CHAPTER - I

INTRODUCTION

I. INTRODUCTION

Economic status of any country depends upon various factors, such as Industries, Agriculture, Natural Wealth etc. Of these industrialization is one of the most important factor in the nation's economical development. Agricultural development and other sectors of economic activities alone can't cope up with the ever increasing rate of population. Hence each and every nation is concentrating on industrialization. Although the industrialization is essential for the economic development of the nation the ill effects associated with it should not be neglected. Process of industrialization involves various occupational hazards, such as accidents and occupational diseases, which has detrimental effects on the health of workers, leading to partial or total disability. Sometimes even deaths followed by the mental and physical torture. Hence, the attention of various developing nations has now been focussed towards making the work place safer to work. Various statutory provisions have been made in labour laws of the nations of the world. On the one side there is a race among the nations of the world to attain the maximum industrial growth, whereas, on the other hand various research works are carried out to provide ways and means of making the work place safe and free from occupational health hazards.

Like other countries, India is also concentrating on industrialization. In India various kinds of industries are present, of these textile industry is one of the important and largest industry.

1. Textile Industry :

Food, clothing and shelter are the three basic needs of human being. Of these, clothing is second most important need fulfilled by textile industry. There being several millions of textile operatives throughout the world. U.S.A., Japan and India are the three largest textile producing countries in the world. India ranks third in textile production in the world.

India has an international reputation of a textile producing country. The textile industry constitutes one of the largest sector in our country, employing about 8 to 10 lakhs of workers. Most of the textile mills situated, in western region of our country especially in Mumbai and Ahmedabad, and few are also in eastern and northern region of our country. In India, the first spinning and weaving mill established in Mumbai in 1854.

The textile industry plays important role in stabilizing economy of our country as well as supplying all essential commodity for entire population. Because it gives direct employment to about 20% of all industrial labour and accounts

for about 10% of the foreign earnings. It also constitutes 20% of total industrial production.

The industry includes spinning, weaving and finishing of all kinds of fibers, that is natural fibres, artificial fibers and synthetic fibers. The machines used in this industry varies from primitive handlooms as used in cottage industry to highly expensive and intricate machines used in modern factories.

2. Powerloom Sector :

Textile industry includes spinning, weaving and finishing of all types of fibers. After the spinning of the fibers, further processing may take place either at the handloom sector or in the powerloom sector or in the mill sector. In India, handloom sector contributes about 21% of total cloth manufacture, whereas, the mill sector has the maximum contribution of about 7% of total cloth manufacture, while, the powerloom sector has the maximum contribution of about 72% of the total textile manufactured.

Powerlooms are nothing but the mechanically operated handlooms, with the help of power except for certain drives, most of the operations relating to the powerlooms are done manually.

In India powerloom sector occupies the top position in the hierarchy in the various sectors of the textile industry. It provides employment to large number of workers as compared to

textile mills and handlooms sector. There is a judicious combination of employment and productivity in powerloom sector. In mill sector productivity is more but there is limited employment due to use of highly sophisticated technology and intricate machinery. While, in handloom sector the weaving operations are carried out by the workers manually, and there is employment at the cost of efficiency. But the powerloom sector, rather efficiently bridges the gap between the primitive handlooms and the decadent mills. In powerlooms, machines used are designed to reduce the workload along with the expense. The machines used in the powerloom sector are in fact mechanically operated looms, which make the use of power, generated by electricity. In powerloom sector certain drives are operated electrically, most of the operations remain to be carried out manually.

3. Operational Details in Powerloom Sector :

Firstly from the raw cotton, cotton bales are prepared. In spinning mills different grades of yarn produced from these cotton bales. This yarn spinned around cones. These cones are used to load the bobbins with the help of reeling machine. Next, the ends of wrap threads are drawn and fully wound bobbin is incorporated in a shuttle. The powerloom is switched on, subsequently the shuttle is started with the help of a gear and

thus, the process of weaving initiates. The cloth thus produced is known as Gray cloth. Finally this gray cloth is washed, dyed, printed, called finishing. Then it is folded and packed to be sold in the market.

