.164
	39 to 48 years	80(73.4)	24(22)	5(4.6)		
	49 to 58 years	69(82.9)	13(15.9)	1(1.2)		
Place of residence	Rural	105(79.5)	22(16.7)	5(3.8)	2.926*	0.210
	Urban	50(70.4)	19(26.8)	2(2.8)		
Education	Primary	0(0)	1(100)	0(0)	8.750*	0.205
	Secondary	77(72)	25(23.4)	5(4.7)		
	Higher secondary	70(83.3)	12(14.3)	2(2.4)		
	Degree holder	8(72.7)	3(27.3)	0(0)		
Habits						
Smoking	No such Habit	90(70.3)	24(20.3)	4(3.4)	15.56*	0.008
	Very light smoker	24(85.8)	2(7.1)	2(7.1)		
	Light smoker	20(57.1)	14(40)	1(2.9)		
	Heavy smoker	21(95.5)	1(4.5)	0(0)		
Alcohol intake	Yes	63(72.4)	20(23)	4(4.6)	1.56*	0.481
	No	92(79.3)	21(18.1)	3(2.6)		
Using spectacle	Yes	29(63)	15(32.6)	2(4.4)	6.02	0.039
	No	126(80.3)	26(16.5)	5(3.2)		
Variables related to the job of the study participants						
Travel distance (in Kms)	200 to 299	23(88.5)	1(3.8)	2(7.7)	15.72*	0.054
	300 to 399	16(100)	0(0)	0(0)		
	400 to 499	47(72.3)	17(26.2)	1(1.5)		
	500 to 599	38(74.5)	11(21.6)	2(3.9)		
	600 to 699	21(70)	8(26.7)	1(3.3)		
	≥700	10(66.7)	4(26.7)	1(6.7)		
Maximum speed attained while driving (in Km/hour)	< 60	89(75.4)	26(22)	3(2.5)	1.21*	0.548
	60 to 80	66(77.6)	15(17.6)	4(4.7)		
Number of leaves avail in past three months	< 3 days	50(76.9)	13(20)	2(3.1)	6.26*	0.163
	3 to 6 days	67(83.8)	11(13.8)	2(2.5)		
	> 6 days	38(65.5)	17(29.3)	3(5.2)		
Number of break-time per day	< 3	87(68)	34(26.6)	7(5.5)	13.19*	0.006
	3 to 5	54(90)	6(10)	0(0)		
	> 5	14(93.3)	1(6.7)	0(0)		
Driver-conductor conflict	Yes	8(44.4)	5(27.8)	5(27.8)	20.63*	<0.001
	No	147(80)	36(19)	2(1)		
Vehicle-comfortability	Yes	149(78)	40(20.2)	3(1.8)	16.51*	0.001
	No	6(54.5)	1(9.1)	4(36.4)		
Have received the non-accident certificate	Yes	72(87)	10(12)	1(1.1)	8.51*	0.011
	No	83(69.2)	31(25.8)	6(5)		
With sleep and depression categories						
ESS - category	Good sleep	137(89.5)	16(10.5)	0(0)	60.346*	<0.001
	Average sleep	11(39.3)	14(50)	3(10.7)		
	Very poor sleep	7(31.8)	11(50)	4(18.2)		
PHQ-9 category	No depression	142(92.2)	12(7.8)	0(0)	87.668*	<0.001
	Mild depression	13(29.5)	26(59.1)	5(11.4)		

	Moderate depression	0(0)	3(60)	2(40)		

*Fischer exact test value.

Among the study participants who hail from the urban area (p=0.010), who are using spectacles (p=0.012), who are taking less than 3 breaks per day (p=0.001), who have driver-conductor conflict (p=0.001), and who are not comfortable with their vehicle (p<0.001) have statistically significant association with very poor sleep when compared to other groups by using the Chi-square test as represented in Table 4.

