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A Case Control Study Among Carpet Thread Factory Workers in Uttar Pradesh, India: Occupational Injury and its Deteriorating Factors

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Abstract

Occupational injuries have a major impact on public health and exact a huge toll in the workplace. Annually throughout the world, it is estimated that ?300 000 people die from 250 million accidents that occur in the workplace (who 1999). However, efforts towards investigation of determinants among carpet thread factory workers are very minimal in developing countries including India. The aim of the study was to identify determinants of occupational injury among workers in carpet thread factory of Varanasi district, Uttar Pradesh state, India and to assess the different protective measures used during working day to prevent the different hazards.The sample consisted of 650 carpet thread factory included 310 workers (cases) and 340 non workers (controls).All the respondents were interviewed by a pretested questionnaire regarding occupational injury status within Eighteen month period (May 2007 to November 2008).

Index terms— Occupational injury, Carpet Thread Factory, Workers, Non Workers.

1 Introduction

he work is considered a basic part of our life. Most adults spend approximately one fourth to one third of their time at work and often perceive work as a part of their self identity (Rogers, 1994). Employed people in industries spend at least one third of a day at work which have a strong effect on their health and safety due to work and work related injuries (Antonio et al, 2001). Injuries are the leading cause of morbidity and mortality among workers. Thousands of people are killed in industrial accidents every year, and the number of disabling injuries is staggering. Many workers suffer job-related injuries that result in lost working hours, medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job. Today injuries continue to claim lives, inflict physical and psychological damage and consume the resources of workers and their families. Leigh et al. (1999) estimated around 16 million injuries every year, with 2 million moderate to serious injuries on the Indian subcontinent. Indirect costs, such as pain and suffering by workers and family members, are very evident, but a major limitation in dealing with this negative scenario is the inappropriate accounting of the accident events and the potential risks for work-related injuries.

This study presents an analysis of occupational injuries in the Carpet industrial process. Pranab L. Nag et.al reported that of the world's total textile production, the industrial enterprises of the Asia-Pacific region contribute two-thirds, to the tune of about 50 million tons of fabric annually. Accident data from the textile industries in this region are sporadic. The prevalence of work hazards, and the quantitative relationships between the nature of work and workplace accident causation are conspicuously lacking. In India alone, nearly 13,500 enterprises employ about 2 million workers in the textile sector. The work processes in these industries require intense human involvement under suboptimal working conditions which culminate in a high incidence of accidents of varied severity, some of them fatal.

Worldwide in 2005, an estimated of 250 million occupational injuries and 5.4 million deaths due to injuries occurred annually. From this, over 90 percent was in low and middle income countries where the greatest concentration of world's workforce and low level of factories found (Tetsuya, 1999). This problem costs the world a loss of roughly 4% of the gross national product (Eijkemans, 2004;. Despite this, only 5 to 10 percent of the workforce in developing countries has access to some kind of occupational health and safety services .

India has been a member state of International Labor Organization and signed conventions related to health and safety of factory workers since 1923. However, the national occupational safety and health policy is not issued though it is required by the country (Seblework, 2006). Currently to prevent occupational injury and to promote health and safety at work places, the Ministry of Labour and Employment , Ministry of Social Justice and Empowerment, Directorate General Labour Welfare, Internal Works Study unit, International Labour Affairs Section, Wage Board, Chief Labour Commissioner, Central Labour Service, Social Security Division of Government of India and regional board Labor and Social Affairs and Affiliated Zonal representative offices have taken responsibilities for occupational safety and health services of workers according to labor proclamation (http://labour.nic.in/).

Occupational injuries in developing countries are a major concern . It is estimated that 250 million occupational injuries, 160 million work-related diseases and 2 million deaths occur each year resulting in a loss of roughly 4% of the world gross national product due to workers' compensation, loss of workdays, interruption of production, retraining, and medical expenses and the 1:14 , Eijkemans G 2004). More than 350,000 workers die each year due to injury, significant proportions occurring in low and middle income countries (Who 2009).

Studies done in France, U.S and China indicated that men had a higher risk of occupational injury than women **??**Bhattacherjee et al, 2003;Rhys and Paul, 2005; **??**mith,2004). However, a study conducted in India among small and medium scale factory workers indicated that occupational injury has no any significant statistical association with gender of the worker (Tadesse and Kumie, 2007). Investigators at different places indicated that younger workers suffer more occupational injury at a higher rate than older workers (Rhys and Paul, 2005; **??**ulle, 1988). Also a study done showed that the prevalence of work and work related injury increased with young age (Tadesse and Kumie, 2007) An **??**LO (1997 **??**LO (-1998)) study in Vietnam indicated that textile workers were exposed to hot and noisy environments, and these workplace exposures led to many accidents at work. The study of Lithuanian textile workers by Ustinaviciene and Piesine (2007) reported 9.3% injuries, with an increase in morbidity with age, and women having 1.5 times highermorbidity than men. Fritschi et al. (2004) reported data from Australian textile units which show that workers, particularly men, are at high injury risk. The shift schedules in work of this nature also have a significant influence on the health, sleep length, social activity, and problem intensity of textile workers (Pajunen et al., 2007).

Findings of a study done among textile factory workers demonstrated that the most frequent causes of occupational injury were machinery 42(29.4%), hit by or against objects 29 (20.3%) (Senbeto, 1991). Ministry of Health and Family Welfare in India reported that striking (25.5%), falling (12.8 %) and flying objects from machines (8.5%) were the major causes of occupational injury (Ministry of Health and Family Welfare,2006). similarly the Uttar Pradesh labour department reported that machinery (36.7%), mishandling (15.3%), falling (14.5%) and hand tools (6.2%) were the commonly complained occupational injury types among manufacturing industrial workers (Uttar Pradesh labour department reported that machinery, 2009-10).

All of the above studies except few were focused on characterization of occupational injury among industrial workers. Potential risks for workrelated injuries include workload, psychosocial and organizational factors (Simpson CL & Severson RK 2000). Machinery-related injuries are the second leading cause of traumatic occupational fatalities **??**Pratt et.al1996). However, to solve occupational health and safety problem of the workforce advanced epidemiological studies are essential for policy makers, public health experts and program implementers. Reducing the risk of occupational accidents requires a combination of a safe work environment, comprehensive training for workers and implementation and enforcing systematic management. Implementation of preventive programmes is also an important task (Jovanovic J & Jovanovic M 2004). Therefore this case control study was designed to fill the gap by identifying the determinants of occupational injury among thread factory workers which is very important for the development and strengthening of legislations and intervention priorities to safeguard the health and safety of the work force.

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3 Methods

This study was conducted in thirteen thread factory workers in Varanasi district of Uttar Pradesh during the period May 2007 to November 2008. Out of thirteen industries, in ten industries, there is an insurance mechanism for workers that may be injured during work. This encouraged the workers to report every accident during work. There are about total 650 samples included 310 workers (cases) and 340 non workers (controls).

Cases were workers who have experienced occupational injury within Eighteen month period (from May 2007 to November 2008) in thread factories and the Non workers or control groups were workers who did not experienced occupational injury within Eighteen month period (from May 2007 to November 2008) in thread factories.

Data was collected using pre tested and structured questionnaire include two parts, one to assess the industrial hazards and their preventive measures including demographic data, occupational history, present health symptoms, past history of illness, industrial hazards and preventive measures Job stress and job satisfaction of workers were assessed using 14 and 12 three scale item standardized workers response questionnaire, respectively (Nearkasen et al, 2002). The second one was include the information from the health record of the worker in Health Insurance included pre-placement examination and periodic medical examination. Occupational injury status was the outcome variable and socio demographic, behavioral and environmental factors independent variables. The presence of sleepiness problem when the worker is at work in the factory

After editing, cleaning and coding, the data was entered to version 16 SPSS for analysis. Bivariate logistic regression analysis was employed to see association between determinants and occupational injury. Crude odds ratio with confidence intervals, Pvalues were considered as statistically significant when less than 0.05. Variables with p at <0.2 during the bivariate analysis were included in the multivariate logistic regression analysis to see the interaction effect of confounding variables.

The sample size was calculated using statistical software program for case control study design. The control group exposure to sleeping disorder (58.4 %), lack of training on health and safety (35.3%) and 5 years or less work experience (27.3%) were considered for sample size determination from previous studies (Senbeto, 1991; Abebe and Fatahun, 1999; Thoreia et al, 2004). From the above determinants, exposure of the control group to sleeping disorder problem (main exposure variable) gave the maximum sample size with assumptions of a one to two case to control ratio, a minimum detectable odds ratio of 2 and 95% the above assumptions, a total of 650 study participants (310 cases and 340 controls) were included in the study.

4 III.

5 Results

Three hundred ten cases and 340 controls were interviewed for this study and from these 62.90% of cases and 58.23% controls were male workers. The mean year of work experience for cases was 10.8 and 14.0 for controls and 91.9% of the cases and 89.1 % of controls were permanently employed in the factories.

