

ORIGINAL ARTICLE

Health and safety aspects of textile workers from Solapur (India) textile industriesRahul B Hiremath¹, Ruth Kattumuri², Bimlesh Kumar³, Gurudevi R Hiremath⁴

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Abstract

Introduction: Textile sector in India plays an important role in the country's economy, providing employment to a significant population in rural and urban areas. **Objectives:** This paper focuses on health and safety aspects of textile workers in Solapur City (one of the key textile cluster) in the state of Maharashtra, India. **Methodology:** A sample of 180 workers from the identified textile industries of Solapur city were assessed for their general physique, muscle tone, lung condition, and eyesight using different techniques. The study aimed at developing a framework for understanding risks to textile workers resulting from lack of health and safety standards in companies. **Results:** Findings showed that most of the workers have been affected by respiratory problems, increase in muscle tone, eye problems and musculoskeletal problem. It has been also observed that job security or regular work impacts positively to the worker's long term body health. However, there is an immediate need to adopt and implement measures in accordance with Indian Factories Act (OHSAS 18001/ILO-OSH 2001) which includes directions and procedures in respect of industrial installations, work environment and occupational health and safety guidelines.

Key Words

Textile; health and safety; Policies; Solapur

Introduction

The textile sector in India plays an important role in the country's economy, providing employment to a significant population in rural and urban areas. It generates about 27% of foreign exchange for the country and is a repository of the cultural heritage of the nation. It is estimated that, this industry will generate more than 12 million new jobs with projected revenue of around US\$ 115 billion by the year 2012 [1]. The state of Maharashtra in India with an estimated investment of US\$ 224 million on various textile projects is the biggest contributor to

India's textiles market [2]. The prominent textile clusters in Maharashtra are Kolhapur, Nashik, Solapur and Thane. The present study focuses on textile clusters of Solapur city.

There is evidence from some studies in India about health risks to industry workers. Suryakar *et al* [3] carried out a study to assess exposure effects of cotton dust on oxidant and antioxidant status, which may induce, related health hazards. Another article by Agnihotram [4] provided a review of existing evidence from community based epidemiological studies and addressed the growing need for

evidence-based occupational health research in India. Knutsson [5] focuses on major disease related to shift work such as sleep disorders and risk of accidents. The effects of shift work on physiological function through disruption of circadian rhythms are well described. Knutsson [5] also provides a model to summarize possible mechanisms of disease in shift workers. Metgud *et al* [6] conducted an observational cross-sectional study on a sample of 100 women workers with respect to their cardio-respiratory and musculo-skeletal profile before, during and at the end of work, Sant *et al* [7] have studied the adverse effect of smoke/flue on lung functions of glass factory workers of Firozabad district. Müezzino [8], Spiro and Stigliani [9] and Hendrickson *et al* [10] have reported the adverse health impacts of textile effluents.

The textiles sector contains many hazards and risks to workers, ranging from exposure to noise and dangerous substances, to manual handling and working with dangerous machinery.

Aims & Objectives

To develop a framework for understanding the risks textile workers were exposed to due to lack of health and safety standards in the industry.

Material and Methods

During the field survey, semi-structured interviews of unit owners and workers in various textile clusters were conducted with the help of a checklist. The various steps involved in the process of each textile such as raw materials used, the environmental scenario due to usage of raw materials, review of existing CETP units (Centralized Effluent Treatment Plant recently established) and present health status of workers and their working conditions were analyzed. The study covered both small scale and medium scale units. At the first stage out of 29 textile units from the city a total of 6 textile mills were selected by random sampling technique from all six textiles. This is approximately 21% of the entire population. Survey has been done during December 2010 to December 2011. In the second stage, workers were selected from these textile mills. For the selection purpose of respondents a complete list of permanent workers between the age of 20 to 55 which having the minimum 3 years work experience were proportionally selected from all the 6 textile mills. A sample of 180 workers (consented to be interviewed) from textile industries participated and they were assessed on various measurements. The

monitoring equipment's and parameters for measuring occupational health status are detailed below:

Weight and Height: The body mass index (BMI) is a heuristic proxy for human body fat based on an individual's weight and height. The BMI is dependent on patterns of food consumption, associated living and working conditions, the nature and duration of physical work [11].

Hand Grip Meter: The test measures the maximum isometric strength of the hand and forearm muscles. This test is often used as a general test of strength. Strength also depends upon various activities like daily food intake, working hours, and pattern of work [12].

Peak Flow Meter: A peak flow meter is a portable, inexpensive, hand-held device used to measure how air flows from the lungs in one "fast blast" [13]. The peak flow measurement of 350 l/min is considered to be normal for adults, while 200 l/min indicates a condition of chronic bronchitis and, therefore, significant lung damage.

