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Assessment of the Relationship between Job Demand, Work Stress and Fatigue among Railway Workers in Warri-Itakpe Train Service, Nigeria

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ABSTRACT

Occupational fatigue in the railway industry is a multidimensional problem deeply embedded in the psychosocial architecture of the working environment. Among the psychosocial risk factors most consistently linked to fatigue, job demand and work stress occupy a central position. In the Nigerian context, the rapid expansion of rail infrastructure typified by the inauguration of the Warri-Itakpe Train Service (WITS) in 2020 has introduced a burgeoning workforce into an operationally demanding environment where the management of psychosocial risks remains nascent. Railway workers face heavy and irregular workloads, shift schedules, vigilance-intensive tasks, and limited job control, all of which collectively elevate the risk of occupational fatigue and its attendant consequences for productivity and rail safety. This study investigated the relationship between job demand, work stress, and occupational fatigue among railway workers in the Warri-Itakpe Train Service of the Nigerian Railway Corporation (NRC), while contextualising these associations within the broader spectrum of psychosocial health risk factors. A quantitative, cross-sectional survey design was employed. Using Slovin's formula at a 5% margin of error, a sample of 305 railway workers was recruited from 12 stations within the Warri-Itakpe Train Service using multi-stage sampling. Data were collected with the Smith Wellbeing Survey (SWELL), a validated 27-item instrument grounded in the Wellbeing Process Questionnaire (WPQ). The Demands, Resources, and Individual Effects (DRIVE) model guided conceptual framing. Statistical analyses included weighted averages, relative risk (RR), absolute risk (AR), Pearson's correlation, Chi-square tests, and logistic regression, all executed in SPSS Version 25.0. Job demand and work stress were the two strongest psychosocial predictors of occupational fatigue across the entire study population. Job demand recorded the highest relative risk of all 15 health risk factors assessed (RR = 7.71; AR = 89%; $r = 0.81$, $p < 0.01$; $R^2 = 0.66$), while work stress followed closely (RR = 5.22; AR = 84%; $r = 0.73$, $p < 0.01$; $R^2 = 0.53$). Chi-square analysis confirmed statistically significant associations for job demand ($\chi^2 = 29.754$, $p < 0.001$) and work stress ($\chi^2 = 12.985$, $p < 0.001$) with occupational fatigue. Stratified analysis by job type revealed that engineers bore the highest job demand risk (RR = 24.00; AR = 96%) while train drivers recorded the most severe work stress risk (RR = 12.00; AR = 92%). Job demand and work stress are predominant psychosocial determinants of occupational fatigue among Nigerian railway workers. The findings underscore an urgent need for the Nigerian Railway Corporation to restructure workloads, enforce fatigue-risk management policies, expand staffing, and institutionalise psychosocial support mechanisms. Failure to address these factors threatens both worker well-being and the operational safety of Nigeria's growing rail network.

Keywords: Job demand, work stress, occupational fatigue, railway workers, Warri-Itakpe Train Service, psychosocial risk factors, Nigerian Railway Corporation, work-life balance, railway safety

INTRODUCTION

Occupational fatigue is widely acknowledged as one of the most pressing health and safety challenges confronting the global railway industry. Defined as perceived weariness arising from prolonged working, heavy workloads, insufficient rest, and inadequate sleep, occupational fatigue impairs cognitive performance, reduces vigilance, increases error rates, and elevates the risk of workplace accidents (Cameron, 1973; Harma *et al.*, 1998). In safety-critical sectors such as railways, where decisions made in fractions of a second can determine the safety of hundreds of passengers, the consequences of fatigue extend far beyond individual health to encompass institutional reliability and public safety.

Among the many risk factors implicated in occupational fatigue, psychosocial stressors particularly job demand and work stress have attracted sustained scholarly attention. The demand-control model, originally proposed by Karasek (1979), established that high job demands in combination with low job control generate elevated psychological strain, which in turn accelerates the onset of fatigue. Subsequent work by Moos (1988) and Hockey and Wiethoff (1990) elaborated the mechanisms through which unmanageable workloads translate into physiological and cognitive depletion. In the railway context, where operational demands are inherently intense, non-negotiable, and perpetually vigilance-dependent, this relationship assumes particular salience.