Table 4: Association of ESS Categories with the Risk Factors of the Study Participants (N=203)

Variables		**Epworth Sleepiness Scale**			**Chi-Square Value**	**P-Value**
		Good Sleep	**Average Sleep**	**Very Poor Sleep**		
		N (%)	**N (%)**	**N (%)**		
Socio-Demographic Variables						
Education	Primary	0(0)	0(0)	1(100)	15.393*	0.009
	Secondary	73(68.2)	19(17.8)	15(14)		
	Higher secondary	72(85.7)	6(7.1)	6(7.1)		
	Degree holder	8(72.7)	3(27.3)	0(0)		
Place of residence	Rural	100(75.8)	23(17.4)	9(6.8)	9.241	0.010
	Urban	53(74.6)	5(7)	13(18.4)		
Age	29 to 38 years	7(58.3)	4(33.3)	1(8.3)	9.043*	0.044
	39 to 48 years	83(76.1)	10(9.2)	16(14.7)		
	49 to 58 years	63(76.8)	14(17.1)	5(6.1)		
Habits of the study participants						
Smoking	No such Habit	89(75.4)	15(12.7)	14(11.9)	4.068*	0.670
	Very light smoker	24(85.7)	2(7.1)	2(7.1)		
	Light smoker	23(65.7)	8(22.9)	4(11.4)		
	Heavy smoker	17(77.3)	3(13.6)	2(9.1)		
Alcohol intake	Yes	64(73.6)	17(19.5)	6(6.9)	5.894	0.053
	No	89(76.7)	11(9.5)	16(13.8)		
Using spectacle	Yes	27(58.7)	11(23.9)	8(17.4)	8.754*	0.012
	No	126(80.3)	17(10.8)	14(8.9)		
Variables related to the job of the study participants						
Travel distance (in Kms)	200 to 299	21(80.8)	3(11.5)	2(7.7)	7.85*	0.631
	300 to 399	14(89.5)	1(6.2)	1(6.2)		
	400 to 499	49(72.3)	12(18.5)	6(9.2)		
	500 to 599	41(80.4)	5(9.8)	5(9.8)		
	600 to 699	19(63.3)	4(13.3)	7(23.3)		
	≥700	11(73.3)	3(20)	1(6.7)		
Maximum speed attained while driving (in Km/hour)	< 60 Km	86(72.9)	16(13.6)	16(13.6)	2.17	0.338
	60 to 80 Km	67(78.8)	12(14.1)	6(7.1)		
Number of leaves avail in past three months	< 3 days	50(76.9)	9(13.8)	6(9.2)	8.78	0.067
	3 to 6 days	67(83.8)	7(8.8)	6(7.5)		
	> 6 days	36(62.1)	12(20.7)	10(17.2)		
Number of break-time per day	< 3	86(67.2)	20(15.6)	22(17.2)	18.63*	0.001
	3 to 5	53(88.3)	7(11.7)	0(0)		
	> 5	14(93.3)	1(6.7)	0(0)		
Driver-conductor conflict	Yes	6(33.3)	6(33.3)	6(33.4)	17.02*	<0.001
	No	147(79.5)	22(11.9)	16(8.6)		
Vehicle-comfort ability	Yes	151(78.6)	22(11.5)	19(9.9)	18.38*	<0.001
	No	2(18.2)	6(54.5)	3(27.3)		
Have received the non-accident certificate	Yes	66(79.5)	9(10.8)	8(9.6)	1.39	0.498
	No	87(72.5)	19(15.8)	14(11.7)		

*Fischer exact test value.

Among the study participants who hail from the urban area (p=0.021), who are taking less than 3

breaks per day (p<0.001), who have driver-conductor conflict (p=0.001), and who are not comfortable with their vehicle (p<0.001), have statistically significant association with moderate depression when compared to other groups of bus drivers by using the Chi-square test as represented in Table 5.

