CHAPTER II – LITERATURE REVIEW

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2.1 Review of Previous Studies Conducted in Workplace Environment

Industrialization is necessary for prosperity and at times for the survival of a nation. The production is the real wealth of a nation. The World Health Organization mentioned in the report that the most successful economies have demonstrated that workplace designed according to good design principles of occupational health safety and ergonomics are most sustainable and productive.

2.1.1 Occupational Diseases

When prevention and control measures at work fail, occupational diseases can occur. ILO report (2011) has estimated 2.02 million deaths 160 million non-fatal work-related disease annually in global industrial sector. Occupational diseases have social and economic costs for individuals and for the country as a whole due to loss of productivity. Direct financial costs include the value of lost production, lower incomes for the workers concerned, health and rehabilitation costs, and administrative and transfer costs. The costs for cancer, in particular, are exceptionally high. In addition, there are further costs due to pain and suffering for individuals and their families and communities. International Labour Office (ILO;2013) reported that in the United States, skin diseases, hearing loss and respiratory conditions were the three leading diseases among the 224,500 reported cases of non-fatal occupational illness in 2009.

The WHO estimates occupational health risks as the tenth leading cause of morbidity and mortality. In the world health report 2002, stated that occupational risk factors account for a number of morbid conditions globally, including 37% back pain, 16% hearing loss, 13% chronic obstructive lung disease, 11% asthma, 10% injuries, 9% cancer, and 2% leukemia. In Argentina 22,013 cases are reported in 2010, with noise-induced hearing loss, musculoskeletal diseases and respiratory diseases as the leading diseases (ILO report; 2013).
2.1.2 Occupational Risks in India

Legislation on occupational health and safety has existed in India for over 50 years. The principal health and safety laws are based on the British Factories Act. The concept of general awareness about occupational safety and occupational and environmental hazards were not spread forward in the society toward the poor working conditions, it resulted in the deteriorating health conditions of Indian labor (Mandel; 2009). The Factories Act, 1948 has been amended from time to time, especially after the Bhopal gas disaster, which could have been prevented. Leigh et al (1999) have estimated an annual incidence of occupational disease ranged between 924,700 to 1,902,300 and 121,000 deaths in India. Major risks associated to Indian occupations are work related accidents, pneumoconiosis, musculoskeletal injuries, chronic obstructive pulmonary diseases, pesticide poisoning, byssinosis, asbestosis, noise induced hearing loss and workplace stress (Pingle; 2012). Gupta et al (1995) recorded, a very high respiratory morbidity from a cross-sectional survey on mango plantation workers in Lucknow. This respiratory morbidity was attributed to prolonged inhalation of organic dusts during the farming operation

The aspects of health and safety in the small scale industries hardly received any attention. As a result working conditions in most of small scale industries is not satisfactory and posing a great risk to the health and safety of the personnel working in such units (Dubey; 2000). He also noted the reasons like lack of sources, knowledge and one-man management for the less attention paid towards safety and health in small scale units.

National Institute of Health and Family Welfare reported prevalence of silicosis in India was 6.2 - 34 % in mica miners, 4.1 % in manganese miners, 30.4% in lead and zinc miners, 9.3% in deep and surface coal miners, 27.2% in iron foundry workers, and 54.6% in slate-pencil workers. Prevalence of asbestosis was extended from 3% in asbestos miners to 21% in mill workers. In textile workers the bysinosis was as common as 28-47%. Agnihotram (2005)
studied the condition of adult carpet weavers in Mirzapur and reported respiratory problems as major occupational risk, the causal factors are carpet dust particles. Sing et al (1982) noted high levels of noise ranged between 86.5 and 110 dB (Leq) in forging units of north India.