Work stress, defined as the harmful reaction arising when the demands of the job exceed the worker's capacity, resources, or needs, operates both as a direct cause of fatigue and as a mediating variable through which excessive job demands exert their effects (Pradhan *et al.,* 2015). Fatigued workers under chronic stress demonstrate reduced reaction times, impaired decision-making, decreased concentration, and a diminished sense of personal responsibility all factors that have been explicitly linked to railway incidents and accidents (Howard *et al.*, 2016; British Rail Safety and Standards Board, 2005).

In Nigeria, the railway sector has undergone considerable rehabilitation and expansion in recent years. The Warri-Itakpe Train Service (WITS), inaugurated in September 2020, represents a flagship project of the Nigerian Railway Corporation (NRC), connecting the port city of Warri to Itakpe across a 326-kilometre standard gauge corridor spanning Delta, Edo, and Kogi States. The WITS employs approximately 1,800 personnel across 12 stations, many of whom operate on 24/7 shift schedules while managing demanding operational tasks under resource-constrained conditions. Rail vandalism, inadequate remuneration, pending wage adjustments, and skeletal staffing further amplify the psychosocial burden on workers.

Despite these realities, empirical research into the psychosocial determinants of occupational fatigue within the Nigerian railway industry remains extremely limited. Most available evidence is drawn from the European and North American railway contexts, where institutional supports, regulatory frameworks, and operational conditions differ markedly from those prevailing in Nigeria. This study addresses the gap by rigorously examining the relationship between job demand, work stress, and occupational fatigue among WITS railway workers, providing an evidence base for context-specific interventions within Nigeria's rapidly evolving rail sector.

The aim of this study was to assess the impact of psychosocial health risk factors with a specific focus on job demand and work stress on occupational fatigue among railway workers in the WITS, and to evaluate the implications of this relationship for productivity and rail safety. The specific objectives were to determine the prevalence of job demand and work stress as psychosocial risk factors, evaluate their statistical association with occupational fatigue, compare these associations across job types within the WITS and propose evidence-based recommendations for fatigue risk management.

MATERIALS AND METHODS

The Study Area

The study was conducted across the 12 stations of the Warri-Itakpe Train Service (WITS) of the Nigerian Railway Corporation: Ujevwu, Agbarho, Okpara, Abraka, Agbor, Igbanke, Ekehen, Uromi, Agenebode, Itogbo, Ajaokuta, and Itakpe. The WITS is a 326-km standard gauge railway officially inaugurated on the 29th September, 2020. It traverses Delta, Edo, and Kogi States (Figure 1) with an operational design speed of 150 km/h. The district employs approximately 1,800 personnel, operating on continuous 24/7 schedules across diverse job roles including train drivers, engineers, station managers, station workers, train guards, signallers, and ticket checkers.

Figure 1. The Study Area

Research Design and Sampling

A quantitative, cross-sectional survey design was adopted, consistent with the study's objective of establishing associations between variables across a defined population at a specific point in time (Amin, 2005). Sample size was determined using Slovin's formula (Eqn. 1) at a 5% margin of error (e = 0.05), applied to the total WITS workforce population of N = 1,284:

$$n = N / (1 + N(e)^2) \quad \text{......Eqn. 1}$$

$$= 1{,}284 / (1 + 1{,}284 \times 0.0025)$$

$$= 1{,}284 / 4.21$$

$$\approx 305$$

The limitation of the Slovin’s formula include assumption of relatively uniform populaion, the margin of error range between 5% and 20% (5% was adopted for the study) and not ideal for high precision. Methods requiring high precision uses Cochran’s formula. However, it is apt to use when total number of people is known, when no data is available on the population’s variability and also for quick rapid calculations in reserach especially for social sciences.

A multi-stage sampling approach was employed: stratified sampling was applied to select stations, followed by purposive and random sampling to recruit 305 participants across all job categories. The snowball technique supplemented recruitment where workers with specific operational knowledge were sought. Participation was voluntary, and all participants provided written informed consent.

Research Instrument

The Smith Wellbeing Survey (SWELL) a validated 27-item questionnaire grounded in the Wellbeing Process Questionnaire (WPQ; Williams, 2014) was used for data collection. The instrument was structured into four parts: Part 1 captured personal and individual characteristics (personality, healthy lifestyle); Part 2 assessed job demands, job control and support, working environment exposures (noise, vibration, fumes), and shift work status; Part 3 measured well-being outcomes including work stress (Item 17), job satisfaction (Item 18), physical and mental fatigue (Item 19), presenteeism (Item 21), work-life balance (Item 23), and happiness at work (Item 24); and Part 4 captured fatigue consequences such as absenteeism and workplace accidents. Responses were measured on a 10-point Likert scale (1 = not at all; 10 = very much so) with selected items as binary yes/no responses. The instrument was administered in private office spaces, lasting approximately 30 minutes per participant.

