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Research Article

Healthy Workplace Healthy Workers: Balance for Productivity Enhancement – A Case Study of Garment Manufacturing Units in North India

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Abstract

The textile and garment industry in India contributes 14% to industrial production, 5% to GDP and 11% to the country's export earnings. It provides employment for over 45 million people at various skill levels. The garment manufacturing industry of North India has established itself as a majorapparel sourcing destination for the global markets.

The hypothetical projection is that work conditions are usually unsafe and unhealthy.The workstations in the well established industries tend to be poorly designed with uncomfortable work tables and chairs,lack of ventilation, inappropriate lighting, and excessive noise. This kind of a poor working environment impacts adversely on the performance of the workers over long durations. Consequently it reduces the productivity of themanufacturing units.

Focus

The focus of this paper is to conduct an environmental audit in several sections of the garment industry to ascertain how favourable is the working environment of the workers. Environmental parameters like noise level, illumination and temperaturewere calibrated on instruments like sound level meter, luxmeter and hand held thermometer. The readings were subsequently compared against OSHA(Occupational Safety and Health Administration) standards.

Method

The review of literature and interactions with the industry experts was the method of enquiry adopted to collect data on the work environment in a majority of the garment manufacturing industries.

Findings

The research findings showed that the workstations were consistently having congestedwork areas, poor illumination, high temperatures and inadequate ventilation.

Scope

The scope of this study is to suggest appropriate intervention strategies to improve health, safety and comfort levels of the workers in the garment manufacturing units in various parts of North India in general and Punjab in Particular.

Keywords: Work environment, Garment manufacturing industry, Ergonomics, Temperature, Illumination, Noise level, Healthproblems.

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Introduction

A healthy motivated workforce is a singular factor enhancing the productivity and economic prosperity of any garment manufacturing unit. Workers are most involved in their work processes and job specifications and are often eager to seek rewards for their productive efforts. These expectations are enhanced through improved working conditions and a safe work environment. In the current scenario the expansion of the scale of operations along with the aging of mechanical installations and the rapid paced newer, complicated and hazardous technologies has resulted in raising the health risks several times over. This has made it imperative to address the rising safety requirements for workers in such units.

These work environment oriented hazards result in high rates of accidents, occurrence and prevalence of occupational diseases and unhealthy work conditions that are largely based on elements of lightening, noise, temperature, humidity and chemicals that are hazardous. These are significant parameters that have lasting impact due to the consistent human exposure. These parameters impact directly or indirectly on the production and quality attainment levels. This is especially so as they are dependant on the actual physiological functioning capacity of any human being spending long hours in such environments.

It is therefore, essential that all garment manufacturing premises ensure that the requisite environmental parameters are ergonomically proven to be conducive to a prolonged duration, repetitive action work process. It has currently become all the more relevant and important to provide a comfortable and sustainable environment alongwith the assurance of an overall prolonged worker comfort ethic whenever the job, the equipment and the work environment are being planned for and engineered. The ergonomics of such environments are largely based on human anthropometric measurements and tolerance levels.

Occupational Hazards

An environmental hazard can be taken to be any circumstance or situation which has the potential to threaten or pollute the surrounding natural environment as well as the work that adversely affect the worker's health. Observations of the status of workers in most manufacturing units have shown them as facing countless environmental and occupational hazards every day. Such hazards fall in four categories:

(i) Physical Exposure Hazards: As the worker is in an environment for long durations of time the properties of temperature, light dust saturation, etc, take their toll on his or her physical well-being.

(ii) Chemical Exposure Hazards: Several processes in the garment manufacturing line pertain to the use of chemicals. The dyes used on fabrics, the chemicals used in the washing and cleaning of garments all have chemicals that may have a number of hazardous outcomes for the workers handling these garments.

(iii) Biological Exposure Hazards: The biological systems of the workers are compromised due to prolonged exposure to fumes, fibre dust, noise above tolerance levels and setting or standing in fixed positions doing repetitive actions.