Powerloom is most important but unorganized part of the textile industry, and widely dispersed throughout the country. They are more concentrated in three states, such as Maharashtra, Gujarat and Tamil Nadu, and subsequently also in West Bengal, Uttar Pradesh, Andhra Pradesh, Punjab and Karnataka.

Powerloom sector has an economic importance because it is job-oriented small scale industry, employing over a crore of people. It also plays a role in foreign earning. There are about 20 lakh powerlooms in India. Maharashtra consist of 27 spinning mills and 53 composite mills (Upadhay and Pandey, 1991). Powerloom sector is widely spread in Maharashtra. It is more concentrated in Bhiwandi, Malegaon and Ichalkaranji. Of these three centres, Ichalkaranji holds a distinction of installing first powerloom in our country established in 1905.

In Kolhapur district about 80 per cent powerlooms and handlooms are working in the Ichalkaranji area (Hupare, 1979). Ichalkaranji is a small town, situated in Hatkanangale taluka of Kolhapur district. Ichalkaranji is important town, developed into

a prosperous weaving centre, so this town is popularly known as 'Manchester of Maharashtra'. In 1950, the number of looms in Ichalkaranji was 1,400, it has now reached to over 1,50,000. Ichalkaranji employs about 50,000 to 55,000 workers in textile industry. Of which about 40,000 to 42,000 are the powerloom workers. About 60 per cent of the working population of the town is directly or indirectly involved in powerloom industry. Powerloom industry in Ichalkaranji produces varieties of fabrics, which includes common varieties of Dhoties, Sarees, Lungies, Bedsheets, Towels and plain cotton cloth.

4. Health Hazards and Stresses in Powerloom Sector :

If we knock the door of any industry, we observe that the workers have to face adverse working environmental conditions. The textile industry is also not exception for this. Textile units are always in limelight because of their poor occupational environment. Occupational hazards affect the health and well being of industrial population, who spend major part of their life in such environment. According to Jon Vitek of ILO for every five minutes one of world's worker is killed and fourteen permanently disabled as a result of accidents at work or occupational diseases. In India over the last thirty years 36,000 workers have been killed and 64 million injured in accidents (Nair, 1982).

In powerloom sector during powerloom operations, the workers are constantly exposed to a number of occupational health hazards, and stresses. Occupational health hazards in powerloom sector arise mainly due to the occupational stress factors such as high concentration of cotton dust, humidity, heat, poor illumination, vibration and excessive noise.

In weaving shed during weaving process high amount of cotton dust produced, gets freely mixed in air. This dust is of respirable size, that is below 5 μm (Sawant *et al.* 2000). So that this cotton dust easily enters the respiratory tract of the workers, and causes variety of respiratory tract illness. It also produces skin complaints like irritations and damage of skin. This cotton dust is not always visible, and this is just one of the many respects in which workers need help to reduce possible danger to their health.

The powerloom workers are constantly exposed to a dangerously high level of noise. Textile industry in our country uses quiet old machineries, which produces excessive noise and workers are exposed to high level of noise (Patil, 1990). Noise produces various physiological, psychological and behavioural problems in the textile workers. Noise causes a detrimental effect on the hearing of the workers. Besides hearing impairments noise also brings about cardio-vascular

abnormalities, nervous abnormalities and mental° behavioural changes. Due to noise verbal communication among the workers is also disturbed.

Another stress factor in the powerloom is vibration, which affects joints and causes muscular strain.

Most of the powerloom operations are carried out in closed settings that are ill-illuminated. Inadequate illumination results poor co-ordination of eyes and hands with brain, and hence visual fatigue occurs (Pal and Mohan, 1990).

The powerloom generates much heat due to which, the powerloom workers are under high thermal stress. The thermal stress thus produced may manifests itself in the form of psychological as well as physiological stress and fatigue.