Theoretical Framework

The study adopted the Demands, Resources, and Individual Effects (DRIVE) Model (Mark & Smith, 2008) as its conceptual framework. The DRIVE model posits that occupational fatigue arises from the interplay of job demands (including workload, time pressure, and environmental stressors), job resources (control and social support), and individual differences (personality, coping strategies, health behaviours). Critically for this study, the DRIVE model positions job demand as a primary antecedent of fatigue, with job resources particularly control and support serving as moderating variables. The model was augmented with personality measures given evidence that personality traits significantly predict emotional well-being and fatigue susceptibility (Diener *et al.*, 2003; Costa & McCrae, 1980).

Ethical Considerations

Ethical approval was obtained from the College of Science Research Ethics Committee at the Federal University of Petroleum Resources, Effurun. All participants were briefed on the study's objectives, assured of confidentiality, and informed of their right to withdraw at any time. Data were anonymised using participant aliases, and completed questionnaires were securely stored.

Data Analysis

Data were entered into Microsoft Excel and analysed using SPSS Version 25.0. The analytical framework comprised five methods. First, weighted averages (threshold = 6.55) were computed to classify each risk factor as high or low risk. Second, relative risk (RR; where RR = high responses / low responses) and absolute risk (AR; high responses / total × 100%) quantified the strength and likelihood of association between each psychosocial factor and fatigue. Third, Pearson's correlation assessed the direction and magnitude of associations. Fourth, Chi-square tests of independence evaluated statistical significance ($\alpha = 0.05$). Fifth, logistic regression analysis determined the predictive contribution (coefficient of dependence, R^2) of each risk factor to occupational fatigue.

RESULTS AND DISCUSSION

Sociodemographic Profile of Respondents

The study adopted the responses from the 305 participants. The study showed that 223 were male and 82 were female representing 73% and 27% of the total respondents sampled. 57% of the respondents were between 18 and 30 years of age which is 57% of the total. This reflects a predominantly young workforce partly due to the 2023 NRC recruitment exercise. In yerms ofeEducational attainments amongst the workforce, 48% held bachelor's degrees or higher degrees, 34% held national or higher national diplomas, while 18% possessed senior secondary school certificates, underscoring the technical character of railway operations. In terms of job designation, station workers constituted the largest group (26%), followed by engineers (25%), station managers (16%), train drivers (13%), train guards (9%), signallers (7%), and ticket checkers (6%).

Weighted Average Analysis of Psychosocial Health Risk Factors

The weighted average threshold calculated from all 15 health risk factors was 6.55. Among the five psychosocial health risk factors assessed, job demand (mean = 7.56) and work stress (mean = 7.62) both exceeded the threshold and were classified as high risk for occupational fatigue. By contrast, job support and control (mean =

6.37), job satisfaction (mean = 6.27), and work-life balance (mean = 6.31) fell below the threshold and were classified as low risk. Table 1 summarises these findings.

Table 1: Weighted Average of Responses to Psychosocial Health Risk Factors (N = 305)

Category	**Risk Factor**	**Low (%)**	**High (%)**	**Mean**	**Decision**
Psychosocial	Job Demand	35 (11)	270 (89)	7.56	High Risk
	Job Support & Control	248 (81)	57 (19)	6.37	Low Risk
	Job Satisfaction	217 (71)	88 (29)	6.27	Low Risk
	Work-Life Balance	89 (29)	216 (71)	6.31	Low Risk
	Work Stress	49 (16)	256 (84)	7.62	High Risk

Source: Authors, 2025

The results reveal that almost nine in ten workers (89%) experienced high job demand, while 84% reported high work stress. These rates are strikingly elevated and point to a systemic psychosocial hazard within the WITS operating environment. The high mean scores for job demand (7.56) and work stress (7.62) on a 10-point scale suggest that these conditions are experienced at near-chronic severity, consistent with the Demand-Control model's prediction that excessive demand with constrained control generates sustained psychological strain (Karasek, 1979; Van Yperen & Hagedoorn, 2003).

