

Literature Review Report on -“An Analytical Study on Working Conditions of Loco-Pilots (Railway Drivers) in India”

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Abstract

The work of Indian railways' drivers is considered as extremely stressful. It is working in an environment over which they have no control whatsoever and is an atmosphere that wrecks their schedules, disrupts their home life, makes social activities and regular breaks very hard to plan. This paper deals with the working conditions of Indian railways' drivers and the factors that lead to a fatigue and stress, causing high probability of accident. This review of literature deals with the working conditions of an Indian railways' drivers which is having very high importance on their total wellbeing and hence their productivity and entire growth and safety of an Indian railway.

Keywords: Railway driver, working conditions, fatigue and stress.

1. Introduction of Loco-Pilots and Purpose of the Study

1.1 Indian Railways' Driver:

The work of the railway driver is demanding and full of responsibility. The railway driver is in-charge of both safety and punctuality, a job which requires a high level of concentration and alertness. The extremely irregular working hours constitute an added workload for the railway driver. The physical work environment can also give rise to workload; this includes, for eg; noise (or distressful noise levels), vibrations or an uncomfortable cab conditions (too hot, too cold, draughty). The railway driver is also exposed to a demanding psychosocial work environment, which includes solitary work, limited opportunities for social contact and a heavy responsibility for operating the train (in terms of both safety and adhering to the timetable). The railway driver's job, i.e. to operate the train, is largely governed by timetables and technical conditions (e.g. type of train, track area), which restricts the driver's ability to decide for himself how the job is to be done.

Railway drivers struggle to fulfill work and family responsibilities. This struggle is due to long hours, irregular and inflexible work schedules, and heavy workloads. Thus, work-family conflict can be a common work stressor for railway drivers (Göran Kecklund et al; 1999).

Railways' Drivers / Loco-Pilots are the most important person in executing the huge task of transporting nearly 25 Million passengers and more than 2.8 Million Tons of freight daily with the help of 2,29,381 wagons, 59,713 coaches and more than 9,213 locomotive engines of various kinds(www.Indian railways, Wikipedia). Thus Railway Driver is one of the most important posts in the railway staff. He is the person (along with the Guard) in charge of the train. Driver is also responsible to carry the train safely to its destination. We can say that he is the person who shoulders the responsibility along with the Guard of taking the train from one destination to other safely. In that sense he is one of the most important employees in the Railway. One has to be really dedicated and hardworking to handle this work. Railway drivers playing a key role in Indian Railway's safe & punctual running of trains with security and productivity (Source: *Railway Driver*, How to become a *Railway Driver* ... - Education India).

1.2 Objectives of this Research Study:

Present study tries to address the following objectives:

1. To study earlier research on the working conditions of train drivers.
2. To understand work-life of Indian railway drivers.
3. How do Indian railway drivers experience their work environment in terms of stress, work load, time pressure, and work-life balance?
4. What are the experiences of Indian railway drivers relating to working conditions and their effect on safety, stress and sleepiness?

1.3 Nature of Duty:

The job of a Railway Driver demands hard work and great presence of mind along with courage to handle diverse

conditions. For this one should have discipline, patience, responsibility, punctuality, commitment, courage and above all self-confidence. The job requires lots of hard work, stamina, alertness of mind, adaptability to follow difficult time schedules too. But the main and remarkable, highly appreciable role of Railway drivers is the only who works with full honesty, in day & night, in heavy cold, hot & rainy weather (Source: *Railway Driver*, How to become a *Railway Driver ... - Education India*).

Loop Holes in Existing System:

The driver doesn't know anything about what's going around. He doesn't have any information about other trains. His only job is to see a signal aspect and follow that. And the signal aspect depends upon the Station Master, so if Station Master gives wrong signal and gives wrong route accidents occur. Whole working is Station Master dominant. The driver cannot take any decision. In fog or worst weather condition driver can't able to see the signal and the situation would lead to accidents. (Anjali Jain et al; 2013)

1.4 Life after the Duty/Job:

When railway drivers at outstation duty, after signing off his duty, railway driver stay in the running room located near by the station premises. He carry himself rations, vegetables etc. for cooking meals in the kitchen of running room. Because in running room no any cooked food served around the clock. Only cooks are available for preparing the food. Due to shortage of cooking staff(generally 2-3 staff working) in running room, sometime cook taking 3-4 hours for preparing food (rules to served within 45 minutes). So, they are unable to get more than 10-12 hours of rest even as they are provided 16 hrs. rest. After the meal normally he goes to sleep immediately, because due to high speed and continuous running train Loco-Pilots are extremely tired.