Table 5: Association between PHQ-9 Categories with the Risk Factors of the Study Participants (N=203)

Variables		Patient Health Questionnaire – 9			Chi Square Value	P-Value
		No Dep. N (%)	Mild Dep. N (%)	Mod. Dep. N (%)		
Socio-demographic variables						
Education	Primary	0(0)	1(100)	0(0)	11.29*	0.082
	Secondary	75(70.1)	29(27.1)	3(2.8)		
	Higher secondary	71(84.5)	11(13.1)	2(2.4)		
	Degree holder	8(72.7)	3(27.3)	0(0)		
Place of residence	Rural	107(81.1)	21(15.9)	4(3)	7.27*	0.021
	Urban	47(66.2)	1(1.4)	23(32.4)		
Age	29 to 38 years	7(58.3)	5(41.7)	0(0)	4.36*	0.325
	39 to 48 years	81(74.3)	24(22)	4(3.7)		
	49 to 58 years	66(80.5)	15(18.3)	1(1.2)		
Habits of the study participants						
Smoking	No such Habit	90(76.3)	25(21.2)	3(2.5)	3.82*	0.661
	Very light smoker	23(82.1)	4(14.3)	1(3.6)		
	Light smoker	23(65.7)	11(31.4)	1(2.9)		
	Heavy smoker	18(81.8)	4(18.2)	0(0)		
Alcohol intake	Yes	68(78.2)	17(19.5)	2(2.3)	0.52*	0.863
	No	86(74.1)	27(23.3)	3(2.6)		
Using spectacle	Yes	30(65.2)	15(32.6)	1(2.2)	4.15*	0.107
	No	124(79)	29(18.5)	4(2.5)		
Variables related to the job of the study participants						
Travel distance (in Kms)	200 to 299	22(84.7)	3(11.5)	1(3.8)	15.68*	0.050
	300 to 399	14(87.5)	2(12.5)	0(0)		
	400 to 499	48(73.8)	17(26.2)	0(0)		
	500 to 599	32(62.7)	17(33.3)	2(3.9)		
	600 to 699	26(86.7)	2(6.7)	2(6.7)		
	≥700	12(80)	3(20)	0(0)		
Maximum speed attained while driving (in Km/hour)	< 60 Km	87(73.7)	30(25.4)	1(0.8)	4.76*	0.077
	60 to 80 Km	67(78.8)	14(16.5)	4(4.7)		
Number of leaves avail in past three months	< 3 days	50(76.9)	12(18.5)	3(4.6)	7.26*	0.091
	3 to 6 days	66(82.5)	13(16.2)	1(1.2)		
	> 6 days	38(65.5)	19(32.8)	1(1.7)		
Number of break-time per day	less than 3	83(64.8)	40(31.2)	5(3.9)	23.73*	<0.001
	3 to 5	57(95)	3(5)	0(0)		
	more than 5	14(93.3)	1(6.7)	0(0)		
Driver-conductor conflict	Yes	7(38.9)	10(55.6)	1(5.6)	13.49*	0.001
	No	147(80)	34(18)	4(2)		
Vehicle-comfortability	Yes	151(79)	38(19.8)	3(1.2)	15.74*	<0.001
	No	3(27.3)	6(54.5)	2(18)		
Have received the non-accident certificate	Yes	69(83.1)	14(16.9)	0(0)	5.67*	0.048
	No	85(70.8)	30(25)	5(4.2)		

*Fischer exact test value.

The odds ratio for developing stress among study participants who are not received the non-accident certificate is 3.842(1.522 – 9.695) when compared to participants who have received the non-accident certificate. The odds ratio for developing stress among study participants who are having poor sleep is 18.370 (7.475 – 45.142) when compared to

participants who are having good sleep. Table 6 shows the odds ratio for having high stress associated with the risk factors.

Table 6: Estimating Odds Ratio for Having High Stress with Various Risk Factors (N=203)

S.No	Variables	P-Value	Odds Ratio	Confidence Interval	Adjusted Odds Ratio*	Confidence Interval
1	Vehicle Comfortability	0.001	2.88	0.84 – 9.92	0.169	0.026-1.123
2	Not Receiving Non-Accident Certificate	0.011	2.918	1.387 – 6.137	3.842	1.522-9.695
3	Smoking	0.008	0.989	0.513 – 1.907	0.926	0.407-2.110
4	Having Driver-Conductor Conflict	<0.001	4.836	1.786 – 13.089	3.671	0.815-16.537
5	Having Poor Sleep	<0.001	15.222	7.009 – 33.062	18.370	7.475-45.142

*To calculate Adjusted Odds Ratio, each variable is adjusted to other variables in the table.