2.1.3 Occupational Lung Diseases

Occupational lung diseases are caused primarily by long-term exposure to irritating or toxic agents at the workplace. Occupational lung diseases are a leading cause of lost work productivity. World Health Organization reported that occupational exposures account for about 10.3 percent of lung cancer cases worldwide. An estimated 14 % of chronic obstructive pulmonary disease (COPD) is due to occupational exposure. Many occupational lung diseases are related to a specific occupation or exposure to hazardous materials, such as asbestosis, coal workers’ pneumoconiosis (black lung), silicosis (exposure to fine sand as in ceramic workers), berylliosis, byssinosis (brown lung, exposure to raw cotton) and farmer’s lung. Workplace exposures can cause or worsen adult-onset asthma, COPD (which includes emphysema and chronic bronchitis) and lung cancer (Webber et al; 2009).

Byssinosis (brown lung disease) is a chronic condition involving obstruction of the small airways, severely harming lung function. It is caused by exposure to dusts from hemp, flax and cotton processing. As the length of exposure increases over the working years of the employee, symptoms of the chest tightness and shortness of breath occur more frequently and on workdays other than on the first day of the workweek. Medical monitoring, which includes a questionnaire and pulmonary function testing, is important for early identification of workers experiencing breathing problems that may be related to their workplace (NCDOL; 2007). Dr. Richard Schilling reported that the degree or severity of response for individuals with symptoms of byssinosis is related to the dust level at the workplace. In 1995, Jiang and Kong studied 1320 cotton workers and reported that the median of respirable
dust concentrations ranged from 0.41 to 1.51 mg/m$^3$, while the median of total dust concentrations ranged from 3.04 to 12.32 mg/m$^3$.

2.1.4 Respiratory Effects of Cotton Dust

Cotton workers are at risk for occupational lung disease, including byssinosis and chronic bronchitis. Murlidhar et al (1995) examined 273 cotton textile workers in Mumbai and reported that 54 (30%) of 179 workers in dusty sections and 16 out of 94 workers (17%) in non-dusty sections were affected. A number of epidemiological studies have shown strong association of exposure to cotton dust in the textile industry with a lung diseases called as byssinosis, which leads to decreased pulmonary function and other symptoms. The initial phase of byssinosis is characterized by acute reversible symptoms, such as wheezing, chest tightness, shortness of breath, or cough, and is typically evident on the first day back to work after an absence of 48hrs or more. Raza et al., (1999) reported that the prevalence of chest disease attributed to the exposure to cotton dust. Alemu (2007) reported the prevalence of byssinosis was 38.0%. The highest found in the carding (84.6%), drawing (72.2%) and ring frame (63.0%) sections among textile workers in Ethiopia. These early symptoms are generally accompanied by reversible changes in pulmonary function (across-shift drops in FEV$_1$). Christiani et al (2001) reported continued exposure, the disease may progress to a stage in which symptoms are present throughout the workweek and may eventually result in severe pulmonary disability.

Prevalence of respiratory symptoms significantly increased in some sections as blending & picking, spinning & carding and combing & twisting in cotton industries. These sectors had high dust concentration compared to other sections. These agree with many studies conducted in Assiut by El-Shinawi et al. (1994) who reported that respiratory symptoms increase in preparatory and spinning departments (cough 26.1%, 24.7% respectively, dyspnea 12.3%, 11.1% respectively and chest tightness 6.9%, 6.5% respectively) in Alexandria. Ahmad (1988) reported that 67.7% and 58.8% of...
workers who working in bale opening and spinning departments respectively suffer from chest symptoms. Fantahum and Abebe (1999) also reported increase in respiratory symptoms in spinning department (59.7%) in his study conducted in Ethiopia. Christiani's team (2001) has also found evidence that exposure to cotton dust can impair respiratory function in the short term. They conducted a longitudinal study of 225 newly hired textile workers in Shanghai, testing respiratory function at 3, 12, and 18 months after their start date. Beckett et al. reported statistically significant low peak expiratory flow rate was identified among 52.9 percent of workers. Among them, 42.9 percent had symptoms of cough with or without phlegm; 5.7 percent had a history of chronic bronchitis and/or asthma, and 4.3 percent experienced chest tightness or breathlessness.