(iv) Physiological Exposure Hazards: Breathing in fibres, being in contact with high speed machines working heating appliances and straining in poor light all translate into severe physical problems.

Figure 1: Cutting Section Unit – 1

Figure 1: Cutting Section Unit – 2

The garment industry in India caters to both the domestic and the export markets. It is among the earliest industries to come into existence. Currently the garment manufacturing industry has 27000 domestic manufacturers and 48000 fabricators and 1000 manufacturer – exporters.The garment industry comprises several functional divisions that start from purchase of fabric and its checking to cutting, sewing, ironing, finishing and packaging ending after due defect detection at all stages. A conducive work environment in the garment manufacturing industry plays a vital role in the productivity enhancement as well as ensures the well-being of the sustained health of the workers. Lighting, noise and temperature are significant parameters to which employees are recurrently exposed in the garmentmanufacturing units. They greatly influence the health, comfort and performanceof the workers.

Figure 3: Sewing Section Unit – 1

Figure 4: Sewing Section Unit – 2

Observations in the garment manufacturing units have brought up environmental causative factors and operational guidelines which, when ignored,can result in episodes of eye strain, headache, dizziness, heat stress, heat cramps,heat burns, heat exhaustion, heat stroke and other such ill-health manifestations among the workers. As a result of employee absenteeism, the turn-over and performance levels impact adversely upon the garment manufacturing unit. The author has examined two garment manufacturing industrial units of North India for assessing how conducive they are to worker comfort and satisfaction levels.

Figure 5: Finishing Section Unit – 1

Figure 6: Finishing Section Unit – 2

Literature Review

Scholarly inputs on the subject have been reviewed to gain insights on the garment manufacturing units from the perspective of human tolerance over sustained periods.

According to Bridger (2003), ergonomics is concerned with making the workplace efficient, safe and comfortable. Parsons (2000) had conducted a study of the principles, methods and models used in environmental ergonomics to understand the impact of hot and cold temperatures, vibrations, noise and light on the health, comfort and performance of people. Sarder, Sheik and Mandahaw (2006) conducted a study on export garment manufacturing plant in South East Asia to evaluate poor working conditions and their impact on garment unit workers.

Calvin and Joseph (2006) had studied occupation related accidents occurring in the garment industry in Bangalore while Parimalam, Kamalamma and Ganguli (2006) had suggested ergonomic interventions for improving upon the work of environment of the garment manufacturing units. Padmini et al. (2012), found the work environment in garment industries of Tirupur to be unhealthy and unsafe for the workers who were exposed to dust, chemicals in the form of solvents, work stations that were non-ergonomic besides psycho-social problems etc. Mehta (2012) identified major health risk factors experienced in the garment manufacturing units of Jaipur, Rajasthan.

Methodology

This study was an attempt to conduct an environmental audit on a limited scale in two garment manufacturing industries (100% EOU) in North India. The entire garment manufacturing units'work processes were mapped. About 80% of the total work force in the garment

manufacturing unitswas housed in the cutting, sewing and finishing sections. Environment work parameters like temperature, illumination and noise levels were measured using a handheld thermometer, a lux meter and a sound level meter respectively. Meticulous recording of measurements was done in the morning, afternoon and evening for over 2 hours duration between each. The points identified for conducting the measurements were earmarked as being near the window (partly natural daylight),center of the seating or work space area where mostly artificial lighting was being used and the third point of measurement was the farthest from the window (completely artificial lighting). The datacollected was compiled, tabulated and then analyzed comparatively. The Occupational Health and Safety (OSHA) standards were the foundation for comparison. Once the measurement were compared to the actual situation in the garment manufacturing unit than the requisite interventions were suggested for improving the work place ergonomics of such places in general and the two units being studied in particular.

Results and Discussion

The measurements obtained in the two garment manufacturing units as well as the observations were collated and tabulated to be analyzed for understanding the environmental health status prevalent in the units. The results have been tabulated work section wise that is in the cutting section, the sewing section and the finishing section. The details of the work environment parameters in the cutting section the sewing section and the finishing section are presented in tabular and graphical form. The temperature, illumination and noise levels were tabulated at different timesduring each week and have been recorded for analysis. After statistical and quantitative as well as qualitative analysis the findings are presented in the following paras.