Eye testing: The Snellen chart is used by eye care professionals and others to measure visual acuity. There are several lines of block letters printed on the chart. The first line consists of very large letters or symbols, and subsequent rows have increasing letters or symbols decreasing in size. If the smallest row can be read accurately, it indicates that the person has good eyesight [14].

Results

Health and Safety Indicators: In the industries that were surveyed, the team was able to interview and measure the selected health parameters of 180 workers. To aid comparison of the occupational health status, these workers were divided into two categories depending on the number of years of engagement in the current unit: 124 of them had been with the units for up to 5 years, while 56 had worked for more than 5 years. The following [Table 1](#) shows the no. of workers engaged in various processes in our sample.

Body Mass Index (BMI): The BMI of the workers [Table 2](#) indicates that those remaining in the same unit for longer durations had better health. In other words, regular work benefits the workers, while also reflecting the sound health of the industry workers. For the improvement of the body mass index, our findings suggest that regular work with job security

over time and incomes that enable the workers to sustain them and their families.

Pulmonary Function Test (PFT) and Pulmonary Health: The measurement of the PFT gives rise to much concern [Table 3]. In other words, all the workers are being exposed to vapours, gases, fibers, and particles in a work atmosphere that is not conducive for pulmonary health.

The precautions to be taken in such situations are to (a) use pigments and cleaning agents that do not emit vapours known to be injurious; (b) install exhaust systems which ensure proper ventilation in the sheds and a regular supply of fresh air; (c) periodic medical check-ups of all workers to identify the early signs of pulmonary distress; and (d) rotation of jobs so that exposed workers are able to reduce the duration and intensity of their exposure.

Hand Grip Meter (HGM) and Muscle Tone: The result from the Table 4 shows poorer health for the workers in the HGM test. The results of the test indicated that there was a decline in muscle tone.

The safety measures comprise (a) regular rest periods to avoid muscle fatigue; (b) better designs of grips for the blocks and screens; (c) design of suitable places and registration guides; and (d) table heights that enable pressure to be applied directly on to the blocks. These measures would also improve productivity

Eye Strain and Eyesight: Apart from the effects of work on the body, the lungs, and muscle tone, the repetitive work and the continuous visual attention to detail also seems to have an impact on the eyes of the workers [Table 5].

Normal eyesight, Hypermetropia (long-sightedness), and myopia (short-sightedness) could be estimated through eye testing using the Snellen chart. In addition, a few of the workers also reported symptoms of watering, cataract, strains and swelling in the eyes in both categories. Our observations at the work place suggest that there is a lack of uniform and adequate lighting in most of the sheds. Proper illumination and regular breaks from work will enable the eye muscles to avoid fatigue and redesign of the working tables to enable work to be done within the normal eye range would offer further relief to the workers as well as improve the quality of the work.

Muscular Pains and Body Pains: Additionally, many of the workers also reported muscular pains in the back, at the joints and the lower abdomen [Table 6].

Results revealed that there were some complaints of pain in the chest and the right arm and shoulder. These complaints are clearly related to the nature of work. Regular rest periods are recommended through this report.

Some findings of the study: This baseline study, tried to examine the implicit linkages between working in the textile industry and its impact on the health of the workers. This analysis is based on a pilot study and requires more detailed observation of a larger sample with experimentation at specific pilot locations. Some key findings from the pilot study are:

- It was observed that the general body health improved for the workers in all sampled textile industries as they worked for more years, indicating that regular work is beneficial for workers in the long run.
- All the workers who participated in the survey where exposed to significantly high levels of air pollution as only one-tenth seem to have normal lung functions. About 60% workers have reported Asthamatic tendency, whereas, 25% workers have shown symptoms of Chronic Bronchitis. It was noticed that the incidence of chronic distress increases with the number of years worked.
- In the surveyed textile industries among the weavers, it was observed that the muscle tone of those workers engaged in repetitive laborious work declines with increasing number of working years.
- The eyesight of most workers are deteriorating over time in all locations, and a comparison among the workers shows that it is declining more rapidly for those engaged in certain tasks requiring immense and constant attention to detail.
- Interviews with workers yield a range of complaints regarding body aches, sores cuts, burns and calluses, lung and eye problems, deafness, fatigue and sleeplessness, and stomach problems. About 73% of workers have complained of muscular and body pain.
- However, some of the problems are made worse by workers' habits of smoking, chewing tobacco, drinking alcohol, and taking intoxicating materials.

