Effects of Safety Pattern, Cabin Ergonomics and Sleep on Work-Related Stress and Burnout of City and Transit Bus Drivers in Lahore, Pakistan

Zahara Batool [a]
[a] Institute for Transport Studies, University of Leeds, United Kingdom

Z.Batool@leeds.ac.uk

Muhammad Waqas Younis [b,*]
[b] Department of Technology, The University of Lahore, Pakistan

[*]*(Corresponding Author)*
engr.waqasyounis7@gmail.com

Ammar Yasir [c]
[c] National Engineering Services Pakistan (NESPAK), Pakistan

ammardost1@gmail.com

Atteq Ur Rehman [b]
[b] Department of Technology, The University of Lahore, Pakistan
attequrrehman92@gmail.com

Mudassar Dilawar [b]
[b] Department of Technology, The University of Lahore, Pakistan

mudassardilawar@hotmail.com

Mazhar Yasin [b]
[b] Department of Technology, The University of Lahore, Pakistan

mazharyasin105@gmail.com

Muhammad Hamza [b]
[b] Department of Technology, The University of Lahore, Pakistan

[d] School of Civil Engineering, Central South University, China

engr.hamza30@gmail.com

Saqib Shahzad [d]
[e] Chung-Ang University, School of Civil and Environmental Engineering, South Korea

engrsaqib59@gmail.com

Muhammad Sarmad Ali [e]
[f] Communication & Works Department, Government of Punjab, Pakistan

MUHAMMADSARMAD127@gmail.com

Arslan Jamil [f]
[g] Department of Transportation Engineering and Management, University of Engineering and Technology Lahore, Pakistan

contact.arslanjamil@gmail.com

Muhammad Haris Asghar Khan [b]

[b] Department of Technology, The University of Lahore, Pakistan

hariskhan1040@gmail.com

Practitioner Summary

This study explores burnout and work-related stress of bus drivers in Lahore (Pakistan). City and transit bus drivers were interviewed through a questionnaire, containing three sections, using different subjective ratings based upon their past reliability. Results indicate that stress in bus drivers emerged as a physical and psychological health-damaging factor.

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Health and working environment of bus drivers is compromised in low-middle-income countries like Pakistan which leads to burnout and excessive Road Traffic Crashes. Hence, this study delves into factors affecting their safe operations from health and work environment perspectives and measures their associated stress and Burnout level. In a study of four hundred and ninety-nine (499), 86% city and 14% transit bus drivers are surveyed through a questionnaire. Stress is estimated for city and transit bus drivers, using the Effort/Reward Imbalance Model (ERI) of Siegrist, and burnout is calculated using the Copenhagen Burnout Inventory (CBI). For determination of important determinants, descriptive and regression analyses are conducted. Findings show that stress has emerged as negative factor for physical and psychological health of city and transit bus drivers. Results based on bus drivers' responses suggest that organizational awareness and emphasis on health and safety level can significantly reduce driver stress and burnout.

Keywords: Bus drivers; Burn out; BMI; Cabin ergonomics; Lahore

1 Introduction:

Work–related stress is now recognized as a widespread problem around the globe. Long-term and unresolvable stress can cause emotional exhaustion and job deprivation (Iacovides et al, 2003) and ultimately lead towards occupational burnout (Freudenberger, 1974). Work–related stress can lead to physical illness, as well as psychological distress and mental illness. Stress at workplace may be the result of exposure to a range of work stressors and it arises when people attempt to manage their responsibilities, tasks or other forms of pressure related to their jobs and encounter strain, anxiety or worry in this attempt (Bhui et al., 2016). Work–related stress often shows high dissatisfaction among the employees, job mobility, burnout, poor work performance, and less effective interpersonal relations at work (Parasad, 2015).

Burnout is characterized as the feeling of fatigue, cynicism, and ineffectiveness (Maslach and Schaufeli, 1993). It is also described as feelings of emotional exhaustion, personal accomplishment, and depersonalization (Iacovides et al, 2003; Wu et al, 2006). Past researches indicate that city bus drivers are more susceptible to mental stress and fatigue than individuals in other occupations (Kompier, 1996; Wang and Lin, 2001; Jones et al., 2014; Morshidi and Norafneeza, 2019). It is because they have to successfully balance the competing demands of safety, customer-focused service, and company operation regulations (Tse et al., 2006). Fatigue and acute sleepness may increase the risk of Road Traffic Crashes (RTCs) (Bener et al., 2017)(and in Columbia work stress is an issue that compromise the safety of bus drivers)(Useceh et al., 2018), poor health (e.g. in the United Kingdom (UK) urban bus operators confess that their bad health and high rate of mortality is due to work-related stress)(Duffy and McGoldrick, 2007) and administrative losses (e.g. high absenteeism rates in the transport sector)(Geurts and Schaufeli, 1993). Like stress, bus drivers are also at higher risk of burnout which affects every aspect of the individual's working life (Iacovides et al., 2003). It is considered a strong indicator for the identification of drivers who pose a risk to the organization and road safety. Continuous work-related stress and burnout can ultimately induce trauma and not only lead to physical health problems but substance abuse (Chen and Cunradi, 2008; Issever et al., 2002).

Many factors including sleep deprivation, perceived safety culture, bus ergonomic, and health status have been linked to contributing to driver stress and fatigue and increased risk of at-work accidents (Emkani and Khanjani, 2012; Bjornskau and Longva, 2009). All these factors are of interest because they relate to stress and burnout. A study conducted in Norway on 29,600 drivers who had been involved in accidents, reports drowsiness as a contributing factor in 3.9% of all accidents. This percent increased to 18.6%, 8.1%, and 7.3% in night-time accidents, driving more than 150 km in one trip, and personal injury accidents, respectively (Philips and Sagberg, 2013). In developing countries like, a study conducted in India found that low income, inadequate rest, and poor safety culture are the major factors influencing the work quality of city bus drivers (Arora and Randhawa, 2019). Another study conducted in Brazil concluded that working time, excessive workload, and poor sleep quality are the leading causes of stress in bus drivers (de Medeiros et al., 2017). Similarly, a study conducted in Argentina revealed that short-distance bus drivers are partially sleep-deprived, overweight, have poor work-rest conditions, and have high levels of anxiety and fatigue (Diez et al., 2014).

Another significant factor in assessing the health status of a person at work is body mass index Shin, et al., (2013) studied that in bus drivers the main cause of hypertension is obesity.

He further stated that the reason for high BMI (Body Mass Index) (BMI > 25kg/m^2) is due to irregular eating habits and low physical activity due to the nature of the job. BMI in association with sleep quality has a strong relationship. Several researchers proved high association of short sleep with elevated BMI levels (Watson, et al., 2010; Shochat et al., 2016; Grander, et al., 2015).