Relatively same condition at home station. 100% housing should not be provided to drivers as they are residing up to 5-6 KMs. away from their station of posting and are taking a lot of time in commuting. They are unable to get more than 10-12 hours of rest even at home station when they are provided 16 hrs. rest (*FIRE Quarterly Magazine*, Aug.2012). After the meal normally he goes to sleep immediately, because due to high speed and continuous running train Loco-Pilots are extremely tired.

1.5 Railway Driver Career Prospects:

A Railway driver usually begins his career as a diesel or electric assistant driver, where his job is mainly to check the state of the locomotive, help with all the auxiliary equipment as needed, and to call out the aspects of the signals. ALP with minimum 2 years of service as Diesel Asstt. /Electric Asstt. and 60,000 Kilometer running experience is required for the promotion to the post of Loco-Pilot (Goods). An assistant driver works as an assistant on goods trains, then on passenger trains, and finally on express trains. It takes at least 8 or 10 years, usually more, before an assistant driver works up the ranks to become the driver for a Rajdhani or Shatabdi train (www.Indian Railway Driver Information, 2012) ("*Promotion of non-gazetted staff in loco running cadre – posts of Goods Driver redesignated as Loco Pilots [Goods]*" ,(RBE No: 101/08, 12/09/2008,)

1.6 Working Conditions:

At present Loco Pilots are classified under 'continuous' roaster. Not any calendar day rest provision. Normally the Loco Pilot has to work for 10 hours duty at a stretch and can demand relief after 12 hours with 2 hours prior notice to controller (Singh Ravi Kant, 2008). (ILO regulation only 9 hrs upper limit +1 hrs extra in case of emergency duty) (*FIRE Quarterly Magazine*, Aug.2012).

1.7 Cab Conditions:

The heavy noise, dust pollution, excess heat, high voltage electricity in the electric locomotive and diesel smell in the diesel locomotive are contributing to early fatigue to the crew. The noise level in a diesel locomotive is about more than 100 decibels which is 25 decibels more than maximum allowed limit of 75 decibels by the Industrial Pollution Control Board. The heat, diesel smell, noise from the engine room comes to the driving cab as the doors in the driving cab are not designed sound proof. To overcome this problem the locomotive cab has to be air-conditioned so that fatigue will no attack the drivers and they can concentrate on their duties properly and ensure safety of trains. (*FIRE Quarterly Magazine*, Aug.2012). No natural calls facilities (no toilets available) (Singh Ravi Kant, 2008).

1.8 Periodic Rest to Loco-Pilots:

At Headquarters :	
For duty of less than 8 hours	12 hours
For duty of 8 hours or more	16 hours
In either case a Running staff shall not be called to go out if rest is under 6 hours except in unavoidable necessity as in case of accidents or breakdowns.	
At Outstation :	
8 hours rest for 8 hours running duty or more (staff may sign for rest to the extent of 6 hours if they so desire)	

After 3 continuous full night duty, one full night rest/sleep provided (But, practically it is not possible because Full night duty/running considered between 22:00 PM to 06:00 AM completely) (HOER Rule-2005).

But, Loco-Pilots cannot leave the H.Q. If, Loco Pilot wants to leave the head quarter, he must be given written application to the Crew-Controller. It means in emergency loco pilot called for duty in any time even in rest conditions.

1.9 Running Room:

Running Room is situated around the station premises, in which Loco-Pilots taking rest after the duty. In running room, normally dormitory so loco pilots getting disturbance of sleep when other crew members or call boy are coming or getting ready for duty and putting lights etc. Due to high temp. Loco-Pilots not enjoyed fully undisturbed sleep before running trains. Because, generally no air-conditioning provided (*FIRE Quarterly Magazine*, Aug.2012).

He carry himself rations, vegetables etc. for cooking meals in the kitchen of running room. Because in running room no any cooked food served around the clock. Only cooks are available for preparing the food. Due to shortage of cooking staff (generally 2-3 staff working) in running room, sometime cook taking 3-4 hours for preparing food. So, they are unable to get more than 10-12 hours of rest even as they are provided 16 hrs. rest.

1.10 Medical Facilities:

Paternity leave for 15 days only two times during the whole service periods. Paternity Leave may not normally be refused. Leave cannot be sanctioned for more than 5 years continuous.

Medical leave : - During one year,

- ❖ 10 days with full pay.
- ❖ 20 days with half pay.
- ❖ More than 20 days without pay.

When Railways' drivers joining after six months of medical leave, Railways' authority take a full/complete medical test. If found medically not fit, duty/job/post of Loco-Pilot can be changed (Indian Railway Establishment code, Vol-1).

1.11 Personal/Family Related Problems:

Loco-Pilots are not giving (spending) more (sufficient) time with his family and societal activities.

- ❖ 100% housing should not be provided to drivers as they are residing up to 5-6 kms. away from their station of posting and are taking a lot of time in commuting. They are unable to get more than 10-12 hours of rest even at home station when they are provided 16 hrs. rest.
- ❖ All other railway employees get 12 National Holydays and 52 Sundays, guaranteed weekly rest but Loco-Pilot does not get any National Holyday. So, all the personal work has to be done by availing leave, or between short spells in between duties, which creates mental agony, losing concentration in running duties.
- ❖ No any calendar day rest provision, so that they may fulfill their family and social obligations.

(*FIRE Quarterly Magazine*, Aug.2012).

1.12 Issues:

These are the following issues raised from the present study:

1. Irregularities in lunch and dinner
2. Irregularities in sleep
3. Disturbed sleep
4. Sleep disorder
5. Work under pollution and high voltage electricity
6. Due to heavy night duty feeling cold or rain or hot sun in summer when normal temperature up to 46 to 48 degree, in locomotive, temperature increases up to temperature 54 to 56 degree centigrade, i.e. adverse weather conditions.
7. Noise level more than 100 db
8. Insufficient facilities in running room
9. Unhighgenic water and meal atmosphere
10. Suffer from stress related disease (hypertension, diabetes, frequent headaches etc.)
11. No any calendar day rest provision, so that they may fulfill their family and social obligations.
12. All their personal work has to be done by availing leave, or between short spells in between duties, which creates mental agony, losing concentration in running duties (*FIRE Quarterly Magazine*, Aug.2012).
13. Do not spend sufficient time daily with his family members (including wife, child/children, and older parents).

14. Always miss out quality time with his family and friends because of nature of work.

2. Review of the Literature on Railway Drivers

As there are relatively few published literature (studies) available on Indian railways' drivers working conditions. So, researcher has included studies of other nations that are relevant to this research.

A Swedish study (Kolmodin-Hedman and Swensson, 1975) finds out, that the irregular working hours disrupted the drivers' sleep in connection with night and early morning duties. There were also reports that the working hours intruded upon railway drivers' social lives and led to problems of sleep and fatigue. The most unpleasant working hours were the night and early morning duties, which were regarded as providing too little time for rest and recovery. The best working hours were those that started after 7.00 a.m. or that involved afternoon and evening work. Finally, this study too showed that irregular working hours was perceived as one of the most serious problems at work. One of the worst causes of stress that a railway driver can be exposed to is that of running over and killing or seriously injuring a person.

A Japanese study (Kogi & Ohta, 1975) has analysed near-accidents/accidents and their relation to sleepiness, and found that approximately 17 percent of incidents were sleepiness-related.

A Finnish study (Hannunkari et al; 1978) and a Danish study (Netterstøm et al; 1981) also show that irregular working hours are a major problem for train drivers as well as their physical work environment. Working hours, in particular night duties and long hours following an early morning start were also a major problem. High mental demands at work, such as intense concentration and continual alertness, were also felt to be psychologically demanding.

American accident investigators at the NTSB (the National Transportation Safety Board) have reported some very serious train accidents in which the driver had fallen asleep because of a strenuous schedule, an accumulated lack of sleep and, in certain cases, drug abuse (Lauer & Kayten, 1988).

A German study (Myrtek et al, 1994) has, examined railway drivers' perceived mental workload and heart rate variability. They found that when driving monotonous stretches at high speeds, the drivers' heart rate variability decreased something that is considered to be a sign of increased mental workload and stress. However, according to (Heitmann et al; 1997), while drivers have very strenuous (irregular and long) work, with regular micro-sleep events during the night.