Discussion

Study covered the sample survey of 180 textile workers of selected textile industries in Solapur city,

and the results showed that most of workers have been impacted by the unhealthy and non-safety working conditions which resulted in to 85 % workers affected by respiratory problems, 70 % have reported increase in muscle tone, 48% complained of eye problems and 73 % have been found affected by musculoskeletal problem. Hence, there is an immediate need to adopt and implement measures in accordance with Indian Factories Act (OHSAS 18001/ILO-OSH 2001) which includes directions and procedures in respect of industrial installations, work environment and occupational health and safety guidelines. Learning from it, authors strongly emphasize the need of policies for successful implementation of health safety programme. This will address key factors like well-being of workers, the development of policy and objectives related to hazard identification, emergency standards, and workers' participation in safety management, risk assessment and risk control. Such initiative will ensure commitment of the top management towards healthy and safe working practices. In Solapur, the technology used in power loom industry is old. The central government is running Technology up-gradation Fund (TUF) Scheme for the modernization of the power loom industry. As most of the weavers are unaware about the scheme, there is a need to make weavers aware about the same. Introduction of mandatory group health insurance to the affected parties could act as an important incentive towards improvement of health and safety standards in the plant. Subsidies from stakeholders to small units for adopting such initiative will serve as a motivation towards the proper functioning of the plants.

Conclusion

To summaries, authors' feel the possible solution for the mitigating the problem would be regular work with regular wages to the workers, use of non-toxic materials and processes, improved ventilation and lighting, regular medical check-ups, adequate rest periods, and job rotation.

Recommendation

Through this research work it is primarily hoped to enrich the lives of the textile workers and people in the district. It is also envisaged that the success of these pilots will effectively demonstrate the viability of health and safety issues. Finally, it is expected that the success of these projects will lead to scaling up of such initiatives to the state and national level

under both commercial and CSR agendas. The results acquired can be disseminated through information and technology transfer to the nearby rural areas by setting up Innovation Centers and Centers of Excellence at the institution level. Funding and policy support is necessary for the success of such projects which can play a key role in improving the quality of life of the textile workers in the coming decades and contribute to sustainable and equitable development at state and national level.

Authors Contribution

RH, RK and BK: designed the objectives, methodology and interpreted the survey. RH and GH: did the survey work. All authors have equally contributed in writing the paper.

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Tables

TABLE 1 PROCESSES AND NUMBER OF WORKERS

| Textile Processes | Number of workers | | | | |
|-------------------|-------------------|-----------|-----------|-----------|------------|
| | Male | | Female | | Total |
| | A | B | A | B | |
| Fiber Formation | 4 | 8 | 3 | 5 | 20 |
| Spinning | 5 | 12 | 4 | 7 | 28 |
| Weaving | 5 | 13 | 5 | 7 | 30 |
| Knitting | 6 | 13 | 5 | 8 | 32 |
| Bleaching | 4 | 10 | 4 | 6 | 24 |
| Dyeing | 3 | 8 | 3 | 4 | 18 |
| Printing | 3 | 6 | 3 | 4 | 16 |
| Finishing | 2 | 5 | 2 | 3 | 12 |
| Total | 32 | 75 | 29 | 44 | 180 |

TABLE 2 BODY MASS INDEX OF WORKERS

| Category of workers | Years worked in present unit | Number of workers | Body Mass Index (BMI) | | |
|---------------------|------------------------------|-------------------|-----------------------|--------|-------------|
| | | | Under Weight | Normal | Over weight |
| Fiber Formation | 0-5 | 14 | 6 | 7 | 1 |
| | >5 | 6 | 1 | 5 | 0 |
| Spinning | 0-5 | 18 | 7 | 11 | 0 |
| | >5 | 10 | 2 | 8 | 0 |
| Weaving | 0-5 | 22 | 8 | 14 | 0 |
| | >5 | 08 | 1 | 7 | 0 |
| Knitting | 0-5 | 24 | 5 | 18 | 1 |
| | >5 | 08 | 00 | 08 | 0 |
| Bleaching | 0-5 | 18 | 01 | 17 | 0 |
| | >5 | 06 | 00 | 06 | 0 |
| Dyeing | 0-5 | 16 | 02 | 14 | 0 |
| | >5 | 02 | 00 | 02 | 0 |
| Printing | 0-5 | 16 | 02 | 14 | 0 |
| | >5 | 00 | 00 | 00 | 0 |
| Finishing | 0-5 | 12 | 03 | 09 | 0 |
| | >5 | 00 | 00 | 00 | 0 |