Significant relation is also found between RTCs and perceived safety culture. National Transport Commission of Australia (2004) classify bus drivers as safety critical workers or high stress safety workers and recommends cautious health management for bus drivers due to lack of advancement in the city bus network. According to Bjornskau and Longva (2009), critical safety scenarios within the organization may impart some serious effects on psychomotor skills, decision making, and concentration; all of which may play roles in accidents.

Cabin ergonomics is another factor that is found to have a significant effect on the stress of bus drivers (Kompier and Di Martino, 1995). Exposure to air, noise pollution, fix posture of their working condition and whole body vibration puts them at the risk of stress and tension (Bhatt and Seema, 2012; Grösbrink et al., 2011). Morshidi and Norafneeza, (2019) and Kovacevic, et al., (2010) identified that incorrect sitting, unadjusted car seats, and non–use of safety belts are frequent causes of fatigue and accidents.

Alongside these, a study conducted in Stockholm revealed that different working conditions influence stress levels. As lack of driving experience increases stress level while oldest drivers appeared to be less stressed compared with younger drivers (Hlotova et al., 2020). Another study conducted in Iran also revealed that stress level is high in Heavy Transport Vehicle (HTV) drivers than Light Transport Vehicle (LTV) drivers. It showed that vehicle type, workload, and income influence the stress level and burnout of professional drivers. (Rahimpour, 2020).

In Pakistan context, professional bus drivers have been identified as a particular group, suffering from health issues and stress. This ~~is~~ equally holds for city and transit bus drivers. The work stress associated factors are long hours, workload, and time pressure (Roohi and Hayee, 2010). National Highway Authority, Pakistan (2015), professed extreme fatigue and sleep disturbance as a major cause of accidents. Aslam et al., (2016) also found obesity as a prevalent factor in Pakistani bus driver`s bad health. It is further stated that bus driver obesity is directly linked with stress, prolonged sitting, and short sleep. Pakistan transport network is also losing its grip over labor legislation due to which the transport workers are going to liberalize the road transport market and will result in fragmentation of service structure (Hisam, 2006). Urban transport workers in Pakistan are mostly male and they are the main feeding arm of the family but still, their lives are vulnerable having no social security, and always have a constant risk of losing their livelihood (Sayyed and Javed, 2001). Moreover, unskilled drivers also used illegal recommendation channels to get the job even on low wages which is more perilous for passengers and organizations.

Perceived stress and burnout affecting factors have been discussed above after studying a variety of literature. Health issues, safe working environment, cabin ergonomics, and such other work-related stress causing factors are more active of growing concern in low-income society and were neglected in the past (Chopra, 2009; Houtman, 2007). Therefore, despite the lack of comparative evidence of work-related stress and burnout of city and transit bus stress, there is a need to address this issue by using different models. Research is necessary to carry

out while considering different stress domains in professional bus drivers by using multiple models in middle-income for developed countries. Hence, the current study follow-up model validation to evaluate effects of multiple stress domains in city and transit bus drivers. Hence, this study will help to develop a universal scale to assess the effects of stress, especially in under-developed nations. This study also intends to highlight the stress-related problems of Pakistani bus drivers. Characterizing the stress and burnout issues that are common among bus drivers, will be helpful in understanding and ultimately preventing these hazardous matters. It is anticipated that this research will contribute to make policy guidelines regarding health, road safety, and wellness program for bus drivers and to develop the road safety standard of public transport services in Pakistan.

2 Methodology:

2.1 Instruments:

In this study, two different scales are used to evaluate stress and burnout. To add some potential effect self-reported sleep quality and perceived safety culture of the organization, considering two additional measurements were also added. Self–constructed questions related to bus ergonomics were also added to find their effect on dependents. Driver characteristics (e.g. age, income, working hours, BMI, etc.) were also included as possible controlling factors in the modeling process. The harmony of these scales is their reliability and efficiency shown in past studies.

Stress is measured using Siegrist`s effort/ reward imbalance model (Siegrist, 1996). The Karasek model of demand/ control (Robert & Karasek, 1979) and Siegrist model are the two most commonly used stress measuring scales. But later on, Radi et al., (2007) affirm that Effort Reward Imbalance (ERI) model works better than the demand/control model. ERI model uses work characteristics (i.e. effort at work is responded by money, esteem, and status control which are socially defined reward items) while the demand/control model uses psychological strain results from the interaction between job demands and job control (i.e., low control and high demand producing job strain). Tse et al., (2006) use this model to measure occupational stress among British bus drivers. Similarly, in Germany Aust et al., (1997) and Chung and Wong, (2011) implemented this model on bus drivers to evalute stress in Taiwan. The adopted scale for current research contains 17 items; 6 items measure participant effort, and the remaining 11 items measures reward. The items are rated on 4 points Likert scale coded from 1 (strongly disagree) to 4 (strongly agree). The score is calculated by dividing the sum of effort score divided by the sum of reward score with adjustment of a number of items. A score greater than 1 represents more effort than a reward.

Burnout level is measured by using Copenhagen Burnout Inventory (CBI), developed by (Kristensen et al.,2005). Before CBI, Maslach Burnout Inventory (MBI) (Jackson & Maslach, 1986) was used widely to measure burnout syndrome but due to its group-oriented limitations (i.e., teachers), CBI was introduced to cover up the limits. As, MBI works in two dimensions that do not precisely pertain to burnout syndrome (Halbesleben & Demerouti, 2005), CBI comes up with three sub–dimensions i.e., personal burnout, work-related burnout, and client related burnout which measures physical and psychological fatigue. The adopted scale originally consists of 19 items, measuring personal burnout, work-related burnout, and client related burnout. This study focuses only on work-related burnout which contains 7 items. Each

item is recorded on a 5-point scale always (score 100) to never (score 0), or very seriously (100) to very slightly (0). The total score will be the average of the seven items. Chung and Wu, (2013) implemented the CBI scale (i.e. only work-related burnout) to assess the burnout level of Tiwanese public transport drivers while Winwood and Winefield, (2004) tested CBI scale on Australian dentists and compare their results with the Maslach burnout scale and suggested CBI as an appropriate burnout measure among health professionals.

Self-reported sleep quality of bus drivers is measured by using Pittsburg Sleep Quality Index (PSQI) (Buysse et al., 1989). PSQI scale can assess sleep quality over a one-month period from self–reports. It was initially used for clinical purposes but later on, it was accepted as a convenient tool in several patient groups including commercial drivers (Sabbagh et al., 2005; de Phino, et al., 2006). PSQI is used for self-rated or reported questions. PSQI consists of seven components (i.e., sleep quality, sleep onset latency, sleep duration, sleep efficiency, sleep disturbances, sleep medication, and daytime dysfunction). Inventory score ranges from 0 to 21 and the participant having a score more than 5.0 is typically classified in the poor sleep category.

For the safety assessment of the organization, scale developed by Global Aviation Network (GIAN, 2001) is the best prediction model. Originally this scale was introduced only for flight safety operations but later on, it was successfully adopted by Bjornskau and Longva, (2009) for various types of groups and activities including bus companies in Norway. Chung and Wong, (2014) also implemented this scale for Tiwanese commercial drivers. This scale comprises 25 questions related to organization safety, management attitude, and focus on safety, the attitude and focus on safety among employees, a culture of reporting, and reactions to reported errors and incidents. These items are measured with a 5-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree). The global score is a sum of 25 items, ranging from 25 to 125. The score of 92 or above indicates good perceived safety culture while a score lower than 59 indicates poor perceived safety culture. A score between 59 and 92 is considered an average safety condition.

Table 1.

Variables and Definitions

Variable	Definition	Score	Range
Stress Level	Effort / Reward Imbalance	Ratio	More effort > 1 > Less effort
Burnout Level	Copenhagen burnout	0 – 100	No cut off point
Sleep Quality	Pittsburgh Sleep Quality	0 – 21	Above 5.0 poor sleep quality
Safety Culture	Global Aviation Network	25 – 125	Poor >59, 59-92 satisfactory, < 92 good
Bus Ergonomics	Self – Constructed	1 – 20	Good >10 > Poor
Body Mass Index	Weight (kg) / Height2 (m2)	-	18.5-24.9 ideal, 25-30 overweight,<30
Driving Experience	No of years of service	-	Obese
Daily duty timing	Average duty hours per day	-	Ideal if between 8 – 9 hours/day

The ergonomic design of the driver's workstation is a necessary component of driver safety and health protection (Peters et al., 1992). As there is no such scale developed yet to measure the efficiency of bus driver`s cabin area. Hence, based on past literature, five self–constructed questions related to bus ergonomics were added. The questions are rated on a 4-point Likert scale ranges from 1 (completely disagree) to 4 (completely agree). A score above 10 indicates good bus ergonomics.

2.2 Study Area:

Lahore, Pakistan is ranked 42nd most populated city in the world. Due to the transformation of the city into the educational, recreational, and industrial hub of the country, demand for transportation facilities has also increased. The traffic of the city is growing at an annual rate of 3.75% including 9.63% growth is observed in minibuses (Urban Unit, 2008).

Report of Lahore Mass Transit (2007) states that, 1053 public buses are handling around 200,000 commuters daily. In addition to buses, wagons, minibuses and rickshaws are also participating in handling the passengers but still, it is not matching the growing public demand. Russel and Anjum, (1997) stated that bus based public transportation system of Lahore is unsafe, unreliable, and inefficient due to inadequate planning and controlling.

Roohi and Hayee, (2010) stated that high density traffic, jam roads, and severe weather condition in and severe weather conditions in Lahore may cause psychological stress which could result in health issues i.e. (blood pressure, heart rate, body mass index, etc). Job related stress i.e. musculoskeletal disorders are very common in bus drivers of Lahore (Aslam et al., 2016). This induction of stress and fatigue may lead to an increased risk of being involved in a bus crash (Greiner et al., 1998). Since 2010, more than 500 casualties have been reported in 25[1] major bus accidents in Pakistan. Accident data of bus accidents in Lahore is also very horrific.

The reason for high ratio of RTCs is due to fatigue, poor sleep quality, excessive duty hours, poor road conditions, and violation of traffic rules. This irregularity not only slit off the legislation of road transport labor but also urged the public of Lahore to shift to a private vehicle (i.e. cars or motor cycles) instead of public buses. This is the reason that both the user and bus drivers are not comfortable with this environment.

2.3 Participants:

The scope of this study is to accumulate data only from city bus drivers in Lahore. Bus companies working under LTC i.e. (city bus and transit bus) were listed. Seven (7) local and foreign owned bus companies including the only transit bus[2] service was chosen. Around 700 registered bus drivers are working under these city and transit bus services. Before starting interviews, consent of concerned bus companies was taken by writing them through emails and mailing posts. The survey was started as consent was received from these companies that their drivers are willing to be the part of this study.

2.4 Study Procedure:

2.4.1 Pilot Survey:

A preliminary survey was conducted by university students who were researchers and asked questions to bus drivers those work on university bus service of the University of Engineering and Technology (UET)., Lahore. Total, eight (8) students were selected to conduct interviews voluntarily. Researchers were divided into two groups one for the morning shift and the other one for the evening shift. Permission from the bus depot manager was granted. Forty (40) drivers were interviewed with a response rate of 100%. The purpose of pilot survey or

[1] Scatter source of information from different newspapers i.e. The News, Express Tribune, Dawn News

[2] Green line metro bus (length = 27km is operational since 2013. Orange Line metro train project (length = 27.1km) is under construction, while Blue and Purple line mass transit projects of Lahore Mass transit system is under planning phase.

feasibility survey was to train the researchers and to assess the difficulties during the interview. So, errors can be eliminated before the conduction of targeted survey.

2.4.2 Main Survey:

499 city bus drivers including 70 transit bus drivers from different foreign and local bus companies working in Lahore were targeted for the survey. Phone calls and meetings were scheduled with different bus company's operational managers for ethical permission to conduct interviews of bus drivers. After that undersigned statement of ethical practice was submitted to these companies to carry out the survey. Some operational managers upon request, asked for time and security clearance as per their company policy rules. Questionnaire was described briefly to the researchers and they were trained enough to catch maximum drivers at a time. The survey was conducted from March to May 2019. There were 53 questions in the questionnaire and it took almost 30 to 35 minutes. The questionnaire components are as follows:

Demographic Characteristics, Driver Cabin position and Comfort, Occupational/Working Stress (Income satisfaction, salary, admiration, job security, etc.), Burnout/Fatigue, and Safety Culture.

Before the commencement of survey, it was decided to conduct interviews in their staff common room during shift change timings. A group of four to five drivers was allocated to one researcher. After getting approval from companies, consent of drivers was also obtained before starting the questionnaire. The purpose of research and questionnaire was initially explained to drivers. Most of the questionnaires were filled by drivers by themselves. Only from those drivers who couldn't read or had difficulty in reading "Urdu" (as the questionnaire was in "Urdu" language) researcher asked the questions and fill the responses of drivers but that amount was little. In this case, researchers turn wise asked the questions from each driver. The survey was conducted from March to May 2019.

3 Analysis:

Preliminary questionnaire was translated into national language 'Urdu' for the comfort of the drivers. Analysis of data was conducted using SPSS version 22.0. This section also includes the screening of data in which incomplete questionnaires along with unwanted bugs and unnecessary answers from the drivers were scrutinized. Total 449 were the drivers who passed the cleaning process. The cleaning process was done to eliminate those questions which have incomplete answers. Proportion of usable data after the expulsion of incomplete questionnaires was 89.9 % This section is split up into two parts, descriptive and inferential analysis. The detail of analysis is described below.

3.1 Descriptive analysis:

The current section is split up into two parts (i.e., univariate and bivariate analysis) and it describes the basic analysis of the data. The first unit covers up a univariate study in which a comparison between average score of city and transit bus driver characteristics i.e., age, income, working hours, BMI, etc. is represented as below in Table 2. Moreover, to assess the significant difference between the average score of city and transit bus drivers using measurement scales i.e., ERI, CBI, PSQI, GIAN, and inquiries related to bus ergonomics, mean rank analysis is performed as presented in Table 3. Mann - Whitney U test is a non-parametric statistical technique, applied to compare the variances between two separate groups of non-normal data. As this study is focusing two different classes of bus drivers, i.e., city and transit

bus drivers. Hence, this test will help comparing their mean rank scores (Milenovic, 2011). Graphical representation (i.e., box plot) of data by showing overall spread for different measurement scales used in this study is also represented in Figure 1. Cross tabulation is done as a part of bivariate analysis and represented in Figure 2., along with chi-square test to check goodness of fit.

3.2 Inferential Analysis:

This part of analysis is carried out to assess the significant relationship between determinants (i.e., sleep index, perceived safety culture, bus ergonomics, and socio-demographic factors) and the dependents (i.e., stress and burnout) used in this study. The goal of conducting this analysis is to explore the impact of factors affecting stress and burnout and their influence on driver`s health and comfort level. Spearman`s correlation (i.e., data is non – normal) is performed to check out a significant association between the variables while regression is adopted after selection of most strong and significant variables from correlation result. For generating a stress model for city bus drivers (i.e., Model 1a), logistics regression[3] is chosen and for transit bus drivers' simple linear regression is adopted i.e., Model 1 (b). For the burnout models of city and transit bus drivers (i.e., Model 2a and 2b) simple linear regression is selected as a reliable tool. The credibility of selecting these modeling methods is described below.

4 Results:

4.1 Drivers Characteristics:

Bus driver socio-economic and health aspects are descriptively explained in this section. The Standard Deviation (SD) values for Gender (i.e., no female), average age (i.e.,47 years) and driving experience (i.e., 18 years) are somehow similar (i.e., city vs transit bus) with little variability as shown in Table 2. In Pakistan, due to cultural restrictions, it is very difficult for a woman to work as a bus driver. Mean age 47.08 (0.61) and driving experience of 18.29 (5.03) show that most drivers are close to the retirement age as the retirement age in Pakistan is 60 years (Saeed & Sarwar, 2016).

Obesity (i.e., in this study BMI > 25 26.120 (3.40) is overweight, BMI ranges defined by CDC[45], United States) along with the age (i.e. 47 years) of bus drivers has also observed in this section and their significant relationship with stress is highlighted.

It is found that 25.16% of drivers with poor sleep quality have ERI ratio of more than 1 (i.e., Figure 2 a) and 11.58% of drivers lying in overweight and obese category have also an ERI ratio more than 1 (i.e., Figure 2 b). Hence, it can be stated that the drivers with higher BMI also have poor sleep quality and it is indirectly affecting their stress level (i.e., ERI >1).

Mean score of working hours i.e., 8 to 9 hours/day is showing little variation among the city and transit bus drivers as shown in Table 2. This depicts, working hours of both the groups are within the limits. According to International Labour Organization (ILO), RMT[6], and European commission of mobility any kind of driver i.e., long haul, inter or intra city bus driver, cannot

[3] Logistic Regression is a type of predictive model that can be used when the target variable is a categorical variable with two or more categories

[4] The reason for selecting simple linear regression for transit bus drivers is because no driver was reported with stress level greater than 1. Hence only 1 class of stress (i.e. less than 1) is considered

[5] Center of Disease and Control: If BMI < 18.5 underweight, if BMI = 18.5 – 24.9 it is healthy, if BMI = 25.0 - 29.9 it is overweight and above 30 BMI is termed as obese.

[6] RMT = Rail, Maritime and Transport Workers is a British trade union covering transport sector

work more than 48 hours a week (8-9 hours a day). Moreover, working time should not exceed 10 hours during 24 hours. So, the present study withholds the by-laws defined by the concerned international authorities.

Average income of a city bus driver is 18,000 PKR/month (112.36 U$D) whereas the transit driver is earning 25,000 to 30,000 PKR/month (156.04 U$D to 187.27 U$D) inclusive of all incentives as shown in Table 2. According to the UK employment department, gross monthly income of a bus driver is 1,365 pounds/month while gross salary of a bus driver in United States (US) is 1,898 dollars/month (US Department of Labor). This comparison shows that bus drivers are getting very low wages in Lahore. Besides comparison, the difference in income level of transit and city bus drivers shows injustice. As per budget 2018 – 19 Ministry of Finance, Pakistan decided the minimum salary of an unskilled employer must not be less than 17,500 PKR (106.12 $) but, the salary of well-experienced bus driver is maximum of 18,000 PKR. So, it is alarming situation for the bus drivers in Lahore that they are under stress due to having a low salary package.

Table 2.

Bus Driver Characteristics

Variable (Units)	All Drivers (N=449)	Transit Drivers (N= 70)	City Bus Drivers (N=379)
	Mean (SD)	Mean (SD)	Mean (SD)
Age (Years)	47.08 (0.61)	46.52(0.80)	48.41(0.56)
Gender (Male percent)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)
Driving Experience (years)	18.29 (5.03)	20.04(4.36)	18.52(5.02)
Daily duty timing (hours)	8.40 (0.43)	8.00(0.00)	8.80(0.45)
Income (U$D)	121.60(0.959)	171.65(0.00)	112.36(0.80)
Body Mass Index (kg/m2)	26.12 (3.40)	26.95(2.31)	25.96(3.54)
Accidents / Near Misses	1.96(0.354)	0.00(0.00)	1.96(0.354)

4.2 Result Interpretation of Measurement Scales and Comparison between City and Transit Bus Drivers:

Average results and mean rank score as shown in Table 3, depicts more traces of stress and burnout on city bus driver as compared to the transit bus driver. Box plot for stress over city drivers also shows quartile and whisker are crossing the threshold line (i.e., Figure 1 (a)) while in case of burnout as shown in Figure 1 (b) whiskers are touching the ultimate axis which exposes some of the city bus drivers are in severe burnout condition. The reason can either be a difference in income level or variance in average and mean rank of self-reported sleep quality, perceived safety culture and bus ergonomics score as presented in Table 3. Figure 2(a) significantly clarifies that 25.16% of overall drivers are facing sleep problems due to which their ERI ratio is above threshold limit. Not only stress but burnout level of bus drivers is also badly disturbed due to poor sleep quality score (see Figure 2(e)). Box plot results of sleep index as shown in Figure 1 (c) also supports the illustration, as the bottom whisker of sleep index is starting from the critical threshold line in especially in the case of city bus drivers.

Table 3.
Average comparison of measurement scale

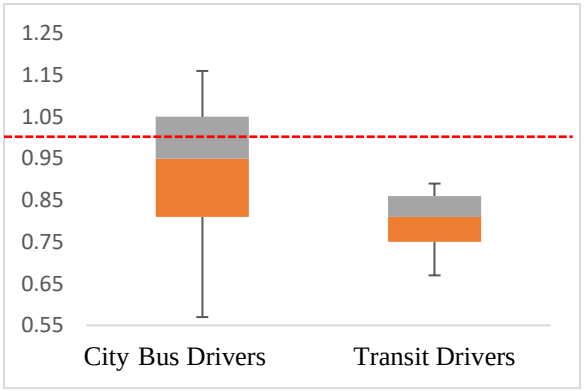
Measurement Scales	All Drivers (N=449)	Transit Drivers (N=70)		City Drivers (N=379)	
	Mean (SD)	Mean (SD)	Mean Rank (Significance)	Mean (SD)	Mean Rank (Significance)
Stress (ERI Scale)	0.90 (0.15)	0.79 (0.08)	149.50 (0.00)	0.92 (0.15)	238.94 (0.00)
Burnout (CBI Scale)	30.86 (14.05)	20.56 (2.94)	217.00 (0.05)	32.76 (14.46)	226.48 (0.05)
Sleep Quality (PSQI)	5.64 (1.80)	2.21 (1.36)	98.00 (0.00)	6.25 (1.03)	248.46 (0.00)
Safety Culture (GIAN)	90.49 (22.13)	110.30 (3.27)	307.50 (0.00)	86.82 (22.18)	209.76 (0.00)
Bus Ergonomics	17.19 (2.08)	18.78(0.41)	232.50 (0.00)	17.27 (2.25)	223.61 (0.00)

Similarly, average and Mann – Whitney[7] mean rank score of perceived safety culture is comparatively far much better in case of transit operators as shown in Table 3. On the other hand, the box plot for city bus drivers also shows deviation in perceived safety culture score as upper quartiles are mostly above the red dotted critical line (see Figure 1 d). Cross tabulation graph between stress and perceived safety culture (i.e., Figure 2 (c)) shows that 20.50% of overall drivers reported significant high-stress levels (i.e., ERI > 1).

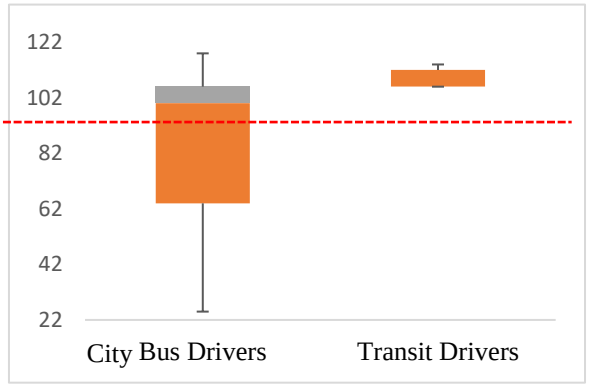
Average and mean rank scores of bus ergonomics as shown in Table 3 represent the reliable driver`s cabin ergonomics as there is no such remarkable difference. While Figure 1 (e) shows whiskers of city bus drivers are starting from the minimum which notifies some of the drivers are not satisfied with their cabin environment. Moreover, drivers with high burnout levels (i.e., above 50) are also unsatisfied with the bus ergonomics as shown in Figure 2(d). The presence of some old model buses with a lot of vibrations during driving, noisy cabin, and absence of fresh air circulation can be the main reason for stress leading towards burnout.

Accident results in this study are not reliable as shown in Table 2. The main reason was the security hindrance in data accumulation. Company operational managers were afraid of publishing the accident status due to which they were not willing to share their accident or bus damage record with the pilot team.

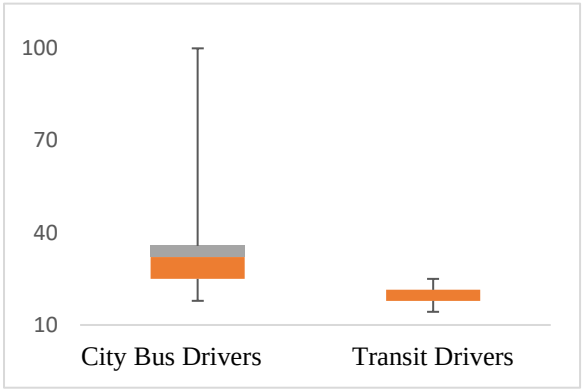
[7] Mann – Whitney U Test compares mean rank score if variables are divided in to only two classes. It is non – parametric test



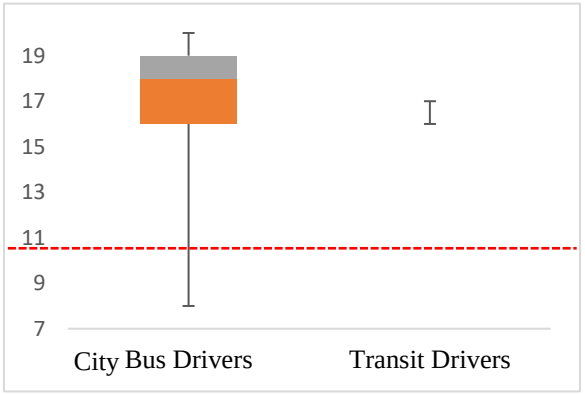
Stress (a)



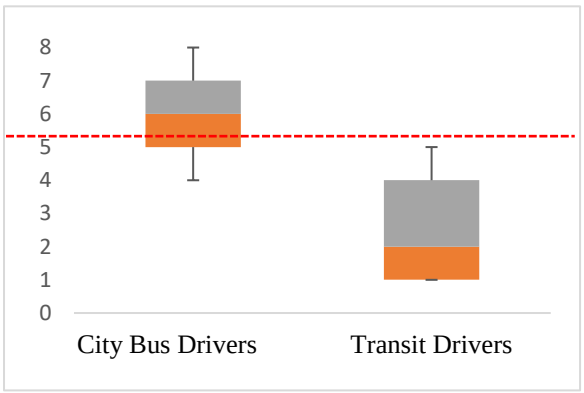
Safety Culture (d)