Factors that likely drive these rates include the 24/7 operational nature of the WITS, the perpetual threat of rail vandalism requiring emergency maintenance deployments, inadequate staffing relative to operational demand, and the ongoing wage dispute that forces many workers to take secondary employment, further reducing their recovery time. Pradhan *et al.* (2015) observed that work stress operating at the organisational level leads to occupational fatigue, withdrawal from service, and performance decline a trajectory that this study's data strongly support.

Relative Risk and Absolute Risk of Psychosocial Factors

Table 2 presents the relative risk (RR) and absolute risk (AR) of all psychosocial health risk factors in relation to occupational fatigue for the full study sample.

Table 2: Relative Risk and Absolute Risk of Psychosocial Health Risk Factors (N = 305)

Category	**Risk Factor**	**Low (%)**	**High (%)**	**RR**	**AR (%)**	**Decision**
Psychosocial	Job Demand	35 (11%)	270 (89%)	7.71	89	High Risk
	Job Support & Control	248	57	0.23	19	Low Risk

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		(81%)	(19%)			
	Job Satisfaction	217 (71%)	88 (29%)	0.41	29	Low Risk
	Work-Life Balance	89 (29%)	216 (71%)	2.42	71	High Risk
	Work Stress	49 (16%)	256 (84%)	5.22	84	High Risk

Source: Authors, 2025

Job demand recorded an RR of 7.71, meaning that workers reporting high job demand were 7.71 times more likely to report occupational fatigue than those reporting low demand. The absolute risk of 89% indicates that almost the entire sampled workforce faces a high likelihood of fatigue attributable to job demand. Work stress produced an RR of 5.22 and AR of 84%, equally alarming figures that classify it as the second-most potent psychosocial fatigue risk factor in the study.

Work-life balance also emerged as a significant contributor (RR = 2.42; AR = 71%), reflecting how the intrusion of demanding work schedules into personal time erodes recovery and amplifies cumulative fatigue. Beauregard and Henry (2009) found that railway employees with high work-life imbalance exhibit markedly lower productivity, and Fan and Smith (2017) identified poor work-life balance as a direct risk to train safety findings that resonate powerfully with the present data.

Conversely, job support and control (RR = 0.23; AR = 19%) demonstrated a protective association, with workers who perceived adequate support and control reporting substantially lower rates of fatigue. This aligns with Karasek's (1979) foundational proposition that control operates as a moderating buffer between high demand and strain. The implication is clear: bolstering job control and social support mechanisms within the NRC would significantly attenuate the fatigue-inducing effects of high job demand.

Psychosocial Risk Stratified by Job Type

Table 3 presents the RR and AR for job demand and work stress stratified by the seven occupational groups within the WITS, providing a granular picture of differential psychosocial risk exposure.

Table 3: Job Demand and Work Stress RR and AR by Job Type

Job Type	N	JD RR	JD AR (%)	WS RR	WS AR (%)
Train Drivers	39	18.50	95	12.00	92
Train Guards	24	5.00	83	7.00	88
Station Managers	48	3.36	77	0.92	48
Engineers	75	24.00	96	11.50	92
Ticket Checkers	18	17.00	94	8.00	89
Station Workers	79	5.58	85	10.29	91
Signallers	22	10.00	91	6.33	86

JD = Job Demand; WS = Work Stress; RR = Relative Risk; AR = Absolute Risk

Source: Authors, 2025

Engineers recorded the highest job demand risk (RR = 24.00; AR = 96%), reflective of their central responsibility for infrastructure maintenance, track inspection, and signalling systems across the entire 326-km route. Engineers within the NRC constitute over half of the corporation's total workforce, yet are typically under-staffed relative to the volume of tasks demanded particularly in the context of ongoing rail vandalism that necessitates emergency repair deployments. The RR of 24.00 means that an engineer reporting high job demand is 24 times more likely to report occupational fatigue than one reporting low demand one of the highest fatigue-risk ratios documented in any Nigerian occupational health study.

Train drivers, despite operating in smaller numbers (n = 39), face a formidable dual burden: job demand RR of 18.50 (AR = 95%) and work stress RR of 12.00 (AR = 92%). This combination is particularly hazardous because train drivers are the most safety-critical workers in the railway system: their cognitive alertness, reaction speed, and decision-making capacity directly determine passenger safety across the entire journey. The Rail Safety and Standards Board (2021) estimates that fatigue among train operators contributes to the majority of serious rail incidents a concern that the present data underscore acutely for the Nigerian context.

