

Assessment of Occupational Stress and Hypertension among Railway Loco Pilots and Division Controllers; A Cross-sectional Research

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Abstract

Introduction: As one of the high-stress positions in Indian Railways, loco pilots were the subject of a cross-sectional investigation on occupational stress in 2020. A comparative cross-sectional research investigation on occupational stress was subsequently carried out in 2022 among section controllers, another high-stress position held by Indian Railways. The studies' main goal was to evaluate and contrast workplace stress and hypertension. In 2020, 230 loco pilots participated in a cross-sectional study on occupational stress and hypertension, and in 2011, 82 section controllers participated in a comparative cross-sectional investigation.

Materials and Methods: A 24-item, closed-ended survey on occupational stress was given out. Systolic blood pressure above 140 mmHg and diastolic blood pressure above 90 mmHg were considered as hypertension as per the VII Joint National Committee. Chi-square test and t-test were used for testing significance at $P < 0.05$.

Results: The average stress score for loco pilots was 8.56, compared to 7.32 for section controllers. 49 loco pilots (21.3% of all loco pilots) had more than 12 stressors, and 7 (8.5%) section controllers had more than 12 stressors. There were 30 (32%) workers in the goods category, 12 (12%) in the mail/passenger category, 7 (19%) in the shunter group, 3 (11%) in the supervisory group, and 4 (7%), in the on-board group known as section controllers, who had more than 12 stress factors. The prevalence of hypertension was 36.52% (84) for loco pilots and 53.66% (44) for division controllers. In a group with more than 12 stress variables, the prevalence of hypertension was 30.61% (15) in loco pilots and 28.57% (2) in section controllers. In both study groups, those who were older, had a family history of the condition, and had a body mass index greater than 25 kg/m² had a higher prevalence of hypertension. The group of loco pilots had higher mean occupational stress and personnel with more than 12 stress variables. Loco pilots in the commodities category experienced the most stress. The risk factors for hypertension in this group were older age, a history of the condition in the family, and a BMI of greater than 25 kg/m².

Keywords: Railways, Loco Pilots, Stress, Indian, Hypertension

Introduction

The Indian Railways values the contributions of its locomotive pilots. Staff members' attention and focus are required for the task. The Operating Department of Railways' section controllers oversee train

movement. The South Western Railway of Indian Railways employs section controllers at the control rooms at the key railway stations in Mumbai. They control how the trains go between stations. The section controller position demands decision-making, attention, and focus. The positions of loco pilot and section controller are very stressful and in high demand.

Robert Karasek,^[1] a sociologist at the University of Massachusetts, developed the concept of the Job Demand Control model in 1979, which showed that job strain occurs in a work environment with considerable demand and low control. He classified jobs into four psychological categories. Active jobs are high demand jobs with high control such as physicians, engineers, and teachers. High strain jobs are high demand jobs with low control such as industrial establishments, service organizations, and transport establishments. Low strain jobs are low demand jobs with high control such as architects and natural scientists. Passive jobs are low demand jobs with low control such as watchman and janitor. High strain jobs are associated with a risk of coronary artery disease.

Dr. Schnall,^[2] Director, Social Epidemiologist, explained that production line personnel with low control are far more likely to have hypertension than managers or executives. The passive jobs at the other end of the spectrum are equally bad and tend to have an association with mental disorders and are prone to becoming demoralized and apathetic. The Effort Reward Imbalance Model of Siegrist J^[3] emphasizes on reward rather than the control structure of the work. The rewards are three transmitter systems, i.e., either money (adequate salary), esteem (respect), or security/career opportunities (promotion, job security). Thus, a high demand job that does not include any of the above three is an example of an imbalance model.

Dr. Dingli Xu,^[4] Southern Medical University, China, in a meta-analysis study reported that epidemiological studies have shown that high strain jobs are associated with an increased risk for coronary heart disease; this meta-analysis included data from more than 130,000 individuals and found that being exposed to high strain jobs was associated with an increased risk of stroke. The researchers calculated a population attributable risk for stroke with high strain jobs of 4.4% overall and 6.5% for women, especially for ischemic stroke. The harmful effect of work stress may be more significant in women.

Hypertension is a cardiovascular risk factor and one of the important cause for cerebrovascular disease stroke, ischemic heart disease, and chronic renal disease. Hypertension is an important public health problem in India and annually causes 1.1 million deaths (globally 9.4 millions) as per Rajeev Gupta et al.^[5] accounting for 10.8% of all deaths and 4.6% of all disability adjusted life years (DALYs).