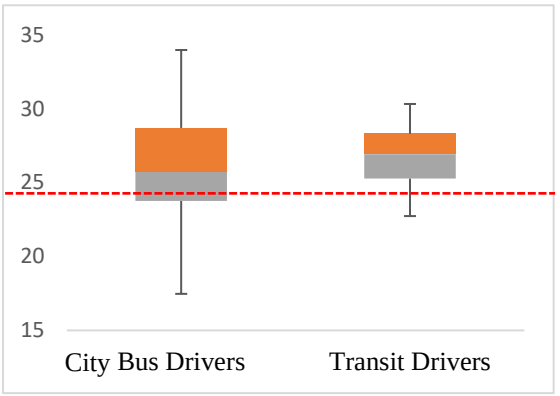
Burnout (b)



Bus Ergonomics (e)



Sleep Index (c)



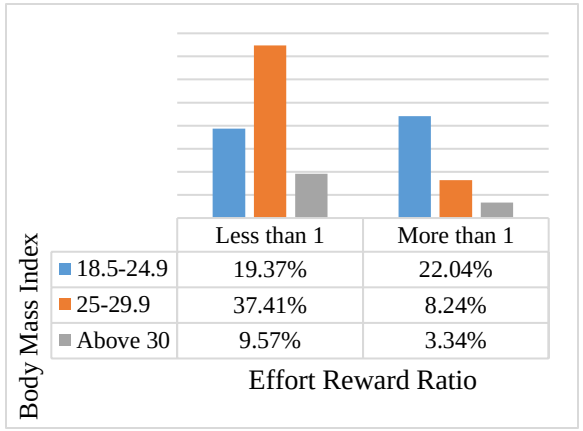
Body Mass Index (f)

Figure 1. Box Plot Comparison between City and Transit Bus Drivers

Figure 1 Alt Text: Figure is showing box plot comparison for six factors of city and transit bus drivers. Part 'a' is describing stress for city and transit bus drivers while part 'b' is describing burnout for city and transit bus drivers. Similarly, part 'c' is elaborating sleep index while part 'd' is highlighting the perceived safety culture for city and transit bus drivers. Part 'e' is showing bus ergonomics while part 'f' is showing BMI of city and transit bus drivers.

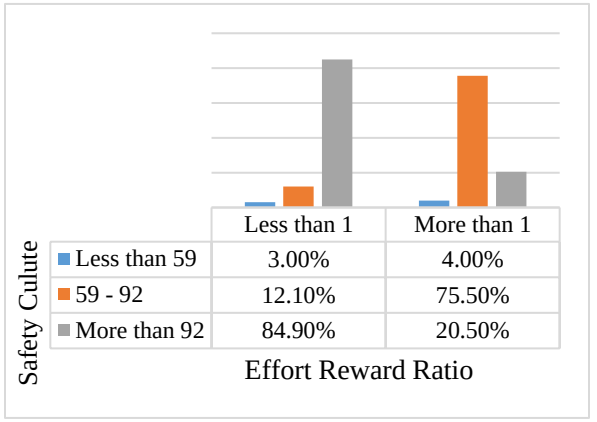
Chi – Square	30.89
Significance	0.00

(a) Sleep Index



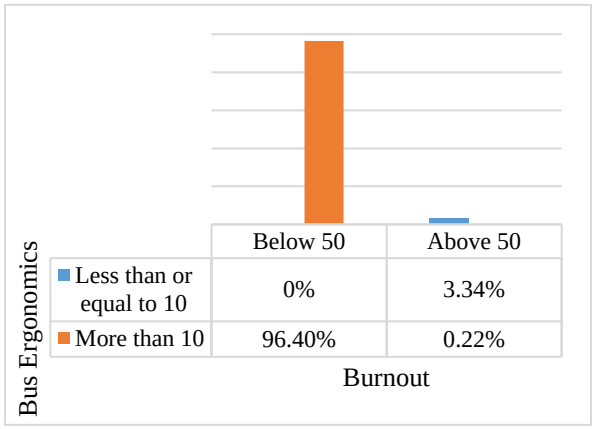
Chi – Square	56.02
Significance	0.00

(b) BMI



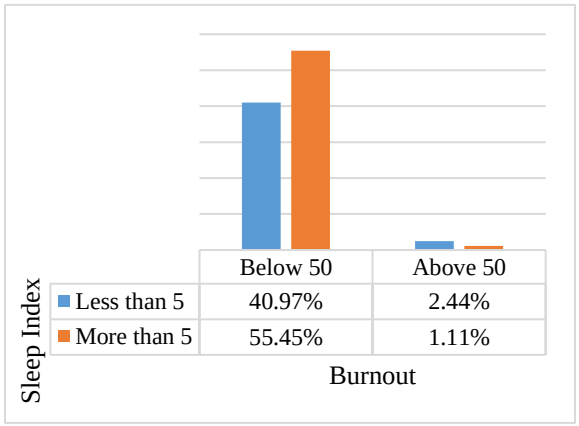
Chi – Square	186.56
Significance	0.00

(c) Safety Culture



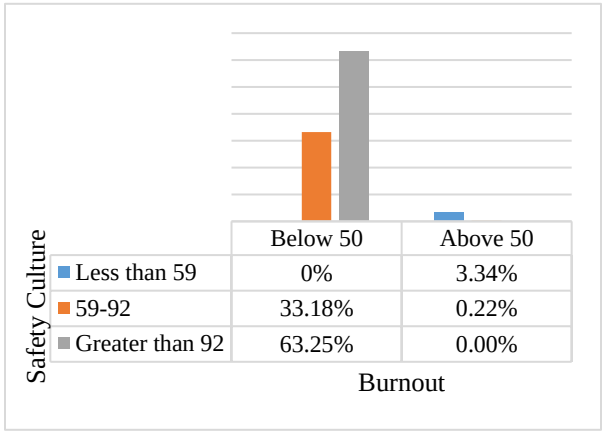
Chi – Square	419.96
Significance	0.00

(d) Bus Ergonomics



Chi – Square	4.32
Significance	0.00

(e) Sleep Index



Chi – Square	420.09
Significance	0.00

(f) Safety Culture

Figure 2. Cross Tab Bar Graph for Different Factors Influencing Effort Reward Ratio and Burnout

Figure 2 Alt Text: Part ‘a’, ‘b’ and ‘c’ of figure 2 are showing effects sleep index, BMI and safety culture on effort reward ratio. While, part ‘d’, ‘e’ and ‘f’ of figure 2 are showing effects bus ergonomics, sleep index and safety culture on burnout.