From socio demographic determinant variables (Table 1), age group at interview, sex and work experience showed statistically significant association with occupational injury in the bivariate analysis. The rest socio demographic variables like religion, ethnicity, marital status, educational level, employment condition and monthly salary did not show significant association with occupational injury. Only sex and age remained significant in multivariate model while years with job became non-significant. Significant at, *P $<$ 0.05 **P $<$ 0.01 ***P $<$ 0.001 @ Not included for multivariate analysis COR @ : Crude odds ratio and AOR @ : Adjusted odds ratio had showed significant association with occupational injury in the bivariate analysis. However, Pan chewing [COR 1.27, 95% 0.76, 2.12] and cigarette smoking [COR 1.28, 95% CI 0.65, 2.51] did not show significant association with occupational injury. Workers who complained problems of sleeping disturbance were more likely to report about two times excess occupational injury compared with workers who did not report problem of sleeping disturbance [AOR 1.99, 95% CI 1.30, 3.04]. This study revealed that job stress was the main predictor of occupational injury. Workers who were stressed due to their job were about 2 times more likely to report occupational injury compared with workers who were not stressed due to their job [AOR 2.25,95% 1. **??**5,4.41] IV.

6 Discussion

The textile industry occupies a unique place in our country. One of the earliest to come intoexistence in India, it accounts for 14% of the total Industrial production, contributes to nearly 20% of the total exports. With rapid industrialization and mechanization in textile industries occupational health hazards are becoming more prominent. Injury in the textile industry in India are the culmination of several factors, such as human-machine incompatibility, poor methods of work, suboptimal working conditions, temporal factors, and environmental stresses. Employment structure, regulations, and the overall work scenario are peculiar, influencing the occupational health of the workers. Occupational injuries are responsible for high morbidity and mortality in India (David and Goel, 2001). Workgroups such as laborers, farmers, tradesmen, and craftsmen are at higher risk, and personal attributes of being young, males, having psychometric disorders and smoking increase the risk of injuries **??**Bhattacherjee et al., 2003). Work related exposures to longer working hours and less job involvement, unsafe work conditions, and unsafe acts all contribute to the likelihood of injuries (Ma et al., 1991;Tiwari et al., 2004) .

Studies done in developed and developing countries reported that men had a higher risk of occupational injury than women in manufacturing industries (Senbeto, 1991;Abebe and Fatahun, 1999). According to this finding male workers were about 2.5 times more likely to report occupational injury than female workers [AOR: 2.54,95% CI: **??**1.58,4.07)]. This can be explained due to the fact that high willingness of male workers to engage towards risk taking behavior than female workers (Bronson and Howard, 2003).

Most study findings at different places by different scholars reported that working at younger age increases the risk of sustaining more occupational injury among factory workers compared with older workers **??**Bhattacherjee et al, 2003;Tadesse and Kumie, 2007;Abebe and Fatahun, 1999). Similarly this study revealed that workers whose

age group below 30 years old were about 1.9 times more likely to report occupational injury than workers whose age group were 30 years and above [AOR: 1.90,95% CI: (1.22,2.94)].

Most occupational health and safety studies conducted in developing countries revealed that increased educational level have been associated with decreased work related injuries **??**Bhattacherjee et al, 2003;Smith and Mustrad, 2004; **??**ulle,1998; **??**sim et al, 2004). This is due to the fact that education is more likely to increase workers safety and health practice that can prevent them from occupational injuries (Rhys and Paul, 2005;Abebe and Fatahun, 1999). But this study and a cross sectional study done in India among small and medium scale factory workers revealed that educational level did not show any statistical significant (Tadesse and Kumie, 2007). This difference may be due to the fact that only education by itself alone cannot reduce occupational injury when the level of hazards is high and the use of reliable techniques and safe work organizations are limited (Tadesse and Kumie, 2007).

The most common accident in spinning process was hand injuries. In Alexandria, study conducted by El-Sabaawi (1978) revealed that hand injuries depended on the nature of occupation among textile workers in spinning process. The consequences of the injuries are painful and disabling because of inadequate injury management. The association of temporal factors (e.g., monthly, date, time, and shiftwise variations) with the occurrence of accidents in textile industry substantiated the observation of Hallsten (1990), whose study of 31,580 work accidents in four different industries over a period of two years, showed that accident peaks occur in morning hours across different occupational groups. The causative factors herein identified for injuries in the thread industry have been corroborated in other studies (Goldenhar et al., 2003;Sorock et al., 2004;Cordeiro, 2002). Workers with sleep disturbances, insufficient sleep and insomnia experience higher injury rates (Nakata et al., 2005). A similar study found that workers with better sleep quality have lower injury rates (Edmonds and Vinson, 2007).

Different scholars reported that sleep disturbances such as difficulty in initiating sleep, sleeping poorly at night, sleep insufficiency, and insomnia symptoms are significantly associated with the occurrence of occupational injuries (Akinori et al, 2005). This study also revealed that workers who complained problem of sleeping disturbance during work had about two times more likely to report occupational injury than workers who did not report problem of sleeping disturbance [AOR: 1.99 ,95% CI: 1.30.3.04]. Most occupational health and safety studies conducted in developing and developed countries strongly agreed with this finding (Rhys and Paul, 2005; Tadesse and Kumie, 2007). This is due to the fact that workers in thread factories were employed in three shifts with 8 working hour's interval which may disturb the sleeping pattern of workers. These sleeping disturbance problems affect the ability to maintain wakefulness, concentration, ability in assessing or watching the work environment and working conditions and performing duties safely.

This study finding indicated that workers who were stressed highly due to their job were more likely to report more than 2.5 times occupational injury compared with their counterparts [AOR: 2.25, 95% CI: **??**1.15,4.41)]. This result was supported by a case control study done among coal mining industrial workers in India [AOR: 1.83; 95% CI :(1.0, 3. Iranian car manufacturing workers reported that the risk of occupational injury among those with high job stress was significantly higher than those with low job stress [AOR: 2.00; 95% CI: (1.2, 3.3)] (Soori et al, 2008). This can explained as job stress can result in physiological and psychological alterations that may increase the likely hood of developing physical and mental problems. These conditions may increase the risk of sustaining more occupational injury among industrial workers (Li, 2001). In this researcher have limitations on measurement of environmental determinant factors like heat, lightening, moisture and noise level at working site due to lack of measuring instruments.

V.

7 Conclusion

Traumatic occupational accidents and injuries are a significant problem in industry. To conclude in from this study that being male worker, younger in age, job stress and having sleeping disturbance increases occupational injury. The implementation of safety training programmes may lead to a significant drop in occupational accidents and traumatic injuries. They are most effective among the youngest and the oldest workers and among workers with little experience, as confirmed by this study. [1] [2] [3] [4]

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Figure 1:

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Socio-demographic variables confidence interval, 85% power of the study. Based on Cases (n=310) N

	Sex	Male Female	195(62.90) 115(37.10)
	Age group	< 30 years >30 years	
	Religion	Hindu Muslim	
	Marital status@	Married Single Divorced Widowed	
	Educational level	< grade 8 G	
	Employment condition		
	Monthly salary in Rs@	>5000 Rs per month	137 (44.20)
	Work experience in years	5 years and below	144(46.45)
		6 years and above	166(53.55)

*[Note: @ not included in multivariate analysis Significant at: *P<0.05, **P<0.01, ***P<0.001 COR @ : Crude odds ratio and AOR @ : Adjusted odds ratio]*

Figure 2: Table 1 :

2

Work Environment variables		Cases (n=310)	Controls (n=340)	COR @ (95% CI)	AOR @ (95% CI)
		No (%)	No (%)		
Health and safety information access	Yes	128(41.29)	188(55.29)	1.00	1.00
	No	182(58.71)	152(44.71)	1.49(1.01,2.20)*	1.05(0.68,1.71)
Work place supervision	Yes	159(51.29)	221(65.00)	1.00	1.00
	No	151(48.71)	130(35.00)	1.58(1.07,2.35)*	1.12(0.70,1.78)
Health and safety Training	Yes	89(28.71)	155(45.59)	1.00	1.00
	No	221(71.29)	185(54.41)	2.22(1.45,3.39)***	1.85(1.18,2.91)**
Working department@	Spinning	124(40.00)	146(42.94)	1.00	
	Weaving	88(28.39)	99(29.12)	1.14(0.72,1.18)	
	Finishing	66(21.29)	63(18.53)	1.03(0.59,1.79)	
	Engineering	32(10.00)	32(.41)	1.30(0.69,1.79)	

Figure 3: Table 2 :

3

From personal protective equipment use [COR 1.77, 95% behavioral determinants (Table 3), CI 1.18, 2.64], a

95% 1.52, 3.36], job dissatisfaction [COR 1.97, 95% CI 1.09, 4.33] and job stress [COR 2.29,95% CI 1.23,4.25

Behavioral variables		Cases (n=310)	Controls (n=340)
PPE use	Yes	No (%)	No (%)
	No	112 (36.13)	168(49.41)
Alcohol use	Yes	198 (63.87)	98(28.82)
	No	115 (37.10)	172(50.52)

No Yes No Yes No Yes No Yes No Yes No **P < 0.01 ***P < 0.001 195 (62.90 224(72.26) 86(27.74) 185(59.

Figure 4: Table 3 :

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