Table 1 shows the standards set by OSHA for tolerance levels of temperature illumination and noise held acceptable and permissible. These standards are similar for all parts of the premises as also various sections. Only in the finishing section are the temperatures slightly higher.

Table 1: Standards Set by OSHA in various Departments

Sr. No.	Parameters	Cutting	Sewing	Finishing
1	Temperature (^{0}C)	25	25	26.5
2	Illumination (lux)	500-1000	500-1000	500-1000
3	Noise (dBA)	100	100	100

Source; Author Field work

For purposes of anonymity the actual names of the garment manufacturing units are being kept confidential and instead they are being designated as Unit 1& 2 to identify the two different work environments. The study results have been shared individually with both the Units and they have also been informed of the suggested measures for improvement.

Table 2: Weekly Observations in Cutting Department with OSHA Standard in Unit 2

Sr. No.	Cutting Department	Week 1 Mean	Week 2 Mean	Week 3 Mean	Week 4 Mean	Week 5 Mean	Week 6 Mean	Mean	OSHA Standards
1	Temperature (^{0}C)	31.59	30.84	31.57	32.33	32.4	31.9	31.77	25
2	Illumination (lux)	561.47	578.31	554.56	575.58	574.5	615.4	576.63	500-1000
3	Noise (dBA)	82.01	80.94	80.96	81.53	82	81.2	81.44	100

Source; Author Field work

Table 2 shows the weekly observations of the three significant environmental factors of temperature, illumination or lighting and in noise various parts of the workplace. The findings were compared on a weekly basis and their mean was derived at. This Mean value was then compared against the OSHA standards. It was observed that the values for temperature were much higher than acceptable as was the illumination. The noise level, however, was low.

Table 3: Weekly Observations in the Sewing Section Compared with OSHA Standard in Unit 2

Sr. No.	Cutting Department	Week 1 Mean	Week 2 Mean	Week 3 Mean	Week 4 Mean	Week 5 Mean	Week 6 Mean	Mean	OSHA Standards
1	Temperature (^{0}C)	31.5	31.9	31.8	31.8	32.7	31.9	31.93	25
2	Illumination (lux)	598.5	620.8	596	614.5	624.9	617	611.95	500-1000
3	Noise (dBA)	119	117.6	120.6	119.6	119.7	120.4	119.48	100

Source; Author Field work

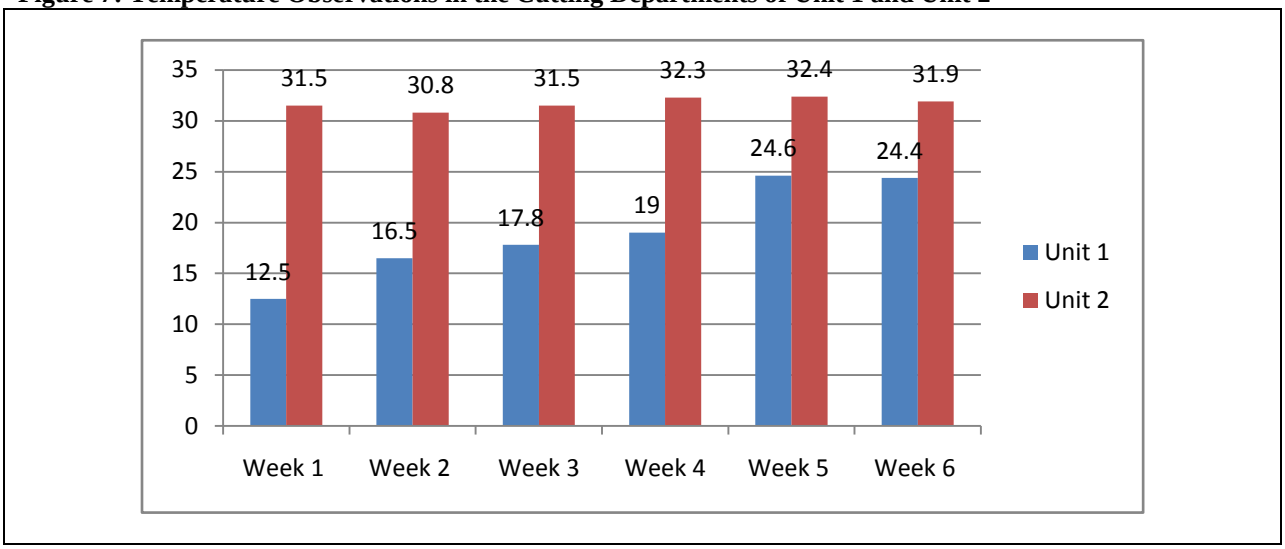
The observations in the Sewing section were observed every week at varied timings and the results were combined to obtain the mean value for all the three parameters of temperature, illumination and noise. The mean values obtained were then compared with the OSHA standards. It was striking to observe that the existent environment values were much higher than the stipulated tolerance levels. The temperature should have been 25^{0}C but was consistently observed to be around 31.93 ^{0}C. The lighting was to have been 500-100 lux and seemed to have been borderline as it was 61.95. The noise levels were higher than the level of tolerance at 119.48 decibels.