Ticket checkers, despite their relatively smaller n (18), recorded an alarming job demand RR of 17.00 (AR = 94%), possibly reflecting the operational complexity of managing passenger compliance, revenue protection, and conflict resolution aboard moving trains tasks that are psychologically demanding and underappreciated. Station workers (n = 79) demonstrated a work stress RR of 10.29 (AR = 91%), the fourth highest in the sample, likely driven by their direct and continuous interface with passengers, coupled with minimal job control and support structures. Signallers, responsible for coordinating safe train movements and preventing collisions, recorded a job demand RR of 10.00 (AR = 91%) and work stress RR of 6.33 (AR = 86%), consistent with the cognitively taxing and responsibility-laden nature of their role (Gorman & Endsley, 2000; Rasmussen & Vicente, 1989).

Station managers, while still experiencing elevated job demand (RR = 3.36; AR = 77%), recorded a notably lower work stress risk (RR = 0.92; AR = 48%) compared to all other job types. This relative moderation may reflect their greater job control as they hold supervisory authority over station operations consistent with Karasek's (1979) model that control buffers the relationship between demand and strain.

Pearson's Correlation and Chi-Square Analysis

Table 4 presents the Pearson's correlation coefficients and Chi-square statistics for all psychosocial health risk factors in relation to occupational fatigue.

Table 4: Pearson's Correlation and Chi-Square Analysis of Psychosocial Risk Factors (N = 305)

Category	Risk Factor	Pearson r	p-value	Chi-square (χ^2)	p-value
Psychosocial	Job Demand	0.81	0.00	29.754	0.000
	Job Support & Control	0.32	0.00	6.480	0.011
	Job Satisfaction	0.39	0.00	2.414	0.120
	Work-Life Balance	0.77	0.00	2.843	0.092
	Work Stress	0.73	0.00	12.985	0.000

Source: Authors, 2025

Pearson's correlation revealed that job demand exhibited the strongest positive association with occupational fatigue ($r = 0.81$, $p < 0.01$), equal in magnitude to the strongest correlation recorded across all 15 health risk factors in the study. This strong correlation indicates that as job demand increases, occupational fatigue increases proportionally and substantially. Work stress demonstrated an equally significant strong positive association ($r = 0.73$, $p < 0.01$).

Chi-square analysis confirmed statistically significant associations for job demand ($\chi^2(1) = 29.754$, $p < 0.001$) and work stress ($\chi^2(1) = 12.985$, $p < 0.001$) with occupational fatigue.

Logistic Regression: Predictive Contribution to Fatigue

Table 5 summarises the logistic regression findings, showing each psychosocial factor's coefficient of dependence (R^2) the proportion of variance in occupational fatigue predicted by each factor individually.

Table 5: Logistic Regression Coefficients for Psychosocial Health Risk Factors (N = 305)

Category	**Risk Factor**	**Correlation r**	**Coefficient (R^2)**	**Predictive Contribution (%)**
Psychosocial	Job Demand	0.81	0.66	66
	Job Support & Control	0.32	0.10	10
	Job Satisfaction	0.39	0.16	16
	Work-Life Balance	0.77	0.60	60
	Work Stress	0.73	0.53	53

Source: Authors, 2025

Logistic regression identified job demand as the single most powerful predictor of occupational fatigue among all 15 health risk factors studied, explaining 66% of variance in fatigue outcomes while work stress contributed 53%. The combined predictive strength of these two dominant psychosocial factors job demand and work stress suggests that addressing these two variables simultaneously would capture the majority of modifiable psychosocial fatigue risk within the Nigerian Railway Corporation (NRC).

These regression results are consistent with the theoretical predictions of the DRIVE model (Mark & Smith, 2008), which places job demand at the apex of fatigue causation, with job resources (support and control) serving as moderating influences. They also accord with large-scale survey evidence from the general working population by Smith *et al.* (2004), who identified high demands and low control combined with long hours as the most powerful predictors of occupational fatigue a configuration abundantly present in the WITS operating environment.

Implications for Productivity and Rail Safety

The practical consequences of the study's findings for productivity and operational safety are substantial. High work stress was reported by 84% of respondents overall, while 89% reported high job demand rates that far exceed the elevated benchmarks reported in comparable international railway studies (Fan & Smith, 2017; Cotrim *et al.*, 2017). Under conditions of severe and sustained fatigue, railway workers demonstrate the physiological and cognitive signatures most hazardous in safety-critical operations: increased reaction time, reduced vigilance, perceptual distortions, impaired information processing, and a diminished sense of responsibility for safety critical decisions (Drew, 1940; Craig & Cooper, 1992; Howard *et al.*, 2016).

The ongoing challenges of rail vandalism in Nigeria add another psychosocial dimension: workers particularly engineers and track maintenance staff are frequently deployed without notice to repair vandalised infrastructure, extending their effective working hours, disrupting rest schedules, and magnifying both job demand and work stress. Without emergency staffing reserves, the workload falls disproportionately on the existing workforce, creating an unmanaged fatigue spiral. Pradhan *et al.* (2015) documented that organisational-level work stress culminates in service withdrawal and performance decline a trajectory that the current NRC operating model appears to be following.

Key findings from the Study

The following are the key findings from the study.

1. Among the five psychosocial health risk factors assessed, job demand and work stress both exceeded the threshold and were classified as high risk for occupational fatigue
2. Workers reporting high job demand were 7.71 times more likely to report occupational fatigue than those reporting low demand.
3. The RR of 24.00 means that an engineer reporting high job demand is 24 times more likely to report occupational fatigue than one reporting low demand one of the highest fatigue-risk ratios documented in any Nigerian occupational health study.
4. There is strong correlation that as job demand increases, occupational fatigue increases proportionally and substantially.
5. Logistic regression identified job demand as the single most powerful predictor of occupational fatigue among all 15 health risk factors studied.

CONCLUSION

This study has provided comprehensive empirical evidence establishing job demand and work stress as the dominant psychosocial determinants of occupational fatigue among railway workers in the Warri-Itakpe Train Service. Job demand recorded a relative risk of 7.71, absolute risk of 89%, Pearson correlation of $r = 0.81$, and logistic regression predictive contribution of 66% the highest values of any of the 15 health risk factors studied. Work stress followed with RR = 5.22, AR = 84%, $r = 0.73$, and $R^2 = 0.53$. Chi-square analysis confirmed highly significant associations for both job demand ($\chi^2 = 29.754$, $p < 0.001$) and work stress ($\chi^2 = 12.985$, $p < 0.001$) with occupational fatigue.

Stratified analysis revealed that engineers (job demand RR = 24.00; AR = 96%) and train drivers (work stress RR = 12.00; AR = 92%) face the most acute fatigue risk, with implications that are particularly grave given the safety-critical nature of their roles. Across all seven job types, job demand and work stress consistently ranked as the two highest-risk psychosocial factors, underscoring the pervasive and non-role-specific nature of psychosocial fatigue hazards within the WITS. The findings validate Hypothesis 2 of the original study: that psychosocial health risk factors significantly predict occupational fatigue among Nigerian railway workers.

Occupational fatigue has been normalised within the Nigerian Railway Corporation without adequate institutional recognition, risk assessment, or management infrastructure. This normalisation, combined with unresolved remuneration disputes, persistent rail vandalism, and constrained staffing, sustains a chronic psychosocial hazard environment that threatens both the individual health of railway workers and the collective safety of Nigeria's growing rail network. The current findings provide an urgent evidentiary basis for systemic reform.

RECOMMENDATIONS

Based on the study findings, the following recommendations are made:

i. The NRC should conduct a comprehensive workload audit across all WITS job types, with priority attention to engineers and train drivers. Task allocation should be restructured to distribute demand equitably, and maximum consecutive working hours should be enforced in line with international fatigue risk management standards.

ii. The NRC management should urgently seek government approval to lift current employment embargoes and recruit additional operational personnel, particularly engineers and train drivers, to reduce the per-capita job demand burden and provide adequate shift rotation and recovery time.

iii. The NRC should establish employee assistance programmes offering access to counselling, stress management training, and occupational health support. Particular provision should be made for train drivers, engineers, and signallers, whose roles carry the highest combined job demand and work stress burden.

iv. The present government and NRC management should expedite resolution of the ongoing remuneration dispute to eliminate presenteeism driven by financial insecurity. A fair and competitive compensation structure will incentivise recovery and help reduce chronic fatigue across the workforce.

v. Shift schedules should be redesigned to ensure adequate inter-shift recovery periods, with particular attention to avoiding early morning starts combined with previous late or night shifts. Rest facilities at key WITS stations should be upgraded to enable effective on-site recovery.

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