The odds ratio for developing depression among study participants who are having driver-conductor conflict is 3.875(1.235 – 12.155) when compared to participants who are not having a driver-conductor conflict. Table 7 shows the odds ratio for developing depression associated with the risk factors.

Table 7: Estimating Odds Ratio for Developing Depression with Various Risk Factors (N=203)

S.No	Variables	P-Value	Odds Ratio	Confidence Interval	Adjusted Odds Ratio*	Confidence Interval
1	Vehicle Comfortability	<0.001	9.821	2.493 – 38.691	4.215	0.919 – 19.333
2	Not Receiving Non-Accident Certificate	0.048	2.029	1.011 – 4.072	1.795	0.864 – 3.731
3	Having Driver-Conductor Conflict	0.001	6.079	2.208 – 16.733	3.875	1.235 – 12.155

*To calculate Adjusted Odds Ratio, each variable is adjusted to other variables in the table.

DISCUSSION

Almost 94 percent of the study participants are above the age of 38 years, which may be due to the gap in the recruitment process for the driver job in that area. With increasing age, the driving experience of the study participants also increases. Similarly, in 2018, a study conducted by Vadivel Murugan et al, in Thirunelveli, has the same age pattern (about 85 percent above the age of 31 years) among the study participants[16]. And a study done by Thirumaran et al, in the Cuddalore district, in 2016, has 89 percent of drivers above the age of 31 years[17]. Comparison of our study results with various relevant studies were shown in table 8.

Table 8: Comparison of Study Results with Various Studies

S.No	Risk Factor	Author, Year, and Place	Findings	Our Study Results
1	Alcohol consumption	Joshi et al, 2017, Pune[18]	Prevalence is 20%	Prevalence is 43%
		Monojit das et al, 2017, Kolkata[19]	Prevalence is 80%	
2	Smoking	Dhamodharan et al, 2020, Salem[20]	Prevalence is 78%	Prevalence is 42%
3	Accidents	Taklikar, 2016, Mumbai[21]	37% of drivers involved in accidents	59% of bus drivers are involved in accidents in the last 2 years

5	Driver-conductor conflict	Premnath TM et al, 2015, Trichy[22]	Prevalence is 16%	Prevalence is 9%
6	Diabetes	Suguna et al, 2019, Puducherry[23]	Prevalence is 23%	Prevalence is 35%
7	Hypertension	Monojit das et al, 2017, Kolkata[19]	Prevalence is 17%	Prevalence is 25%
8	Stress	Bathija et al, 2013, Karnataka[7]	Prevalence is 80%	Prevalence is 23%
		Ashok.j et al, 2018, Erode[24]	Stress is associated with poor sleep	Stress is associated with very poor sleep
9	Day-time sleepiness	Krishnaswamy et al, 2016, Karnataka[9]	Prevalence is 11%	Prevalence is 25%
11	Depression	Poongothai et al, 2009, Chennai[25]	In the general population, prevalence is 15%	In bus drivers, Prevalence is 26%

Most of the study participants (65 percent) in the study area hail from the rural area, similar to a study conducted by Adnan Riza et al, has 67 percent of government bus drivers hail from rural and semi-urban settings[26]. This indicates the job preference between rural and urban residence.

The prevalence of alcohol consumption among the study participants is 43 percent. In contrast to this result, a study done by Joshi et al, in Pune shows the prevalence of only 20 percent[18]. And a study conducted in Kolkata by Monojit Das et al, shows the prevalence of 85 percent among private bus drivers[19]. These differences show the need for further research about the prevalence and reason for the high prevalence of alcohol consumption.

The prevalence of smoking among study participants is almost 42 percent. And about 39 percent of drivers use smoking as a means of refreshment in break-time. Similarly, a study conducted by Dhamodharan et al, in Salem, shows about 78 percent of drivers are smokers [19]. When compared to private bus drivers (where the prevalence is 80 percent) the prevalence is much low [19]. This variation needs further research as this high prevalence may be due to peer pressure that needs to be addressed.