4.3 Inferential Analysis Results:

Spearman`s correlation among predictors (i.e., stress and burnout) and independent (i.e., Sleep index, perceived safety culture, bus ergonomics) variables are represented in Table 4. Cronbach`s α value verifies the reliability matters of the measured values and it is exhibiting satisfactory reliability as its value is exceeding the conventional threshold of 0.70 as shown below (Table 4). Logistic and simple linear regression is used to develop the models as discussed above. Due to presence of city bus drivers in both stress classes (i.e., 1>ERI>1) it was decided to use logistic regression considering as suitable for categorical variables (i.e., Model 1a). On the other hand, all transit bus drivers were reported only in low-stress level class due to which simple linear regression was carried out (i.e., Model 1b). For burnout models, again simple linear regression was adopted as it was not categorized into classes (i.e., Model 2a and 2b).

Correlation result depicts that stress and burnout have strong and weak correlations with the independents but all are significantly linked as shown in Table 4. Based on their significant association, these independents (i.e., perceived safety culture, sleep index, bus ergonomics, and body mass index) are also tested in the regression models and as a result, their effect is strong and significant. The explanation of their significant association and effect on the dependents is also briefly presented.

Perceived safety culture (i.e., -0.70 and -0.43) as presented in Table 4. After observing their significant correlation, safety culture is also inducted in stress and burnout models (i.e., Model 1 and 2) for both city and transit bus drivers and as a result, the stressor is significantly affecting the stress and burnout level especially in the case of city bus drivers.

Sleep quality of bus driver is also significantly linked with both the dependents (i.e.stress 0.30 and burnout 0.55) and its effects on both the models and for both groups (i.e. Model 1 and Model 2) is also significant. As presented in modeling results, self-reported sleep quality of bus drivers is most strong and significant effecting factor and it is more damaging in case of city bus drivers.

Body mass index is another important health factor that has a significant association but it is weakly correlated with stress (i.e., 0.19) and burnout (0.29) as presented in Table 4. On the other hand, a significant correlation of BMI and sleep index is observed which shows that BMI is indirectly causing stress problems among the bus drivers.

Burnout model (i.e. Model 2a and 2b) result shows that BMI is directly causing increment in burnout levels but it is more in case of city bus drivers as compared to transit drivers. This model also presents that sleep quality of bus drivers is also significantly affecting the burnout levels. Hence, it can be concluded that the joint effect of poor sleep quality and increased BMI level is not only affecting stress but it is also generating burnout syndrome. Chung and Wong, (2014) also investigated heterogeneous factors and found BMI as a core variable that is affecting stress and burnout.

Driver`s cabin ergonomics as discussed above in section 4.2 is directly affecting the burnout level of a bus driver. Correlation results (i.e., Table 4) also show a significant correlation of bus ergonomics with burnout (i.e., -0.27) as compared to the stress level (i.e.-0.14) which elaborates that some of the drivers are very much unsatisfied with the bus environment. Regression results (i.e., Model 1 and 2) also support the conclusion that ergonomics and burnout relation is more prominent in case of city bus driver stress and burnout level (i.e., -2.58 and -3.42) than transit bus operators (i.e., stress -0.09 and burnout -0.58).

In case of stress and burnout correlation, a significant association is also observed between these two variables (i.e 0.47) as shown in Table 4. For that reason, stress in a burnout model is manipulated as explanatroy variable (i.e., Model 2a and 2b). Model result shows that burnout generation is due to high-stress level of bus drivers.

Table 4.

Reliability, Average, Correlation of driver`s physical and psychological condition and company safety status

Measurement	Cronbach`s α	Mean (SD)	Correlation					
			ST	BO	SI	BMI	SC	BE
Stress Level (ST)	Effort 0.85 Reward 0.82	0.90 (0.15)	1					
Burnout Level (BO)	0.70	30.86 (14.05)	0.47*	1				
Sleep Index (SI)	0.73	6.00 (2.02)	0.30*	0.55*	1			
Body Mass Index (BMI)	N/A[a]	26.10 (3.48)	0.19*	0.29*	0.26*	1		
Perceived Safety Culture (SC)	0.92	90.49 (22.13)	-0.70*	-0.43*	-0.45*	-0.21*	1	
Bus Ergonomics (BE)	0.75	17.10 (2.08)	-0.14*	-0.27*	-0.18*	0.02	0.20*	1

[a] BMI is a single measurement and thereby has no Cronbach's α value.
*$\rho < 0.05$

Model 1(a) Stress Model for City Bus Drivers

Stress	B	df	Significance	Exponential (B)
Sleep Index	4.33	1	0.05	1.22
Perceived Safety Culture	-3.07	1	0.01	0.14
Bus Ergonomics	-2.58	1	0.01	21.22

Pseudo R-Square	
Cox and Snell	.59
Nagelkerke	.60

Model 1 (b) Stress Model for Transit Bus Drivers

Stress	Unstandardized Coefficients		t	Significance
	B	Standard Error		
Constant	-2.89	4.8	-6.01	0
Sleep Index	0.10	0.00	1.51	0
Perceived Safety Culture	-0.01	0.00	6.23	0
Bus Ergonomics	-0.09	0.14	7.18	0

R	0.87
R^2	0.75
Adjusted R^2	0.74
Standard Error	0.043

Model 2 (a) Burnout Model for City Bus Drivers

Stress	Unstandardized Coefficients		t	Significance
	B	Standard Error		
Constant	-2.89	4.80	-6.01	0
Sleep Index	0.10	0.00	1.51	0
Perceived Safety Culture	-0.01	0.00	6.23	0
Bus Ergonomics	-0.09	0.14	7.18	0

R	0.65
R^2	0.74
Adjusted R^2	0.73
Standard Error	0.69

Model 2 (b) Burnout Model for Transit Bus Drivers

Burnout	Unstandardized Coefficients		t	Significance
	B	Standard Error		
Constant	-127.25	13.62	-9.43	0
Body Mass Index	2.58	0.06	27.99	0
Stress	1.72	2.03	5.25	0.04
Sleep Index	0.30	0.30	3.00	0
Bus Ergonomics	-0.58	0.44	12.51	0
Perceived Safety Culture	-0.00	0.06	-0.71	0

R	0.52
R^2	0.75
Adjusted R^2	0.70
Standard Error	0.68

5 Discussion:

The results showed that mean age of city and transit bus drivers in Lahore ranges from 47 years to 48 years respectively which is near to 60 years of retirement age (Saeed & Sarwar, 2016) but still they are driving. BMI and age have a significant relationship in this study which shows that older age drivers can have high stress and burnout level.