Particular environment is necessary for certain typical processes. During powerloom operations, in order to accomplish the weaving, it becomes necessary to maintain the continuity of the yarn. This continuity of yarn depends on the humidity in the powerloom. Thus the powerlooms are deliberately kept humid by applying steam or by sprinkling water frequently. The already existing thermal stress in the powerlooms, thus coupled with the high humidity, has an adverse effect on the health of the workers, thereby disturbing his thermoregulatory mechanism. It also

creates physiological strain and fatigue among the workers, and affect efficiency and productivity.

5. Review of Literature :

During past few years extensive studies have been made on the textile environment, and its effects on worker's health. The textile industry has been the subject of numerous research, pertaining to the work and working conditions. The working and living conditions of the textile workers are extremely poor (Narde, 1964). Various environmental hazards associated with different sections of textile units have been worked out by Pal and Mohan (1990). In textile industry occupational health problems arise mainly due to occupational stress factors, such as dust, heat, excessive workload, high level of noise and vibrations, inadequate light, sub-optimal design of machine and tools etc. (Sen Sarma, 1989). Sen *et al.* (1964) have investigated physiological responses of various categories of workers, in textile industry in relation to stress, and workload. The body's response to work and workplace environment has been reported by number of investigators. Rylander and Snella (1976b) reported an increase in the body temperature of the workers engaged in the textile industry. Sen *et al.* (1970), assessed work load and thermal stress in relation to physiological responses in

textile workers, with suitable recommendations in the interest of health and efficiency.

Enormous work is carried out on dust concentration in spinning mills, and weaving units, where the incidence of Byssinosis was also determined. The occurrence of Byssinosis in textile industry has been reported by Ghose (1956), Roach and Schilling (1960), Damodaran *et al.* (1962b), Belin *et al.* (1965), Gupta (1969), Shima (1970), Berry *et al.* (1973), Mustafa *et al.* (1978), Haglind *et al.* (1981), Parikh *et al.* (1989). The effect of cotton dust and hemp dust on respiratory functions were reported by Gandevia and Milane (1965) and, Valic and Zuskin (1971), Khare (1959) described upper and lower respiratory tract illness in textile workers. Bishop *et al.* (1986) studied pulmonary functions in rabbit and found bronchoconstriction due to inherent dust constrictor substance. EL Karim *et al.* (1987) found chest disorders and reduced FEV_1 in textile workers. Extensive work has been done on cotton dust induced chronic bronchitis. Chronic bronchitis amongst the workers engaged in the textile industry has been reported by Damodaran *et al.* (1962a), Vishwanathan (1964), Valic *et al.* (1968), Bouhuys and Gee (1974) reported that the autopsy to provide structural basis for the irreversible changes are in the lung function showed a varying degree of chronic bronchitis and emphysema. Cotton dust

produces number of serious health hazards especially respiratory disorder in textile workers have been reported by Dutta and Sharma (1978), Kamat *et al.* (1975) and Kamat (1978). Exposure to cotton dust produces Organic Dust Toxic Syndrome (ODTS) which has similar symptoms like influenza (Do Pico 1986). Exposure to the dust from cotton, flax or soft hemp may develop a characteristic feeling of chest tightness on Monday accompanied by an impairment of respiratory function. Schilling *et al.* (1955) reported chest tightness on the first day of the work week as a characteristic feature of a long term exposure to cotton dust.

Different kinds of alterations in the pulmonary function may develop after exposure to cotton dust. A well documented change is the gradual decrease, over the working day, in air way flow caused by broncho-constriction. Das *et al.* (1990) reported that the majority of the cotton workers had concurrent obstruction with restriction that is mixed respiratory impairment. Bouhuys (1974) suggested that the obstruction of peripheral air ways caused the lung function changes and the accompanying symptoms in Byssinosis. Haglind and Rylander (1984) reported a pronounced decrease in the air way flow. Beck *et al.* (1984) suggested that an air way flow limitation may persist several years after the cessation of cotton dust exposure.

The cotton dust is considered to be a complex mixture of substances including plant matter, fiber, micro-organisms, inorganic materials (soil, sand), pesticides, non-cotton plant matter, and other contaminants, and hence the exact mode of action of cotton dust is not clearly known. Noweir *et al.* (1984), and Parikh *et al.* (1987) suggested that certain compounds, are present in the cotton dust which may be responsible for local histamine release leading to acute reversible broncho-constriction. Similar reports have been made by Hitchock *et al.* (1973) and Nicholls *et al.* (1973) where they suggested that cotton dust exerts its acute effect upon the human lung via a non-antigenic release of histamine from the most cells in the lung tissues.

Among several factors involved in the cotton dust induced pathology, Gram-negative bacteria and their endotoxins are considered to play an important role. According to many reports, raw cotton and bract contain large numbers of micro-organisms, especially Gram-negative bacteria and their membrane lipopolysaccharides. Tuxford *et al.* (1986), identified number of bacterial species in air samples, cotton and humidifier water samples collected in cotton mills. They also found antibodies to some of the species in the blood sera of mill workers. Rylander *et al.* (1985) reported increase in the blood neutrophils and

platelets in cotton workers exposed to air-borne endotoxins in an experimental card-room. Rylander (1990) suggested an influx of inflammatory cells including the neutrophils into the lung tissue, and airways as a consequence of cotton dust inhalation. To overcome bad effects of overall occupational environment in textile industry an effective measures should be applied. Some management techniques to control the occupational health hazards in the textile industry have been suggested by Pal and Mohan (1990). The concentration of cotton dust in the textile mills of Chennai was evaluated by Gautam (1988). The noise level values in different sections of textile mills was reported by Neefas (1982). A perspective of environmental pollution associated with various textile processes and their remedies were suggested by Dutta (1994). The treatability of cotton textile waste by coagulation, making the use of poly-electrolytes was suggested by Shihorwala and Reddy (1989).

Few studies were also done on effect of cotton dust on animal models like guinea pig. Cockrel *et al.* (1986) studied histo-pathological changes in guinea pig exposed to cotton dust. They found cell hyperplasia and thickening of alveolar walls and changes in nasal cavities. Similar study was also made by Pratt *et al.* (1987) on guinea pig. Ellakhani *et al.* (1987) found increase in breathing frequency but decrease in breathing volume,

and hyperplasia of bronchioler epithelium. Coulombe *et al.* (1987) found marked pathological changes in lung parenchyma of guinea pig due to cotton dust exposure. Karol *et al.* (1985) found air flow obstruction in guinea pig due to cotton dust inhalation.

Recently Sawant and Kore (1994) from our laboratory studied physiological responses of textile workers in response to stress and strain in textile industry at Ichalkaranji for prevalent occupational health hazards. Patil (1990) carried out physiological studies on noise problem in textile industry. The occupational noise exposure and epidemiology of high blood pressure has been worked out by Kanbarkar (1992). Sawant and Dubal (1995a, 1995b) reported physiological responses and occupational stresses among the powerloom workers, their working conditions and health status, and found that stresses in powerloom badly affect health and efficiency of powerloom workers. Shinde (1997) studied haematological alterations in textile workers due to cotton dust inhalation, and found decreased haemoglobin percentage, increased number of PMNs, decreased FEV_1.

6. Reasons that lead to the Present Investigation :

Since many decades the effects of occupational exposure to cotton dust and other related stresses in textile industry, on the health of the workers is known. Numbers of investigators,

scientists and research personnel are engaged in finding out methods to neutralize the adverse health effects imposed on the workers, due to occupational exposure. While dealing with the hazards to health that arise at the workplace a special emphasis is given for prevention. The measures employed for the prevention may be technical or medical. The technical method includes use of different means for controlling the harmful substances and dust at their origin. The medical supervision involves detection of early stage of harmful effects of the causitive factors, in order to prevent those harmful effects. Technically it is not possible to eliminate the cotton dust completely, but if mode of action of cotton dust and other stresses in powerloom sector on the body and body's reaction to them is understood, then it becomes very easy to avoid adverse effects of them on the body.