Ahasan et al (2000) noted prevalence of respiratory abnormalities in the cotton workers were typical monday symptoms 9.0%; FEV\textsubscript{1} fall by $> 5\%$ after a shift 16.8%; FEV\textsubscript{1} fall by $> 10\%$ after a shift 4.2%; FEV\textsubscript{1} < 80% predicted 6.1% FEV\textsubscript{1}/FVC < 75% 4.0%; cough or phlegm 18.2%; chronic bronchitis 10.9%; and byssinosis, 1.7%. Alemu (2007) also reported the highest prevalence of respiratory symptoms (cough 77.0%, phlegm 62.0%, chest tightness 46.0% and dyspnea 62.0%) was found in the carding section among textile workers of Ethiopia. Alemu (2007) also reported strong relationship between the high prevalence of byssinosis and other respiratory impairments on exposure to cotton dust. Most of the prevalence increased with increasing age, duration of exposure, and cumulative inhalable dust exposure. Yih-Ming et al (2003) observed that significant trend existed between the cotton dust levels and the frequency of abnormal lung function. They also noted significant trend of lung function impairment in both smokers and nonsmokers in cotton dust exposures.

The frequency of respiratory symptoms and the prevalence of severe byssinosis in the second survey (14.9% and 12.6%, respectively) were significantly lower than that in the first survey (39.7% and 21.9%, respectively). The reduction of symptoms was due to remodeling of this old
cotton mill. The study conducted by Raza et al. (1999) in Lancashire textile weavers revealed that the FEV\textsubscript{1} and FVC were reduced in workers with respiratory symptoms (non-specific chest tightness, shortness of breath, persistent cough, and wheezing) as well as in preparation room workers, current and former smokers, Asians, those working with predominantly cotton fiber (> 50% cotton) and starch size. Nonspecific chest tightness was predicted by low dust concentrations and persistent cough by high dust concentrations. The FEV\textsubscript{1} and FVC were impaired in smokers and those exposed to high dust concentrations in the personal breathing zone. Tahir et al. (2012) observed majority of the workers were facing several diseases due to interaction with particulate matter (cotton dust) during working hours. Flue, cough, eye and skin infections were the most common diseases among workers caused by particulate matter of cotton dust.

2.1.5 Workplace Noise pollution

Since last one-decades extensive research work has been in progress in the field of effects of noise on the health, comfort and performance of people and also to improve workplace environment. The review of the literature indicates that noise has a series of health effects, in addition to hearing impairment. Some of these, such as sleep deprivation, are important in the context of environmental noise, but are less likely to be associated with noise in the workplace. For occupational noise, the best-characterized health outcome is hearing impairment. The first effects of exposure to excess noise are typically an increase in the threshold of hearing (threshold shift), as assessed by audiometry. This is defined as a change in hearing thresholds of an average 10 dB or more at 2000, 3000 and 4000 Hz in either ear (poorer hearing) (NIOSH, 1998).

Other consequences of workplace noise, such as annoyance, hypertension, disturbance of psychosocial well-being, and psychiatric disorders have also been described (De Hollander et al., 2004). Noise is one of the physical environmental factors affecting our health in today’s world.
Noise is generally defined as the unpleasant sounds which disturb the human being physically and physiologically and cause environmental pollution by destroying environmental properties (Melnick; 1979). Many occupational studies have suggested that individuals chronically exposed to continuous noise at levels of at least 85dB have higher blood pressure than those not exposed to noise (Zhao et al; 1991).

David (2010) reported occupational noise-induced hearing loss (ONIHL) has been a common occupational disorder for many years. David (2010) reported that basic principle in diagnosis and assessment is that there must be a “suitable and sufficient” history of noise exposure to cause the hearing loss at hand: although the audiometric notch is a sign of ONIHL, it is not pathognomonic. The history of noise exposure is elicited by taking a careful occupational history, noting “significant” noisy jobs, tasks undertaken doing jobs and noisy equipment used. From this the likely noise exposure levels experienced can be defined.