According to Anchala et al., the overall prevalence of hypertension in India was 29.8%, with regional prevalences of 27.6% in rural India and 33.8% in urban India.^[6] Due to the fact that hypertension is sometimes asymptomatic, it is crucial to frequently check your blood pressure, and businesses are required to do so.

In 2020, a cross-sectional investigation on work-related stress and hypertension was carried out among loco pilots. In order to compare occupational stress and hypertension among loco pilots and section controllers, a cross-sectional study on these topics was undertaken among section controllers in 2022. Analysing occupational stress and hypertension among loco pilots was the goal of the study. Section controllers were the subject of a study to examine their levels of work stress and hypertension as well as to compare the results to those of loco pilots.

Methodology

There were 230 loco pilots (engine drivers) in the research group. The study population includes loco

pilots employed by South Western Railways' Mumbai Division. Senior loco pilots and a representative of the loco pilots' association spoke about the work and stress that loco pilots experience on the job. According to the stress variables addressed with the senior loco pilots, a closed-ended occupational stress questionnaire was created. Using 30 loco pilots as a pilot study population, the questionnaire was evaluated and changed as necessary. The supervising officer of the loco pilots provided written approval for the research, and the loco pilots themselves provided oral consent when interviewed.

The loco pilot investigation was carried out between April 2020 and October 2020. All Mumbai station loco pilots who were considered fit to perform their duties were informed of the research and invited to an examination. At the aforementioned railway stations, when they reported for service to receive their train movement, they were checked in the crew control rooms. To meet all the loco pilots employed at the three stations, each station was stopped at three to four different times. The loco pilots were given the 24-item, closed-ended questionnaire by the investigator verbally, and their replies were recorded in the questionnaire at the same time. Each question on work stress was taken into account as a stressor.

Out of the 24 questions, employees were deemed to have occupational stress if they had more than 12 positive stress variables (or 50%). The observer measured blood pressure using a mercury sphygmomanometer while the subject was seated. The employee's blood pressure was determined using the average of the three measurements. According to the VII Joint National Committee, hypertension is defined as having a systolic blood pressure of 140 mmHg or higher and a diastolic blood pressure of 90 mmHg or higher. If the blood pressure remained above the average even on the third examination, the employee was transferred to the Railway Hospital for additional treatment and was deemed to be hypertensive. Employees with blood pressure readings above the normal were re-examined after a day or two.

Workers with known hypertension were regarded as hypertensives. Chi-square test was used to compare loco pilots and section controllers, the two research groups, and various categories within the two research groups. P 0.05 was used as the significance level for the test of statistical significance. With a test of significance set at P 0.05, the t-test was used to compare the means of the stress ratings among the two research groups as well as between the various categories of each research category.

According to the loco pilots' occupational stress research, younger and better-qualified loco pilots had higher levels of occupational stress. No connection could be made between workplace stress and hypertension. In light of the aforementioned findings, a comparison study was intended. The section controller position was chosen for a comparative study on occupational stress because it is one of the high-stress positions on Indian Railways. 82 section controllers from the South Western Railway's Mumbai Divisional offices made up the section controller study group. Following formal approval from the controlling officers of the section controllers, the research was carried out in 2022.

In the annexe of the control rooms at the Mumbai Railway Divisional headquarters, the section controllers were inspected. The qualifications of each section controller listed on the rosters of the three divisional offices were verified. The investigator obtained oral agreement from the personnel before administering the closed-ended 24-item questionnaire to the section controllers and taking their blood pressure while they were seated.

Results

Under than 41 years and more than 40 years old were the two age categories used to divide the research categories. In the group of loco pilot employees, there were 104 (45.2%) employees under the age of 41 and 126 (54.8%) employees who were older than 40. In the group of division controller employees, there were 20 (24.4%) individuals under the age of 41 and 62 (75.6%) older individuals.

Three categories—the goods category, the mail/passenger category, and the shunter category—were assigned to the study group of loco pilots. Two categories—supervisory (8 hours) and on-board (6 hours)—were used to categorize the section controller group under investigation. In the loco pilot study group, there were 37 (16.1%) workers in the shunter category, 94 (40.9%) in the goods category, and 99 (43%) in the mail/passenger category. In the section controller research group, there were 27 (32.9%) employees in the supervisory (8 hours) category and 55 (67.1%) employees in the on-board (6 hours) class.

The mean stress score for sections controllers was 7.32 with an SD of 3.7 and the mean stress score for loco pilots was 8.56 with a standard deviation (SD) of 4.3. The t-test result was 2.4606 and the P value was 0.022632 (significant at 0.05). [Table 1].

1. The number of loco pilots with more than 12 stress factors was 49 (21.3%) and the mean stress score in this category was 15.16 with a SD of ± 1.94 . The number of section controllers with more than 12 stress factors was 7 (8.5%), and the mean stress score in this category was 14.7 with a SD of ± 1.28 . The Chi-square score between the two stress categories of the two study groups was 6.691, which was statistically significant at $P < 0.01$ (0.00969) [Table 1]
2. The mean stress scores of the different categories of loco pilots was 10.2 in the goods category, 7.36 in the mail/passenger category, and 7.5 in the shunter category. The mean stress scores for the different categories of section controllers were 8.04 in the supervisory category and 6.96 in the on-board category [Table 2]
3. The number of employees with more than 12 stress factors in the different categories of loco pilots was 30 (32%) in the goods category, 12 (12%) in the mail/passenger category, and 7 (19%) in the shunter category [Table 2]; the Chi-square score was 11.4175 and the P value was 0.003317, which was significant. The number of employees with more than 12 stress factors in the different categories of section controllers was 3 (11%) in the supervisory category and 4 (7%) in the on-board category [Table 2]; the Chi-square score was 0.3417 and the P value was 0.558835, which was not statistically significant
4. The relation between the number of employees with more than 12 stress scores and age in the loco pilots was 36 (34.62%) in the less than 41 years age group and 13 (10.32%) in the more than 40 years age group; the Chi-square score was 20.063 with a P value of < 0.00001 , which was significant. The number of employees with more than 12 stress scores and age in the section controllers was 2 (10%) in the less than 41 years age group and 5 (8.06%) in the more than 40 years age group; the Chi-square score was 0.0726 and P value was 0.78765, which was not significant.

Table 1: Stress scores of the two study groups

Study groups	No. of employees with <12 stress factors	No. of employees with >12 stress factors	Total	Mean stress	Mean <12 stressfactors	Mean >12 stressfactors
Loco pilots	181 (78.7%)	49 (21.3%)	230	8.56±4.3	6.77±2.8	15.16±1.94
Section controllers	75 (91.5%)	7 (8.5%)	82	7.32±3.7	6.63±3.11	14.71±1.28
Chi-square and t-test	Chi-square is 6.691			t is 2.4606	t is -0.35349	t is 0.58306
P value	P value is 0.00969 (P<0.01)			P is 0.02263 (P<0.05)	P is 0.724	P is 0.56228
					Not significant	Not significant

Table 2: Mean stress scores and more than 12 stress factors in different categories

Category	Mean stress	Mean <12 stressfactors	Mean >12 stressfactors	No. of employees with <12 stress factors	No. of employees with >12 stress factors	No. of employees
Loco pilots						
Goods LP	10.2±4.4	7.75±2.74	15.5±2.18	64 (68%)	30 (32%)	94
Mail/Passenger LP	7.36±3.7	6.36±2.72	14.67±1.3	87 (88%)	12 (12%)	99
Shunter LP	7.5±4.2	5.87±2.73	14.57±1.81	30 (81%)	7 (19%)	37
Chi-square Chi-square 11.4175 P value is 0.003317 (P<0.01)						
Section controllers						
Supervisory SC	8.04±4.2	7.1±3.37	15.7±1.25	24 (89%)	3 (11%)	27
On-board SC	6.96±3.5	6.4±2.96	14±0.71	51 (93%)	4 (7%)	55

5. The prevalence of hypertension with relation to more than 12 stress factors was 30.6% (15) in the loco pilots and 28.6% (2) in the section controllers [Table 3]; the Chi-square score between the two stress categories with hypertension in the two study groups was 4.4426 and P value was 0.035053, which was significant at <0.05. Rosenthal et al.^[7] reported that the possible relation between job strain and blood pressure levels has been extensively studied but the literature is replete with conflicting results regarding the relationship between occupational stress and hypertension

6. The number of employees with relation to more than 12 stress factors and hypertension in the different categories of loco pilots was 36.6% (11) in the goods category, 25% (03) in the mail/passenger category, and 14.3% (01) in the shunter category; the Chi-square score was 13.1832 and P value was 0.00137, which was significant at <0.01. Among the section controllers, it was 33.3% (01) in the supervisory

category and 25% (01) in the on-board category [Table 4]; the chi square was 0.1141 and the P value was not significant.

Table 3; Hypertension and stress scores in the two studygroups

Category	Hypertension	Hypertension and < 12 stress factors	Hypertension and >12 stress factors
Loco pilots	84 (36.52%)	69 (38.12%)	15 (30.61%)
Section controllers	44 (53.66%)	42 (56%)	2(28.57%)
Chi-square	7.337	4.4426	
P value	0.006754	0.035053	
	(P<0.01)	(P<0.05)	

Table 4: Hypertension and different categories of the two study groups

Category	Hypertension	Hypertension with <12 stress factors	Hypertension with >12 stress factors
Loco pilots			
Goods LP	28 (29.8%)	17 (26.6%)	11 (36.6%)
Mail/passenger LP	45 (45.5%)	42 (48.3%)	3 (25%)
Shunter LP	11 (29.7%)	10 (33.3%)	1 (14.3%)
Chi-square	Chi-square score is 5.9827 P value is 0.0502 not significant		Chi-square is 13.1832 P value is 0.001317 and P is <0.01
Section controllers			
Supervisory SC	17 (63%)	16 (66.6%)	1 (33.3%)
On Board SC	27 (49.1%)	26 (51%)	1 (25%)
Chi Square	Chi-square score is 1.4015 P value is 0.2364 Not significant		Chi-square score is 0.1141 P value is 0.7355 Not significant

Table 5: Hypertension and age, BMI, and family history hypertension in loco pilots

	Loco pilots (%)	Risk factors	Loco pilots (%)	Chi-square	P
Age <41 years	31 (24.6)	Age >40 years	53 (42)	3.691	P is 0.0546 and not significant
No family history of hypertension	37 (28.46)	Family history of hypertension	47 (47)	8.378	P is 0.00397 and <0.01
Normal BMI	37 (29.83)	BMI above 25 kg	47 (44.3)	5.183	P is 0.0228 and <0.05
Age <41 years + no family history of hypertension + normal BMI	5 (17.24)	Age >40 years + family history of hypertension + BMI above 25 kg	19 (73.08)	17.377	P is 0.000031 and <0.0001

Table 6- Hypertension and age, BMI, and family history of hypertension in section controllers

	Section controllers (%)	Risk factors	Section controllers (%)	Chi-square	P
Age <41 years	8 (40%)	Age >40 years	36 (58.1)	1.984	P is 0.158 Not significant
No Family History of Hypertension	19 (44.18%)	Family History of hypertension	25 (64.1)	3.262	P is 0.0708 Not significant
Normal BMI	18 (40.9%)	BMI above 25 kg	26 (68.4)	6.207	P is 0.0127 P<0.05
Age <41 years + no family history of hypertension + normal BMI	1 (16.66%)	Age >40 years + family history of hypertension + BMI above 25 kg	11 (78.57)	6.706	P is 0.009607 P<0.01

Discussion

1. The mean occupational stress was comparatively higher in the loco pilots group. The number of employees with more than 12 stress factors was higher in the loco pilot study group
2. The mean stress score was highest in the goods category of the loco pilots. The number of employees with more than 12 stress factors was the highest in the goods category of loco pilots
3. The employees with more than 12 stress factors with relation to the age were highest in the age with age less than 41 years in the loco pilot group.
4. The five stress factors present in more than 50% of both the study groups of loco pilots and section controllers were (a) job is demanding and increased, (b) lots of responsibilities in the job, (c) noise disturbance

at work place, (d) conflicts in meeting the demands of the job and family, and (e) work interferes with family responsibilities

5. The prevalence of hypertension was higher in the category with 12 and less than 12 stress factors compared to more than 12 stress factors in both the study groups.
6. The number of employees with hypertension and more than 12 stress factors were the highest in the goods category of loco pilots
7. The prevalence of hypertension with relation to age, family history of hypertension, and BMI either individually or in combination, was higher in the categories with older age, with family history of hypertension and BMI above 25 kg/m² in both the study groups.

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