TABLE 3 PULMONARY FUNCTION TEST OF WORKERS

| Category of workers | Years worked in present unit | Number of workers | Pulmonary Function Test | | |
|---------------------|------------------------------|-------------------|-------------------------|--------------------|--------------------|
| | | | Normal | Asthmatic Tendency | Chronic Bronchitis |
| Fiber Formation | 0-5 | 14 | 3 | 6 | 5 |
| | >5 | 6 | 1 | 4 | 1 |
| Spinning | 0-5 | 18 | 2 | 12 | 4 |
| | >5 | 10 | 1 | 5 | 4 |
| Weaving | 0-5 | 22 | 4 | 12 | 6 |
| | >5 | 08 | 1 | 5 | 2 |
| Knitting | 0-5 | 24 | 2 | 18 | 4 |
| | >5 | 08 | 1 | 3 | 5 |
| Bleaching | 0-5 | 18 | 3 | 11 | 4 |
| | >5 | 06 | 1 | 5 | 00 |
| Dyeing | 0-5 | 16 | 3 | 10 | 3 |
| | >5 | 02 | 00 | 1 | 1 |
| Printing | 0-5 | 16 | 2 | 10 | 4 |
| | >5 | 0 | 0 | 0 | 0 |
| Finishing | 0-5 | 12 | 3 | 7 | 2 |
| | >5 | 0 | 0 | 0 | 0 |

TABLE 4 HAND GRIP METER TEST OF WORKERS

| Category of workers | Years worked in present unit | Number of workers | Hand Grip Meter | | | | | |
|---------------------|------------------------------|-------------------|-----------------|------|--------|------|--------------|------|
| | | | Above normal | | Normal | | Below normal | |
| | | | Right | Left | Right | Left | Right | Left |
| Fiber Formation | 0-5 | 14 | 1 | 1 | 0 | 2 | 7 | 3 |
| | >5 | 6 | 0 | 0 | 0 | 0 | 4 | 2 |
| Spinning | 0-5 | 18 | 4 | 3 | 0 | 2 | 11 | 10 |
| | >5 | 10 | 0 | 2 | 1 | 1 | 4 | 2 |
| Weaving | 0-5 | 22 | 0 | 0 | 2 | 1 | 12 | 7 |
| | >5 | 08 | 1 | 1 | 1 | 1 | 4 | 0 |
| Knitting | 0-5 | 24 | 3 | 0 | 2 | 2 | 10 | 7 |
| | >5 | 08 | 0 | 0 | 2 | 2 | 2 | 2 |
| Bleaching | 0-5 | 18 | 1 | 1 | 2 | 3 | 7 | 4 |
| | >5 | 06 | 0 | 0 | 0 | 0 | 5 | 1 |
| Dyeing | 0-5 | 16 | 2 | 1 | 3 | 2 | 5 | 3 |
| | >5 | 02 | 0 | 0 | 1 | 0 | 1 | 0 |
| Printing | 0-5 | 16 | 2 | 1 | 2 | 1 | 7 | 3 |
| | >5 | 00 | 0 | 0 | 0 | 0 | 0 | 0 |
| Finishing | 0-5 | 12 | 3 | 1 | 1 | 1 | 4 | 2 |
| | >5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

TABLE 5 EYE PROBLEMS REPORTED BY WORKERS

| Category of workers | Years worked in present unit | Number of workers | Eye problems | | | | | | | | |
|---------------------|------------------------------|-------------------|--------------|---|---|---|---|---|----|---|----|
| | | | H | M | W | S | C | E | St | N | |
| Fiber Formation | 0-5 | 14 | 3 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 6 |
| | >5 | 6 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Spinning | 0-5 | 18 | 1 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 13 |
| | >5 | 10 | 2 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 3 |
| Weaving | 0-5 | 22 | 3 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 13 |
| | >5 | 08 | 2 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 1 |
| Knitting | 0-5 | 24 | 5 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 15 |
| | >5 | 08 | 2 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 1 |
| Bleaching | 0-5 | 18 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | >5 | 06 | 1 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 1 |
| Dyeing | 0-5 | 16 | 2 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 8 |
| | >5 | 02 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Printing | 0-5 | 16 | 2 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 8 |
| | >5 | 00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Finishing | 0-5 | 12 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| | >5 | 00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

TABLE 6 PAINS REPORTED BY WORKERS

| Category of workers | Years worked in present unit | Number of workers | Pains | | | | | | | | | | |
|---------------------|------------------------------|-------------------|-------|---|---|---|----|---|----|----|---|---|---|
| | | | B | J | K | E | LA | C | RS | RA | L | H | |
| Fiber Formation | 0-5 | 14 | 3 | 2 | 0 | 0 | 2 | 1 | 1 | 1 | 1 | 0 | 0 |
| | >5 | 6 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Spinning | 0-5 | 18 | 4 | 3 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| | >5 | 10 | 2 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| Weaving | 0-5 | 22 | 4 | 4 | 3 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| | >5 | 08 | 2 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Knitting | 0-5 | 24 | 6 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| | >5 | 08 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Bleaching | 0-5 | 18 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| | >5 | 06 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Dyeing | 0-5 | 16 | 3 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 |
| | >5 | 02 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Printing | 0-5 | 16 | 3 | 3 | 1 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 2 |
| | >5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Finishing | 0-5 | 12 | 3 | 2 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| | >5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |