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Occupational Health Challenges of Railway Employees in India – Towards Developing a Comprehensive Framework for Action

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ABSTRACT: *Provision of occupational health services plays a critical role in employee retention, motivation and job satisfaction. Work related health and safety needs of railway employees in India have not received the due attention. Lack of comprehensive framework for analysis and paucity of scientific literature on the subject is a bottleneck for formulation and implementation of effective policies around the subject. This review paper offers a framework for further consideration of the government. In the first of its kind work, the paper also presents a unique and comprehensive perspective of the responsibilities, contextual factors and emerging priorities with regard to occupational health challenges of railway workers. Opting for a comprehensive occupational health policy, capacity building of key stakeholders, regular supervision, strengthening of information management system and facilitating research and innovation on the subject has the potentiality to pay rich dividends in the long run not only to individual workers but also to the economy and the railway industry.*

BACKGROUND

The work conditions and the nature of work environment affect the health of employees. Factors, such as, temperature, sound, vibration, etc significantly determine the quantum and type of work-related ailments and injuries which occur due to unavoidable interaction between the physical–physiological systems of an individual with the external agents at work. Occupational safety and health (OSH) is the science of anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and well-being of workers (Alli, 2013). Besides work-related disorders, it also encompasses all contextual factors that affect health within a work environment.

The burden of disease attributed to occupational diseases is high and it is estimated to be about 11 million cases annually, with about 700,000 deaths (Leigh et al., 1999). The World Health Organization estimates occupational health risks as the tenth leading cause of morbidity and mortality. Selected occupational risk factors account for 1.5% global burden of disease in terms of Disability Adjusted Life Years (DALY). The World Health Report 2002 reported that occupational risk factors accounted for 37% back pain, 16% hearing loss, 13% chronic obstructive lung disease, 11% asthma, 10% injuries, 9% cancer, and 2% leukemia (Wilkinson & Marmot, 1998). On the other hand, the WHO estimates that out of over 40 million working population only 10-15% of the workers have accesses to basic occupational health services (Census of India, 2001).

Developing countries contribute to three-fourths of the global workforce; more than 125 million workers are victims of occupational accidents and diseases every year. In the wake of rapid industrial growth, the occupational morbidity pattern is fast changing. Poor occupational health and, in turn, reduced working capacity may cause an economic loss of up to 20% of the Gross National Product (GNP) (Mikheev, 1994; Zodpey et al., 2009). In India the rates of occupational fatalities and accidents are 10.4 and 8,700 per 100,000, respectively (Alli, 2013). The rapidly changing job patterns, working relationships & modalities of employment are the key barriers to effective management of occupational safety and health risks. According to a World Bank estimate, two thirds of the occupationally determined loss of disability-adjusted life years (DALYs) could be prevented by occupational health and safety programs (WHO, 1995). Concerted attention towards preventive, promotive and rehabilitative health and safety of workers in 'hazardous occupations' is long overdue.

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AIM AND OBJECTIVES

This review paper critically examines the current occupational health scenario of railway employees in India in terms of the various types of hazards they are exposed to and the consequent health challenges. The paper considers the existing constitutional and legal frameworks to deal with employee safety and compensation. In the last section, it summarizes the level of preparedness of the employer to deal with such challenges. The paper is presented in two broad sections: the first section discusses the occupational health challenges of railway workers and legislative safety nets; the responsibility of stakeholders, including of the government, the context and the emerging priorities for each responsibility is presented separately in the last section.

MATERIALS AND METHODS

We adopted a search strategy to retrieve information available on the internet. We used 'PubMed Central' search engine. A set of key words encompassing various domains related to occupational health were used. Those are: occupational health, occupational medicine, industrial health, industrial medicine, occupational health policies in India, occupational health of railway workers, health safety, and occupational hazards. The websites of the Ministry of Environment and Ministry of Labor, the International Labor Organization (ILO), World Health Organization (WHO), International Commission on Occupational Health (ICOH) and Indian Railways were also referred to.

RESULTS

Occupational Health Challenges of Railway Employees

Indian railways (IR) are the backbone of passenger and freight transportation system in India. It is the largest rail network in Asia the second largest under one management, world over (Indian Railways).

IR is a state-owned enterprise, operated by the government of India through the Ministry of Railways. With a humble beginning in 1853, the organization rapidly widened its network to cover by 1880 a route length of about 9000 miles. By 2012, the railway networks covered about 1,15,000 tracks over a route of 40,660 miles & 7,172 stations. In terms of the number of employees, it is the world's seventh largest commercial or utility employer with over 1.3 million employees (Indian Railways). Such a huge workforce is diversified by areas of expertise and nature of work.

Why Occupational Health Matters in Railway Industry

The notion that rail transportation is much less harmful to the environment than road traffic stands demystified by the fact that rail causes some typical organic and inorganic contamination resulting mostly from used lubricate oils and condenser fluids, transportation of oil derivatives, metal ores, fertilizers and different chemicals, as well as from application of herbicides. The two most important types of pollutants connected with railway transport are polycyclic aromatic hydrocarbons (PAHs) and heavy metals. The concern for the potential human carcinogenic hazard of exposure to diesel engine exhaust prompted researchers to conduct early epidemiological studies of railroad workers exposed to diesel exhaust (DE). Elevated exposures to airborne DE have been linked with a variety of health concerns, including acute irritation, respiratory symptoms, allergenic responses, and cancer. The relationship between DE exposure and lung cancer risk has been a subject of investigation for over last four decades, with inconclusive inferences (Hesterberg et al., 2012).

Recent case studies on the fluctuating fate of financial successes and failures of IR have brought back the focus on the health and wellbeing policy initiatives and practices of the government. Though the Indian railway board (IRB) has been continuously trying to address various health related issues of its employees, but the attention given to the occupational and environmental health hazards of workers is far from being satisfactory. The 2014-19 five year plan of the railways for the first time recognized the importance of occupational health of its employees and included measures for health protection, safety standards and health promotion. The department was assigned the responsibility not only to monitor the delivery of health and wellbeing strategies but also to supervise the implementation of guidelines for prevention of ill health. The major thrust was on better management of health and wellbeing at individual level.

Sources of Hazards

The health and safety status of railway workers are determined by the nature of assignments, duration of their exposure to hazardous environments, early recognition of alert signs and proactive health seeking behavior. Existing literature indicates that almost all railways employees, except a very limited managerial / administrative cadre, are exposed to health hazards on a daily basis. Broadly, they are exposed to five categories of environmental stressors: a) mechanical injuries and accidents; b) noise and vibration; c) diesel exhaust; d) electric and magnetic fields; e) other hazards.

A) Mechanical Injuries and Accidents

Workers in the vicinity of rail lines are exposed to fast moving trains, and incidences of accidents are high. Mainly the gang man and repair man involved in track repair and maintenance are the victims. Recommended management strategies may include training the workers in personal track safety procedures, blocking train traffic on lines where maintenance is occurring (i.e. “green zone working”), use of automatic warning system; ensuring design and construction of rail lines with adequate clearance for workers, segregation of stabling, marshalling, and maintenance areas from the running.

b) Noise and Vibration

The crew members and the workers in close vicinity are exposed to high level of noise and vibration. Their health effect is dependent upon the duration & intensity of exposure. Locomotives, rolling stocks, machinery, as well as mechanical shocks are the major sources of pollution and vibrations (Railways). Paucity of scientific literature makes it difficult to quantify health and wage losses of workers due to such exposures. However, the health effects of exposure to noise and vibration are well documented; and those are: quick fatigue, body ache and pain, headache, insomnia, hearing losses, and hormonal imbalances. The recommended management strategies may include: use of air conditioning systems; reduction of internal venting of air brakes; installation of active noise cancellation systems; use of personal protective equipment (PPE); use of dampers at the seat post; and installation of active vibration control systems.

c) Diesel Exhausts

Locomotive crews and workers in stations, rail yards, locomotives and car shops are exposed to exhaust from diesel engines. The IR is contemplating to phase out diesel engines, but the pace of such shift is abysmally slow owing to non-availability of alternate sources of energy. The rail wagon repair workshops are also a constant source of diesel exhaust. Control may be achieved by reducing air emissions from locomotives, limiting the time period for locomotives to run indoors, using pusher cars to move locomotives in and out of maintenance shops, ensuring adequate ventilation in areas where diesel exhausts accumulate, ensuring filtration of air in the train crew cabin, and using PPE where engineering controls are not sufficient to reduce exposure.

d) Electric and Magnetic Fields

The employees working in electric railway systems may have a higher exposure to electric and magnetic fields (EMF) than the general public, as they work in proximity to electric power lines. Electrified railways use either overhead wires or a conductor rail to transmit electrical power to the train locomotive or multiple units. Overhead power lines may also be present near non-electrified rail lines.

e) Others Hazards

Locomotive and railcar maintenance activities enhance the proneness of workers to physical, chemical, and biological dangers. Physical hazards may be associated with work requirements, such as, proximity to moving equipment, machine safety and electrical safety issues. Chemical hazards may include exposure to a variety of hazardous materials (e.g. asbestos, toxic paint, heavy metals, use of solvent-based paints and cleaning solvents, etc). Biological hazards include potential exposure to pathogens present in sewage storage compartments. Pneumoconiosis and occupational poisonings, musculoskeletal disorders (MSDs), psychological stress at work, occupational allergic diseases, occupational tumors, occupational nose, ear, throat, and mouth injuries are found to be common among such workers.

LEGISLATIVE SAFETY NETS

Article 21 of the Indian Constitution enshrines the protection of life and personal liberty of a worker. When read along with Articles 39(e), 41, 43, 48A, article 21 is an epitome of the reflections of India towards health and safety of its citizens at work. The constitution makers have shown valuable concern towards workmen in factories and industries. The Directive Principles of State Policy emphasize on securing the health and strength of workers; proscribe children from abuse, emphasizing citizens should not be forced by economic necessity to enter a work environment which is unsuited to their age or strength; recommend that humane conditions of work and maternity relief are provided to each employee, irrespective of the nature of work. They further reiterate that the government must take

steps by suitable legislation to secure the participation of workers in the management of health and safety issues across organizations. In other words, the government must frame policies and legislations in accordance with the nature of employment and in consultation with workers' welfare organizations and environmental activists (Kulkarni, 2008). A number of Supreme Court judgments have also come in favour of 'right to life' & 'right to health'. Emphasizing that the right to health, while in service, is a fundamental human right, in several occasions the judiciary had observed that occupational accidents and diseases remain the most appalling human tragedy of industries and loss of quality workforce (Radhakrishnan, 2008).

For further analysis, the paper considered the following Acts: 1) The Factories Act-1948; 2) The Mines Act-1952; 3) The Dock Workers (Safety, Health & Welfare) Act-1986; and 4) The Employees State Insurance Act-1948; and 5) Workmen's Compensation Act, 1923 to examine compensatory provisions due to loss of wages of workers because of health or accidents (Government of India).

DISCUSSION

On the basis of literature review, we propose the 'PHRASE' approach to fix responsibilities, re-define the context and resolve emerging priorities (Figure 1).

Responsibility - Policy Formulation

Context - WHA Resolution

In 2007, the 60th World Health Assembly (WHA) urged the member states of the World Health Organization (WHO) to work toward full coverage of basic and essential occupational health services. The WHO was requested to provide guidance to countries on basic packages, tools, working methods, and models of good practices for occupational health services and to stimulate international efforts for capacity building of workers (WHO, 2008; Verbeek & Ivanov, 2013).

Context- Lack of Occupational Health Policy

The failure of governments in developing countries to formulate occupational health policies is well known. In India, exportation of labor, flexibility and inaction of unions and use of power by the elitists are considered as the most probable reasons for non-existence of policy and poor occupational condition of workers in different set-ups across the country.

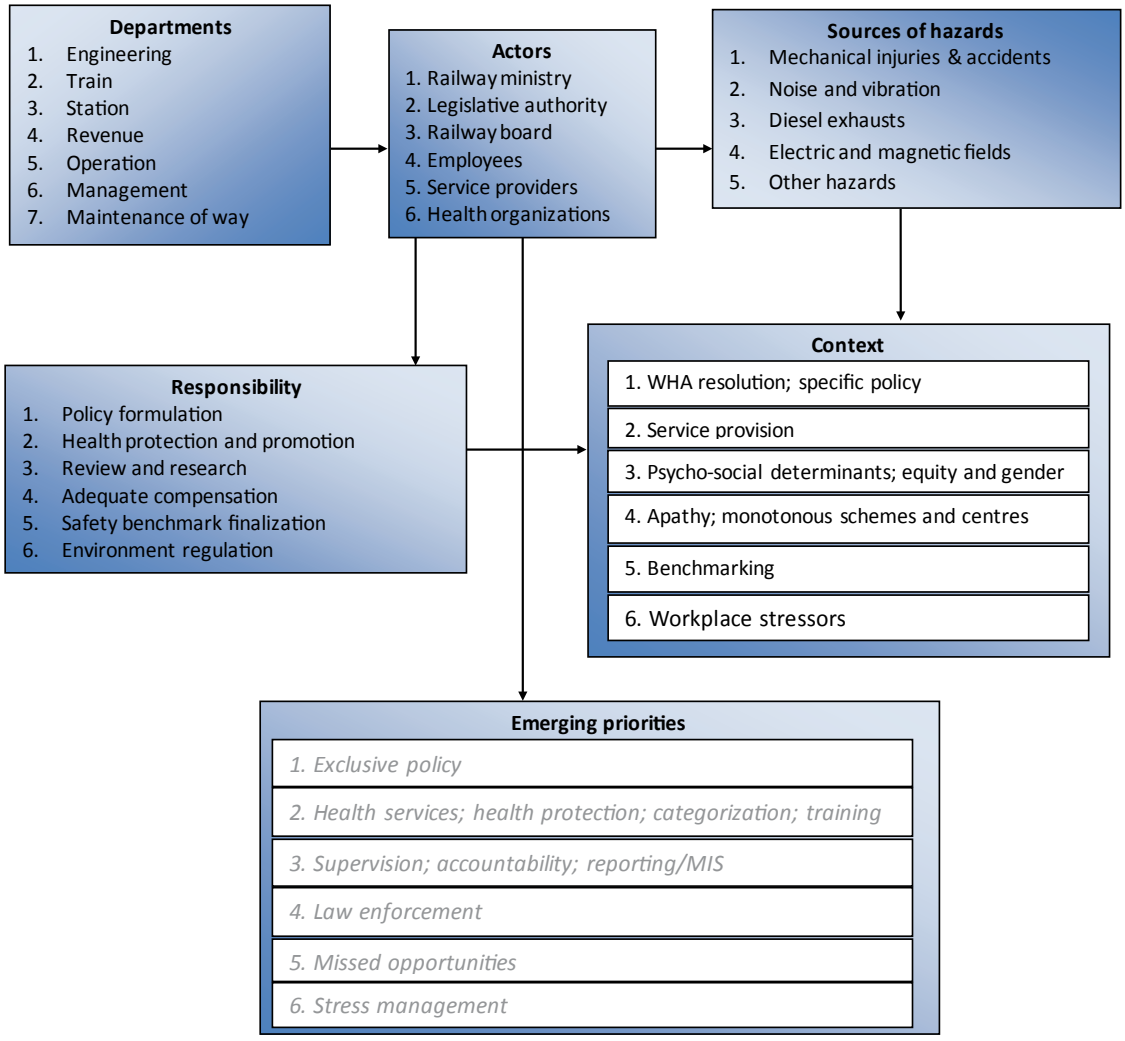
Emerging Priorities-Exclusive Policy

The national health policy 2002 had mentioned about the importance of occupational safety, but fell short in terms of explicitly reflecting the steps to be taken to address systemic barriers in the provision of health to workers. On the other hand, the draft national health policy 2015, in its current form, makes explicit references to occupational safety issues and the role of employers; however, it would be too early to comment on such a document. What is needed is an exclusive policy comprising of long-terms goals, short-term objectives, well spelt-out priority and resource allocation plans of the government in the field of occupational health.

Responsibility - Health Protection and Promotion

Context - Service Provision

Ensuring provision of occupational health services is governed by specific legislations (NIHFW). However, such legislations must



Source: Authors' self-construct, 2015

Figure 1. Conceptual framework (PHRASE) approach for occupational health and safety, India

be adequately supported by appropriate infrastructure and human resources. Studies estimate that about 17 million occupational, non-fatal injuries (17% of the world) and 45,000 fatal injuries (45% of the total deaths due to occupational injuries in the world) occur in India (NPCTOI). Further, the country is projected to account for 1.83 million cases of occupational diseases by 2015 (Kulkarni, 2008). However, out of an estimated 500 million workers in India, only about 5-10% of them have access to occupational health services (Lehtinen, 2008). In terms of human resources, there are around 1000 qualified occupational health professionals, indicating a significant gap in the demand and supply of such specialist services.

Emerging Priorities - Basic Health Services

The WHO, International Labor Organization (ILO), and the International Commission on Occupational Health (ICOH) have advocated for implementation of a package of basic occupational health services. The ILO lists the following 11 functions as being integral to such services: identifying and assessing risk; surveilling workplace hazards; designing safe workplaces; developing programs for improved work practices and for evaluating new equipment; advising on occupational health, safety, and hygiene; surveilling workers' health; promoting adaptation of work to the worker; managing vocational rehabilitation; organizing training and education; organizing first aid and emergency treatment; and analyzing adverse conditions that lead to injury and illness (WHO, 1994). A more pragmatic analysis reveals that the provision of optimum occupational health services is estimated to require one physician and two nurses per 5000 workers. The estimated 500 million workers would need a staggering 100,000 doctors! Although, no definitive data on the exact number of doctors working in occupational health services on a full time/part time basis is available, this number is expected to be very low. The ratio of occupational health physicians to 100,000 workers is 61, 26, and five in Finland, Netherlands, and UK, respectively (Nicholson, 2004). The government must seriously show intentions and come up with a blue print to achieve such targets over a period of next one decade.

Emerging Priorities - Occupational Health Protection

The principles of occupational health protection are: prevention first; prevention and control combined; and finally, comprehensive management is according to the severity of occupational hazards. Tertiary prevention (pathogen prevention, occupational health surveillance, and occupational diseases treatment and healing) is regarded as the best strategy for disease control and prevention.

Emerging Priorities - Categorization and Training

Special attention should be given to the high-risk workers depending upon their job profiles, such as repetitive movement and awkward work postures. Capacity building of training institutions and provision of on-the-job training is a necessary pre-requisite to raise awareness of workers about health, safety and safety analysis. Policymakers ought to change their attitude toward occupational health and recognize that improving work conditions could be a vehicle for socioeconomic development. A wide range of WHO modules are available on the net for use by teachers, trainers, safety in-charge officials, policy makers, clinical personnel and NGO advocates (Forst et al., 2009) Further, workers exposed to electrical hazards should be trained in personal track safety. For instance, only those workers who are specifically trained should be allowed to approach these systems. EMF exposure may be minimized through a safety program which may include: establishment and identification of safety zones to differentiate between work areas with elevated EMF levels as compared to those acceptable for public exposure; limiting access only to properly trained workers; and adhering to an action plan developed by the international commission on non-ionizing radiation protection (ICNIRP).

Responsibility - Review and Research

Context - Psycho - Social Determinants

Due to the combined effect of work-life imbalance, insufficient rest, improper shift habits, irregular work hours, high level of stress, and exposure to multiple pollutants, workers experience fatigue which results in further psycho-physiological complications. Fatigue, particularly of drivers, signalers, maintenance workers and safety operators has dual threat of their own safety and that of the general public. Therefore, occupational health not only should deal with immediate health effects owing to hazardous work factors but broaden its horizon to consider the physical & psycho-social context within which employees operate (Kulkarni, 2008). The interconnection between socioeconomic factors, such as, income, caste, occupation, and class, and health is well documented. Such linkages need to be contextualized within the developmental discourse, globally (Directorate General, 2008).

Context - Equity and Gender

Census 2001 reported that the growth percentage for female workers was higher than that of male workers. The proportion of the male: female working population changed from 78:22 in 1991 to 68:32 in 2001. Such transitions have effects on exposure to toxic chemicals in the workplace, musculoskeletal disorders, and fertility. In addition, the female workers had specific stress-related disorders, resulting from job discrimination and sexual harassment (Banerjee, 1993). The report of the Labor Investigation Committee in India revealed that most of the low-caste families and tribes, including Harijans, are engaged in low-level occupations, such as, coolies and rickshaw pullers (Government of India; Radhakrishna et al., 2008).

Emerging Priorities - Regular Supervision

For strict implementation of non-discrimination work policies, regulations and standards, regular supervision is critical. Health inspection teams may be created and assigned the following functions: (1) audit and approval of preventive assessments to potential project sites; (2) on-site inspection of enterprises/workplaces, and environmental monitoring; (3) checking whether periodic health examinations of workers exposed to occupational hazards were in compliance with national regulations; (4) ensuring workers who were suffering from occupational diseases were properly treated, recuperated, and were transferred to other jobs suitable for them in line with the related regulations; and (5) supervising occupational health record-keeping and occupational disease reporting.

Emerging Priorities - Accountability

Responsibility must be fixed with the employers for the health and safety of their employees in workplaces and for the prevention and treatment of occupational diseases. The employer should establish an occupational health organization staffed with occupational health professionals for in-plant occupational health management and service.

Emerging Priorities - Reporting/MIS

There is no possible source from where we can get the actual health profile of railway workers, neither any scope to get report of allocation of money for the laborers. Published reports of employees state insurance (ESI), social Insurance schemes, and other insurance organizations only indirectly inform us. Therefore, it is critical to maintain database of individuals on job in terms of history, job titles, past occupations, industries, occupational conditions, and identification of risk factors. Issuing of job/occupation cards for the workers like ration card can be done for record keeping. A robust health information management system needs to be developed. The key objectives would be to standardize reporting indicators so that comparable data are available on real time basis; create system enabled dynamic observation and follow-up reports of the cases; be

able to report occupational diseases by enterprise, state and other critical parameters. Modern information technology solutions must be used towards this end.

Responsibility-Adequate Compensation

Context - Apathy

Post-economic reforms, the government of India has not paid commensurate attention to the occupational health concerns (Mandal, 2009; Phoon, 1983; Turshen, 1986; Kamuzora, 1986; Kouabenen, 1990; Sakari, 1993). The National Health Report points out that the country lacked the formation of a national watchdog owing to systemic bottlenecks (WHO, 1983). The ESI Act covered the insured workers and their families for sickness, maternity, employment injury, disability, and dependence (Bachrach & Baratz, 1970). Further, the National Commission of Labor, in 1969, declared that one-third of medical costs of the worker must be contributed by the employers. However, both the schemes were criticized for poorly-staffed services, poor standard of clinics and hospitals, non-availability of medicines and absence of preventive services.

Context - Monotonous Schemes and Centers

In spite of many legislative changes, the social relation between employers and employees has not changed to a desirable level, over last four decades. Even now child labor is exploited problems of bonded labor remain unsolved, and protection of the health of the workers remains questionable (Giuffrida, 2002). There are only a handful of professional agencies like the National Institute of Occupational Health (NIOH) and its arm-the Regional Occupational Health Center (ROHC), and the Industrial Toxicology Research Center (ITRC).

Emerging Priorities - Law Enforcement

Enforcing occupational health and safety would be a crucial strategy to prevent occupational hazards. Enforcement of health and safety regulations and compliance assistance on one hand and state public health agencies on the other will have to play complementary roles in conducting surveillance, monitoring compliance, implementing prevention activities and educating the workers (NIOSH-CSTE, 2001; Stanbury, 2008; Davis & Souza, 2009) Public health departments should also invest in developing specialization around enforcement.

Responsibility - Safety Benchmark Finalization

Context - Benchmarking

We lack a modern occupational health safety (OHS) legislation with adequate in-built mechanisms for benchmarking awareness, enforcement, and research and evaluation components. Internationally accepted benchmarks, such as, the threshold limit value (TLV) of various exposures, the biological exposure indices (BEIs) are not used for compliance studies. With paucity of scientific studies, the government must take the lead to foster an environment conducive for undertaking such research and benchmarking. The effect of each hazardous exposure on workers should be periodically assessed. 162 years of existence and more than a million dedicated workforce, makes this industry vulnerable to higher loss of sickness driven human capital on the one hand and rigorous public health scrutiny on the other. The railway board already has a well established medical wing but its primary focus seems to be limited to curative care only. The promotive and preventive health programs initiated by the department have not percolated down well as yet.

Emerging Priorities - Missed Opportunities

Over the years, the IR has missed many an untapped opportunities for integrating occupational health with its business model. Contemporary public health concerns about emerging infectious diseases, biological and chemical terrorism, and general health issues of workers must be considered on priority.

Responsibility - Environment Regulation

Context - Workplace Stressors

The traffic volume and speed of trains in Indian railways is going to be increasing with passage of time; this ought to create stress among staff connected with train operations. The jobs of railway drivers fall under 'high-strain' category as they have to perform long hours of duty with rigid procedures and little options for taking breaks (Karaset, 1990; Kumar et al., 2011). Studies have revealed higher level of stress among railway drivers as compared to other job categories like assistant station masters, train examiners and office clerks (RDSO, 1997). Pareek (1983) identified 10 stressors related to role demands. The common manifestations of stress include disrupted sexual functions, muscle ache and pains, sleep disturbances, headache, stomach problems, irritability and anger, and frustration, cognitive reactions, psychological and physiological presentations and burnout. At organizational level, stress could lead to decline in performance, withdrawal (absenteeism and quitting) and turnover, poor motivation and satisfaction. Job stress has been found to significantly correlate with stressors like vibration, long duties, improper rest, noise, irregular food habits, and fatigue (Prahastuti, 2010; Yahaya et al., 2010; Prakash et al., 2011).

Emerging Priorities - Stress Management

Amongst the top ten stressors, the top three are postural discomfort and lack of adequate space, noisy workplace, long duties and improper rest. As a pilot project by the Indian Railways, five to six new engines were introduced in almost all divisions which were spacious, air-conditioned and with comfortable seating provisions. But most of the divisions subsequently removed the ACs and replaced it with coolers on technical grounds. The electronic signal exchange as used in most railways, especially in Europe, could be tried where both sides of engine have couple of lights, one each under control of the driver as well as his assistant, so that both the lights don't fail, which are lit for signal exchange at stations. Further, it is imperative to develop stress management strategies and implement in letter and in spirit – the sooner, the better. A robust social supporting system with adequate inbuilt buffering is desirable (Parasuraman, 1992).

CONCLUSION

Lack of rigorously scrutinized scientific literature in this subject limits the scope and measurement parameters with regard to implementation of various policies and guidelines for railway workers. There is no comprehensive law on occupational health, though the government of India in its relevant policies and directives has been stressing on the need to effectively implement a plethora of seemingly teeth-less existing laws. A comprehensive reference framework (PHRASE), delineating the responsibilities, contextual factors and priorities has been proposed in this paper for immediate attention of the government. The railway broad should provide insights into the prevailing situation with regard to the health profile of its employees and must engage with civil society organizations, including public health institutions in redirecting some of its existing service provisions. Occupational health laws in India need revamping and be seen from the perspective of newer challenges that the industry is likely to face in the wake of recent announcements by the government of India to introduce a variety of advanced railway networks in the country.

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