Sr. No.	Finishing Department	Week 1 Mean	Week 2 Mean	Week 3 Mean	Week 4 Mean	Week 5 Mean	Week 6 Mean	Mean	OSHA Standards
1	Temperature (˚C)	32.3	32.2	32.2	31.8	33.2	32.3	32.33	26.5
2	Illumination (lux)	347.6	350.5	344.6	353.5	348.3	359.8	350.71	250-500
3	Noise (dBA)	67.2	65.3	64.7	67	66.7	65.2	66.01	100

Table 4: Weekly Observations in the Finishing Department as Compared to OSHA Standard in Unit 2
Source; Author Field work

The observations in the Finishing Section of Unit 2 showed that while the lightning and noise levels were within permissible limits when compared to OSHA the temperature limits were much higher than the stipulated tolerance levels.

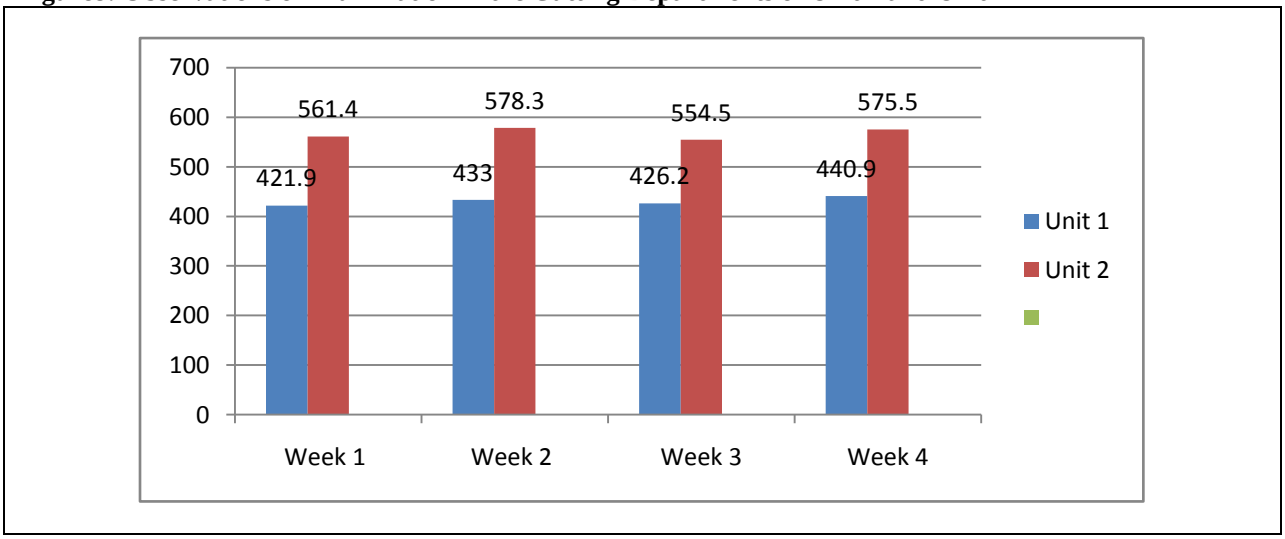
Figure 7: Temperature Observations in the Cutting Departments of Unit 1 and Unit 2