Workload of bus drivers is another contributory factor towards perceived stress level. The current study showed that there is a little variation as working hours were within the limits. The limited working load contributes to less perceived stress. However, this finding is similar to other studies (Hlotova et al., 2020; Rahimpour, 2020).

The study showed that BMI is significantly correlated with sleep index. Further, mean BMI of bus drivers is 26 kg/m^2 which is higher than 25 kg/m^2. Obesity with age has direct influence on sleep quality so higher the BMI, higher the perceived stress level, and poorer the sleep. Longer the sleep duration higher will be the BMI. Sleep problems contribute to obesity, as shorter duration and poorer quality of sleep lead to behavioral, metabolic, and endocrine changes that lead to weight gain (Spaeth, et al., 2013; Beccuti & Pannain, 2011). Role of sleep duration and quality, as well as the negative consequences of stress, are exceptionally noteworthy when assessing lifestyle choices and BMI. Researchers have recently reported that the lack of sleep, as well as the negative impact of stress, maybe risk factors for obesity (Vargas et al., 2014).

Income of drivers is also the main factor affecting stress and burnout. The results revealed that monthly income of experience public bus drivers in Pakistan is 19500 PKR which is slightly higher than the lowest monthly income set by the Government of Pakistan. This low-paid salary affects the stress level of drivers (Sheng et al., 2013; Rahimpour, 2020).

The results of present study also showed that 25% of drivers are facing sleep problems due to which ERI is high than the threshold. The correlation analysis also revealed that self-reported sleep quality is significantly linked with stress and burnout (Joen et al., 2014; Anund et al, 2016; Vetrivel et.al, 2014). Further correlation analysis in this study depicts that perceived safety culture significantly affects stress and burnout level. Perceived safety culture is much better for transit bus drivers while city bus drivers have to follow a schedule that's why they have high stress level and low perceived safety culture as 20% of drivers reported significant high stress level which ultimately leads to traffic accidents (Özkanb and Lajunenb, 2010; Tylor and Dorn, (2005); Chung and Wong, 2014; Useceh et al., 2018).

Bus ergonomics also contribute to high burnout levels as drivers with high burnout levels reported dissatisfaction with cabin ergonomics. Bus ergonomics significantly correlates with burnout. Further regression results showed that ergonomics and burnout relation is more prominent in city bus drivers. This finding is in agreement with other studies (Kompier, 1996; Alperovitch et al., 2010; Berkowitz, 2014; Aslam et al., 2016; Morshidi and Norafneeza, 2019).

Inferential analysis in this study highlighted the association of BMI, safety culture, and cabin ergonomics with stress level. Previously no research has been carried out to evaluate the effects of BMI, safety culture, and vehicle condition in a single study. Further, different stress measurement models including ERI, PSQI, GIAN, and CBI used in this study, for first time has been used to measure stress of professional bus drivers. A bus ergonomics scale to measure the stress level and efficiency of bus driver's cabin area is developed in this study which has not been developed earlier. The current study highlighted the potential factors affecting stress levels comprised on a variety of stress domains. A universal scale of stress measurement can be developed from current findings for developed and low-middle-income countries. Further, the findings would be helpful to reduce hazardous actions by reducing stress and burnout in other countries.

The research was carried out by using a self-reported method which has some definite limits as there might be some biases while reporting. For future studies a large sample size is comprised of data collected from different cities. The experiment design for this study was only performed on city and transit bus company drivers of Lahore city. Further studies might investigate the anthropometric measurements from the drivers and the cabins. The study of complimentary factors of the work environment of city bus drivers such as the potential impact of peak hours traffic load, route characteristics, road characteristics, health indicators, and biomedical charecteristics may provide additional information on work stress dynamics. This potenitially could lead towards a better cabin design and stress reduction alternates.

6 Conclusions:

The findings of the present study showed that life of professional bus drivers in Lahore has been proven to be very hectic and health damaging. Overweight (i.e., BMI > 25) problem is found as a leading fitness destruction factor in both city and transit drivers which is causing stress and burnout and ultimately, they are imposing severe effects on bus driver behavior which can become accident contributors.

Poor sleep quality is assessed among city bus drivers as compared to transit operators which is nominated as the core determinant of stress and burnout and in collaboration with bad rated body mass index, it is severely causing serious health matters.

The collaborative effect of perceived safety culture and ergonomics of driver`s cabin is also moderately affecting the stress and burnout levels in both cases (i.e., city and transit operators). But perceived safety culture individually is also causing increment in stress and burnout levels. Bus ergonomics results are satisfactory in case of city bus but much better results are tabularized in transit operators as compared to other variables.
Income as a socio-demographic factor is directly causing its effect on stress (i.e., Effort / Reward ratio) which consequently leads towards burnout. Hence, determinants have been sorted out and discussed which are causing stress and burnout among bus drivers in Lahore.

7 Policy Recommendations:

After the results assessment and conclusion some of the recommendations are summarized as below:

I. To improve the sleep quality of bus drivers, shift rosters must be designed in such a way that drivers can spend maximum time at home or with co-workers to improve their sleep quality and relieve their minds from stress.
II. It is observed that drivers feel burnt due to a deduction in income if the trip is not completed within the defined time. So, to accomplish the task, time must be given to preserve the health and safety of the bus driver. Moreover, incentives must be introduced based on control in speed limits, which will help in the reduction of stress.
III. Detailed attention is needed to ensure the cab design and replacement of old model buses with the new ones. Ventilation of air quality is up to the possible standard limit and noise levels are reduced below (i.e. 70dB). Driving posture must be feasible and associated with all driving activities.
IV. By forming transport welfare organizations and unions which must have dynamic leadership which would be well informed of national and international governance issues, ground realities and have better communication abilities with the regulatory officials.

8 Limitations:

For some of the drivers who couldn't read 'Urdu', in those cases researcher asked the questions and fill the responses of drivers. This might affect the honesty of those. While interviewing in staff room it might also have chance to overhear each other. However, it was a small group that did not answer the questions themselves.

Some of the companies reported that they facilitate bus drivers with medical facilities. Many of them also reported that they facilitate them with sick leaves and staff turnover. But still, problem might be worse as a company may carry on with a driver who is suffering from burnout until he is physically fit. In current study, drivers were asked about stress and burnout while a comprehensive questionnaire-based study can be conducted to assess the company behavior, mechanism and facilities provided to the drivers.

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Conflicts of Interest: The authors declare no conflict of interest.

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