In this study, the prevalence of diabetes among bus drivers is 35 percent. In contrast, a study done in Puducherry by Suguna et al, in 2019, shows the prevalence of diabetes is around 23 percent[23]. This difference may be due to the difference in the age distribution of this study population where 94 percent of drivers are above 38 years of age. The prevalence of diabetes among bus drivers is far high when compared to the prevalence (about 6 percent) in the general population[27]. The prevalence of hypertension among government bus drivers in this study is 25 percent. A study done in Mumbai city shows similar results (24 percent) regards to hypertension.[21] The prevalence of hypertension in the general population in Tamilnadu is also around 26 percent.[28] This may be evident for poor health-seeking behavior among bus drivers.

The prevalence of perceived stress among bus drivers is 23 percent. In contrast, a study conducted in Karnataka, by Bathija et al, in 2013 shows an 80 percent prevalence in stress among bus drivers[7]. This huge difference may be due to the very low sample size (n=100) and the eligibility criteria (drivers who are driving within the city limits). A high proportion of experienced divers in this study may influence the difference between results.

The prevalence of daytime sleepiness among the government bus drivers is 25 percent by using ESS. A study conducted by Krishnaswamy et al, in Karnataka, conducted among 25,000 drivers shows an 11 percent prevalence of daytime sleepiness[9]. The data collection of the above study was done by self-response questionnaire. In the current study, data were collected through an interview by a trained interviewer, which may be the reason for these different results.

The prevalence of depression among government bus drivers is 26 percent. A study called CURES-70 done by Poongothai et al, in the Chennai urban area, shows the prevalence of depression as 15 percent[25]. A study conducted by Gautam et al, in 2016 across 12 Indian states to find the mental health status of the general population shows the current prevalence of depression among the general population is about 3 percent[29]. This indicates the high prevalence of depression among government bus drivers which needs to be explored.

Limitations- Even though data collection was done by multiple visits on different occasions, some drivers are unable to interview due to timing issues. The study participants have been restricted to specific characters such as geographic location. Hence, the generalizability of the study results to entire government bus drivers in the country is restricted. Our study didn't discuss the severity, complications, disability, and mortality due to co-morbidities and accidents among bus drivers. Since stress and depression is a sensitive topic, there is a chance of under-reporting. As a limitation of a cross-sectional study, the direction of the association

between the risk factors and the perceived stress cannot be arrived.

Strength of the Study- The data were collected using pre-validated scales, which were applied by a trained medical professional through the interview method. The observations were made by the principal investigator which minimizes the inter-observer bias. For the benefit of the participants, a sound referral system was ensured.

Recommendation- Perceived stress scale can be used by the authorities to screen the bus drivers especially those having risk factors such as wearing spectacles, smoking habit, and alcohol consumption. A smoking cessation rally or camp may be conducted to create awareness and motivate smokers to quit smoking. The custom of issuing the non-accident certificate to bus drivers every year should be appreciated and continued. Supervisors should take immediate and necessary action in reducing driver-conductor conflicts. A rotation policy can be ensured for drivers covering maximum travel distance. By increasing the number of break-time while driving will reduce the prevalence of depression among bus drivers.

CONCLUSION

In our study, the prevalence of stress (23%), depression (26%), and sleep deprivation (25%) were high among government bus drivers. The prevalence of co-morbidities such as overweight (75%), Type 2 Diabetes Mellitus (35%), Hypertension (25%), and Cardio-vascular disease (13%) was also very high among bus drivers. The bus drivers who are using spectacles while driving, smoking more than 5 cigarettes per day, who are having Driver-Conductor conflict, not received the non-accident certificate, those who have very poor sleep and moderate depression have a statistically significant association with increased perceived stress.

Based on our study findings, we recommend that authorities can screen the bus drivers for perceived stress especially those having risk factors such as wearing spectacles, smoking habit, and alcohol consumption. A smoking cessation rally or camp may be conducted to create awareness and motivate smokers to quit smoking. The custom of issuing the non-accident certificate to bus drivers every year should be appreciated and continued. Supervisors should take immediate and necessary action in reducing driver-conductor conflicts. A rotation policy can be ensured for drivers covering maximum travel distance. By increasing the number of break-time while driving will reduce the prevalence of depression among bus drivers.

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