Cotton textile environment badly affects the health of the workers. Various stresses especially cotton dust, high level of noise, heat and humidity cause adverse effects on workers health. Number of studies were done on acute and chronic symptoms that follow the exposure to the cotton dust at a high concentration, and over prolonged duration. Most of the investigators reported respiratory impairment due to cotton dust exposure. Khare (1959), Damodaran *et al.* (1962), Valic and Zuskin (1971), Dutta and Sharma (1971), Bishop *et al.* (1986), Karim *et al.* (1987).

This has lead researchers to focus their attention on the physiological aspects of the cotton dust exposure.

The present study was carried in the powerloom sector at Ichalkaranji, as it constitutes the single largest industry employing over one and half lakh of workers. Very less attention has been paid to the health status and safety of powerloom workers. The physiological responses and occupational stresses in powerloom workers have been paid little attention. The poor working and living conditions of the powerloom workers in Ichalkaranji make it a much necessary avenue for further research and improvement.

Number of studies were done on the effect of cotton dust on pulmonary organs and their functions. Still there is lacuna in evaluation of effects of cotton dust and other stresses in powerloom sector on nonpulmonary organs. It is yet a subject to be fully explored. Effects of exposure to cotton dust and other stresses in the powerloom sector on non-pulmonary organs like adrenal gland, kidney, intestine, stomach, heart remain yet to be studied.

Adrenal is called as a stress gland. Any type of physical or even mental stress can lead change in structure and functions of adrenal gland. Change in functions of adrenal gland affects the

functioning of many other organs in body such as kidney, heart, pituitary, stomach, intestine, lymphatic system, brain, reproductive system etc. Hall *et al.* (1980), Fanestil and Park (1981), Homo-Delarche (1981), Kraus-Friedmann (1984), Lenzen and Bailey (1984), Miller (1984). The stresses in powerloom sector may induce structural and physiological alterations in these organs. The present work aims at evaluating alteration, if any, as an impact of exposure to cotton dust and other stresses in powerloom sector.

The physiological responses and occupational stresses in powerloom workers have been paid little attention. For detailed study of occupational stresses and physiological alterations, our laboratory has developed an animal model (Sanandam *et al.* 2001). The present investigation was carried out on animal model rat (*R. norvegicus*) to evaluate histo-physiological and biochemical responses of workers exposed to cotton dust and other stress factors in powerloom sector to correlate changes in some non-pulmonary organs like adrenal gland, kidney, heart, stomach and intestine structure due to industrial stresses in powerloom sector. Histological picture is a mirror of physiological status, and can reflect the recovery or pathologic alterations. The present work restricts to the effects of industrial

stresses in powerloom sector at Ichalkaranji on male albino rats (*R. norvegicus*).

7. The Plan of the Proposed Work :

Keeping in view the aforementioned review and scanty information on the effects of industrial stresses on rat organs viz. adrenal, kidney, heart, stomach and duodenum, it was decided to investigate the histophysiological changes and changes in protein content in male albino rats (*R. norvegicus*). To achieve the goal following plan of work was designed.

i The different organs viz. adrenal, kidney, heart, stomach and duodenum of male albino rats (*R. norvegicus*) were selected for study.

ii. To observe the behavioural changes in rats exposed to the powerloom environment.

iii. To observe the physical changes in rat organs exposed to the powerloom environment by comparing with those of rat (control).

iv. To study the histophysiological alterations in above organs of rats exposed to the powerloom environment by comparing with histophysiological structure of the same organs in rat (control).

v. To study the alterations, if any, in the total proteins in above organs of both rat (control) and experimental rat by Lowry's method (1951).

vi. To discuss significance of effects of industrial stresses on organs of male albino rats.