Davies (2008) recommended that hearing conservation can be done thorough noise monitoring, engineering and administrative controls, audiometric evaluation, hearing protection, education, record keeping, and programme evaluation. Questionnaire survey is important to conduct effective study on impact of workplace noise. The information collected through questionnaire survey viz. otological, occupational and environmental history is a key component of making a reasonable diagnosis of occupational hearing loss and of determining the importance of the various components. Study conducted by Atmaca1 et al (2005) observed 77 workers (30.70) have hearing loss and, according to these results, distribution of these workers with hearing problems to industries is: 37.66% in concrete traverse factory, 25.97% textile factory, 20.77% iron and steel factory, and 15.58% cement factory.

Charles and Geoffery (2004) conducted their study on impact of noise pollution on hearing capabilities of 818 workers in saw mills, corn mills and printing houses. They observed high noise level prevailing in these industries. They reported a total of 49 (10.6%) of workers in saw mills had hearing loss at
speech frequencies, 38 (77.6%) of 49 had mild hearing loss and 18.4% had moderate hearing loss. With regard to workers in the corn mills, out of total 193 workers 14.1% had hearing loss. While, only 3% of the workers from printing houses had hearing loss.

Effects of workplace noise can be easily controlled through awareness among the workers about effects of noise and providing the hearing protectors in noisy workplaces. Zohar et al. (1980) undertook a program to promote awareness of the damaging effects of noise on hearing among workers who were at risk and to increase their motivation to wear ear protection. In addition to a conventional hearing conservation lecture, workers took hearing tests before and after their work shift to demonstrate how much temporary hearing loss occurred with or without use of ear protectors. Use of the protectors minimized such loss and the audiograms of those who routinely wore protection were posted along with those who did not to show the benefits of the protection. The non-users’ audiograms showed profound permanent hearing losses which further accentuated the program’s end goals. This approach yielded a 50% increase in ear protector usage. One explanation for the relationship between noise and absenteeism is that noise contributes to detrimental physiological effects that reduce workers capacity to perform their duties (Clarke 1984). Another explanation is that an unpleasant work environment increases a psychological aversion to return to work each day (EPA 1976).

In many workplaces workers avoid use of hearing protectors with number of reasons. Some studies observed the lack of knowledge related to the issues of noise exposure. Hughson et al. (2002) stated that around two third workers had medium levels of knowledge and one third had high levels, with only 2% being judged to have low knowledge of noise exposure issues. This shows that almost all workers surveyed had at least a basic overall knowledge of noise related issues, however knowledge of certain particular aspects were reported to be lacking. For example, less than 4% of all respondents could name the 85dB level at which they should wear hearing
protection, and less than 10% knew that a sound level of 93dB was twice the level of exposure as 90dB.

The above review of literature shows that there is need to conduct study on occupational health and safety. There is a need to make people aware about workplace health management to improve workers efficiency. The results of such studies can be used to plan and manage workplace to reduce work related illness and injuries. European Agency for Safety and Health at Work (2013) reported that more research is needed to design workplace properly and work organised to meet the needs of people with chronic diseases and health condition. They also noted need to identify modifiable factors and possible interventions in order to prevent work disability and unnecessary job loss.

Many researchers claim that small enterprises have special problems with work environment because risk is higher and ability to control risk lower (Hasle and Limborg; 2006). Agnihotram (2005) suggested that there is a tremendous potentiality for large-scale epidemiological research to determine the exposure and occupational risks. The public-private partnerships are very important to success of this goal. Record occupation on various data bases of public use (ration cards, driving license etc.), surveillance of disease occurrence in industrial belts, analyzing occupation on death certificates, using record-linkage techniques between various resources may also improve the research potentiality on occupation health (Agnihotram;2005).

A longer working life is an economic and social necessity: research can contribute to this aim by developing solutions that help workers remain healthy, engaged and willing to extend their careers. Keeping people healthy and active for longer has a positive impact on productivity and competitiveness.