An Australian study (Edkins & Pollock, 1997) has classified more than 100 railway accidents and near-accidents. The most significant accident factor in this study was the lack of alertness (e.g. meaning that critical signals were missed). They go on to discuss that this is probably related to the high degree of monotony in the railway driver's work. (Dawson et al, 1998), find that railway drivers suffer from severe fatigue and sleepiness when working at night. It is not at all uncommon for railway drivers to skip sleep during the day (or take just a short nap) after a nighttime duty. Performance (tested with a 3 minute "tracking" test) was also at its lowest at around 2 to 3 a.m., while a short sleep (less than 5 hours), or a short period of rest before the duty, resulted in increased sleepiness at work.

European studies (A. G. Stoynev and N. K. Minkova, 1997) show that excessive fatigue resulting from overtime work is a potential additional factor which may contribute to increased accident rates. The work load of truck drivers was significantly greater than that of the control ATC group. This was combined with less leisure time and less sleep. These factors are known to produce excessive fatigue and an increased accident rate.

An Indian study (Ram Chandra Acharya, 1997) show that the total population of India has increased by 350% since early this century, but its urban population has shot up by 840%. As a result, metropolises, cities and towns have sprawled out, engulfing nearby villages or smaller townships and converting them to suburbs. The teeming populations of these satellite towns, where housing was available at reasonable prices, has no choice but to commute long distances, thereby throwing an increasing burden on road and rail. Since rail transport is a vital development area in any city's infrastructure, it continues to play a key role in transportation, especially in the cities of India.



Fig. Crowded in Indian Railways Source: Ram Chandra Acharya, 1997.

A Swedish study (L.Kecklund et al; 2001) has, examined the train drivers' work situation, stress, workload and work hours:

Stress and work load:

The results show that the drivers experience more stress, worse sleep quality, more sleepiness and lower job satisfaction and also more social problems (with family) than other comparable groups. The results indicate that the risk of the drivers developing chronic stress and fatigue is high (Ingre, et.al. 2000).

Work hours:

The drivers' work hours were highly irregular. Stress, sleepiness, fatigue and sleep disturbances were related to a higher frequency of self-reported, work-related errors. Sleepiness and lack of job motivation were the most important factors explaining serious mistakes at work.

An UK (London) study (Spurgeon, Anne, & Cooper, Cary L, 2001) show that complex patterns of working time will be an integral part of working life in the future for many people. It will also become evident that many of these patterns pose potential problems for peoples' health, well-being and performance.

It is fairly clear that shift working constitutes a potential psychosocial stressor. The most frequently reported health complaints of shift workers relate to digestive problems. An important factor is that not all blocks of time are interchangeable and some are much more suited to certain activities than others. For example, time appropriate for spending with children, for certain organised leisure activities or for viewing the most popular TV programmes, is subject to external constraints. Shift workers may therefore lose the opportunity for these activities.

One of the most obvious effects of shiftwork is the disturbance it causes to the length and quality of sleep. Errors may affect work quality and speed of performance but perhaps more seriously, they may also cause accidents.

A Swedish Study (Härmä, M. et al; 2002) finds out, sleepiness and fatigue are frequent problems in railway transportation with occasional monotony and irregular shift schedules. Sleepiness and fatigue are frequent problems in many sectors of transportation with night and early morning work (Akerstedt 1998).

These results indicate that fatigue and sever sleepiness at work are very common among personal responsible for train driving and the control of train traffic.

A Japanese study (Minoru Arai, 2003) founds out, most train collisions, which occur rarely in Japan, may cause great damage and high loss of life. Since 1987, both JR East and other railway operators have experienced major train collisions. In many cases, such collisions are due to the train driver not observing the correct signal aspect for one reason or another. Train drivers must memorize positions of curves, signals, etc., to drive a train at safe

speeds.

An European study (Christopher B. Jones et al; 2005) finds out, fatigue is recognized as one of the most important safety issues in transportation. "It is obvious that a man cannot work efficiently or be a safe driver if he does not have an opportunity for approximately 8 hours sleep in 24. Allowance must be made for eating, dressing, getting to and from work, and the enjoyment of the ordinary recreations."

A Finland study (Mikael Sallinen et al; 2005) finds out, insufficient sleep and impaired alertness are the most common problems with non-physiological working hours. In night shifts, both main determinants of alertness, time since sleep and the circadian phase have a disadvantageous effect on the maintenance of alertness. Their study on sleepiness in train drivers and railway traffic controllers showed that an increase in the occurrence of severe sleepiness at work is associated with night and morning shifts.

An European study (John L.M. et al; 2006) demonstrated a greater understanding that specific stressors result in certain physical (cardiovascular disease, gastrointestinal disorders, musculoskeletal problems, fatigue), psychological (depression, anxiety, post-traumatic stress disorder) and behavioral outcomes (substance abuse). Bus driver ill health will have consequences for organizational performance in terms of employee absence, labour turnover and accidents. Stressors for bus drivers include poor cabin ergonomics, rotating shift patterns and inflexible running times.

The lifestyle of the bus driver at home and at work is inextricably linked to his/her physical and psychological health. Growing threats to well-being such as increased road traffic, violent passengers, and increasingly tight running schedules from commercial pressure will no doubt add to the burden felt by bus drivers.

An Australian study (Sally A. Ferguson et al; 2010) show that inadequate recovery sleep between shifts, in combination with circadian influences on sleep and alertness result in increased fatigue-related risk for many shift workers (Folkard and Tucker, 2003; Smith et al., 1994). Recent studies suggest that more than 6 h time in bed per night is required to maintain performance across consecutive nights (Belenky et al., 2003; Van Dongen et al., 2003). A balance between sleep, work and non-work activities is essential in any working environment.

In India (Sumit Prakas et al; 2012) find out increasing demands, exacting management, poor ergonomics cab and low support at the work with difficult work environment and inadequate recreation at the place of intermediary rest corroborates with development of stress affecting the normal biological functions leading to either avoidance of duty or making the railway loco-pilots susceptible to fatigue and drowsiness, neglect, injuries, and accidents.

An Indian study (Salma Ummul & Kameswara Rao K, 2012) has, examined the alarming relationship of shift work to fatigue, performance, accidents and chronic heart disease, there is reason to believe that shift work may become a major challenge for the employer, employee and occupational health professionals.

Shift workers had a significantly higher prevalence of fatigue. Higher fatigue levels are related to common infections as well. (Mohren et al, 2002). Fatigue ranked first among the railway shift workers of the present study. Further, it is essential that an ideal rotation of the shifts be adopted so as to reduce the sleeplessness and fatigue among the shift workers, ideally limiting the total work hours to less than 50hrs/week and night shift hours to less than 8hrs/week. Thus, the intensity of the stress reduces and the physical ability to cope up increases.

In India (Reetesh Rikku & Neelima Chakrabarty, 2013) define, Loco pilot as "the person on duty who is for the time being responsible for the working of the traffic within station limits, includes any person who is for the time being in independent charge of the working of any signals and responsible for the working of trains under the system of working in force". The main objective of the job of Loco Pilot is reception and dispatch of trains safely, maintaining punctuality in accordance with the rules and regulations in vogue.

In India (Anjali Jain et al; 2013) finds out, the railway network is considered to be the safest and easiest network. More than 10 billions of people and 1050 millions of freight travel by train annually.

After the block section or before the block section train is manually controlled by the Station Master, who is being guided by the Section Controller. The driver doesn't know anything about what's going around. He doesn't have any information about other trains. His only job is do see a signal aspect and follow that. And the signal aspect depends upon the Station Master, so if Station Master gives wrong signal and gives wrong route accidents occur. Whole working is Station Master dominant. The driver cannot take any decision. In fog or worst weather condition driver can't able to see the signal and the situation would lead to accidents.

An Australian study (J. Davey et al; 2013) show that Railway level crossings are the interface between roads and train lines, and as such are the potential site for vehicle-train collisions and incidents. Train Drivers are first-hand witnesses to numerous incidents that occur between road users and trains at railway level crossings. This exploratory study utilised focus group discussions to investigate Train Driver experience of motorist behavior at railway level crossings. Collisions between vehicles and trains at railway crossings account for only a small percent of all road casualties, however these accidents are three times more likely to involve fatalities as compared to all other types of road crashes (Afxentis, 1994).

An Italy study (Alessandro Olivo et al; 2013) show that there is a negative effect on the visual function of railway drivers, which is attributable to the noise level. It has also been proved clinically that tiredness due to noise can be directly associated with loss in the general performance of drivers.

Among the main sources of noise are the wheel/rail contact, the pantograph/line contact, aerodynamic penetration, and the engine. Their incidence varies with vehicle speed. Other situations like vibrational stress, shaking and microclimate conditions, that are not always optimal, determine a decrease in the level of performance of drivers. Other effects on vision, and especially visual tasks that are greatly affected by attention.

2.1 Causes of Sleepiness, Fatigue and Workload:

2.1.1 The Circadian Rhythm:

Problems related to working hours changes are primarily caused by our biology, in that our circadian rhythm is set for rest and sleep at night and for activity and high functionality during the day. Most features of our biological (e.g. hormones, body temperature) and psychological (e.g. level of alertness, mood, performance capacity) make up a pronounced circadian rhythm whereby activity is low at night and high during the day (Åkerstedt et al, 1979). For example, wakefulness (sleepiness) and body temperature levels reach their absolute minimum during the early morning hours, between 3 to 5 a.m., at which time our bodies are programmed to sleep and when it is most difficult to wake up (Dijk & Czeisler, 1995). The circadian rhythm is controlled by a biological clock in the brain, which is sensitive to the changing patterns of light and darkness, in that darkness signals inactivity and rest while light signals activity (Czeisler & Dijk, 1995).

2.1.2 Stress and Mental Workload:

The actual job of driving a train generates a mental workload by virtue of the constant demands to concentrate and monitor, and on the driver's readiness to handle unexpected operational conditions (e.g. technical disruption). Railway drivers are also subject to stress arising from factors not related to the actual driving, such as working hours and lack of sleep. They can suffer from both physical stress (e.g. noise and vibrations) and psychosocial stress (e.g. fast working pace and concern about accidents).

2.1.3 Stress:

Stress in its negative sense implies an imbalance between the demands of the environment and the capacity of the individual to cope, or that the individual's expectations exceed what is offered by the environment. If a stress situation cannot be controlled, negative reactions arise such as discontent, worry, fear, frustration, and a lack of pleasure or motivation at work. Physiological

responses, e.g. increased release of stress hormones, higher blood pressure, a more rapid heart rate, and a rise in blood fat levels are also linked to stress (Theorell, 1997). If this condition is allowed to continue over a period of time, stress can lead a state of exhaustion, burnout and illness. Suffering from burnout entails a constant state of physical and mental exhaustion or extreme tiredness.

Considering now the workload of the railway's drivers, working hours can probably be seen as the most serious stress factor. The relatively limited opportunities to influence working conditions can also be a major source of stress.

2.1.4 Mental Workload:

The concept of mental workload originates from the "human factors" field. It involves analysing the interplay between the capacity of the operator/individual, the demands of the job and of the ergonomic work environment. Mental workload is principally a matter of human mental abilities, of how information is received and processed, and the decisions and measures to which this leads. A high mental workload can result from an abnormally high pace at work. And if this continues over a long period of time, there is considerable risk that conditions of stress will arise.

The circadian rhythm, lack of sleep and sleepiness influence performance ability. Cognitive functions (e.g. reaction time, vigilance and short-time memory) deteriorate late at night and when lacking sleep (Dinges & Kribbs, 1991). If a further lack of sleep occurs, performance levels deteriorate during the day as well.

2.2 Results concerning the train drivers' work situation, stress, workload and work hours:

Stress and work load:

The results show that the drivers experience more stress, worse sleep quality, more sleepiness and lower job satisfaction and also more social problems (with family) than other comparable groups. The results indicate that the risk of the drivers developing chronic stress and fatigue is high (Ingre, et.al., 2000).

Work hours:

The drivers' work hours were highly irregular. Stress, sleepiness, fatigue and sleep disturbances were related to a higher frequency of self-reported, work-related errors. Sleepiness and lack of job motivation were the most important factors explaining serious mistakes at work.

2.3 Summary of Earlier Studies:

1. Working Hours: Earlier research has highlighted above all the problems of irregular working hours. Night and early morning shifts are known to be associated with high sleepiness and inadequate recovery, but it is not fully clear whether this affects safety and leads to more accidents.
2. Physical Work Environment: Most studies have shown that railway drivers feel that they have a strenuous physical work environment.
3. Psychosocial Work Environment: Very little research has been done concerning railway drivers in this field, particularly in terms of work-life balance.
4. Accident Research: By far the most common method used is an analysis of surveys and registered accident data. A few studies have investigated physiological activity related to sleep/wakefulness and stress.
5. Total Scheduling Workload: As far as working hours are concerned. One question of interest is whether an extremely heavy schedule (a dense schedule with frequent morning and nighttime shifts) can lead to chronic fatigue and burn out.
6. Differences between Different types of Train Traffic: One observation is that previous studies make no comparison between different types of traffic. Most of the earlier research is focused on long-distance and high-speed trains, while few studies have investigated commuter train traffic. The differences in traffic density (low versus high), stress, fatigue and safety have not been studied.

In summary, after reviewing of literature identified that Indian railway drivers had difficulties in balancing work, life, and social activities. The findings from this study suggest that contending with stressful situations in the workplace is a common occurrence for the railway drivers leading to deterioration in their quality of work and life. These are the important reasons to assume that sleepiness and stress reduce a railway driver's mental capacity when work load reach its peak. In this context, it was found that railway drivers are exposed to a range of stressors such as the poor ergonomic cab conditions, distressful noise, uncomfortable climate conditions, and work scheduling, resulting in poorer health and work performance (Evans et al; 1999).

The problems of sleepiness and workload decreased when the drivers were given fixed schedules (e.g. when certain drivers worked night-time only).

2.4 List of Indian Train Accidents:

Year	No. of Accidents	Casualties	Injured
2003	2	73	50
2004	1	14	N/A
2005	2	890	N/A
2006	1	4	38
2007	N/A	N/A	N/A
2008	N/A	N/A	N/A
2009	2	28	Several(N/A)
2010	8	104	462
2011	3	14	202
2012	8	47	64

Source: *List of Indian rail incidents* - Wikipedia, the free encyclopedia

3. Gaps Analysis, Raised Research Issues and Conclusions

3.1 Gaps Analysis:

After reviewing the literature, there appears to be a limited amount of research studies available in regards to how Indian railway drivers manage work and personal life to achieve a balanced life. These reviews highlight that there are working conditions issues related to Indian railway drivers that need to be addressed. Internationally, working conditions and the factors affecting quality of work life leading to stress for railway drivers have received considerable attention. However, when coming to India, there have been hardly few studies done to reflect the working conditions of the Indian railway drivers. Very few studies have looked into physiological workload, stress and work-life balance in connection with Indian railways' drivers.

However, through this study, researcher has tried to highlight the conditions of the Indian railway drivers, under which they have been consistently performing their duties. Hence, the present study tries to find, the working conditions and quality of work life of the Indian railway drivers and their perception about the initiatives taken by the Indian railways' to improve their life at work.

3.2 Raised Research Issues:

After reviewing the literature, these are the main research questions raised:

1. How do Indian railway drivers experience their work environment in terms of stress, work load, time pressure, and work-life balance?
2. What are the experiences of Indian railway drivers relating to quality of work- life initiatives?
3. How do work and family related factors influence the work-life balance of Indian railway drivers?
4. What challenges Indian railway drivers face and what strategies do they use to achieve work-life balance?
5. How Indian railway drivers manage their work, to achieve a balanced life?
6. What are the experiences of Indian railway drivers relating to working conditions and their effect on safety, stress and sleepiness?

Drawing upon the large amount of literature, the present study aims to study how Indian railway drivers manage the competing demands of work & life. There is a need for greater research in this area.

3.3 Conclusions:

This study provided an in-depth look into the working lives of railway drivers. Indian railway need to work with researchers, trade unions, policy makers and railway drivers themselves, to formulate initiatives that safeguard railway drivers against work stress, so that the quality of their work- life could be improved. Even so, it is hoped that this study constitute not only valuable insights and attract the attention of the management (Indian Railway) towards the deteriorating condition of the railway drivers and highlight their work- life, but also provide a tentative starting point towards the greater understanding of current scenario under which the Indian railway drivers are performing their duty, so as to bring an improvement for the same.

Future work:

There is a need for a coordinated international effort in the investigation of human factors and railways. This effort should among other things address the implication of workload, irregular work hours, use of automation and the driver's role.

Further, it is essential that an ideal rotation of the shifts be adopted so as to reduce the sleeplessness and fatigue among the Loco-Pilots, ideally limiting the total work hours to less than 50hrs/week and night shift hours to less than 8hrs/week. Thus, the intensity of the stress reduces and the physical ability to cope up increases. (Salma Ummul & Kameswara Rao K, 2012)

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