Source : Authors Field Work

A comparison of the temperature observations across the six weeks duration in Unit – 1 and Unit – 2 in their cutting departments have been depicted in Figure -1. It was observed in Unit 2 that consistently higher values were reported as compared to Unit – 1. It was significant that the higher values observed in Unit – 2, when compared to the OSHA standards were also consistently higher and above the levels of human tolerance. Unit – 1 was, however, well within the OSHA standard limits with the highest temperature reading being at 24.4 ^{0}C while the highest temperature reading recorded in Unit – 1 was 32.4 ^{0}C.

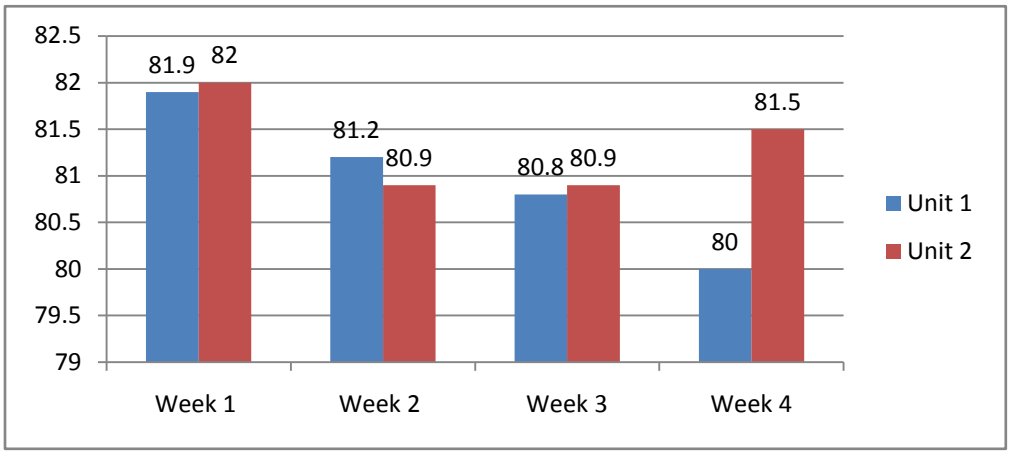
Figure8: Observations on illumination in the Cutting Departments of Unit 1 and Unit 2



Source : Authors Field Work

The results of both Unit 1&Unit 2 have been depicted in Figure – 8 where observations on the Illumination in the cutting department of both units have been depicted. It was significant to note that Unit 1 exhibited successively low levels of illumination that were very much below the stipulated OSHA standard values.

Figure 9: Observations of Noise levels in Cutting Departments of Unit 2



Source : Authors Field Work

The observations shown in Figure 3 are on the Noise levels recorded in both units in their respective cutting department. While the observations in the first three weeks were almost similar for both Unit 1 and Unit 2 there was a significant difference observed in Week 4.

Observations depicted in Table 1 and 2 as well as the Figures 1 and 2 show that the temperature observations in the sewing department were higher in Unit 2 as compared to Unit 1 and the highest reading was in week 5 which is 32.7 ℃ and 26.9 ℃in Week 6 which was more than the determined OSHA Standards for work place human tolerance that is 25˚C. illuminationin the sewing department was well within limits that is between 500-1000 lux which was observed to be well within human tolerance levels. Thenoise levelshowever, was seen to be more than 100 dBA with the highest being recorded in week 4 at 121 dBA.

The Tables and bar graphs show that the temperatures in the finishing departments was observed to be much higher in Unit -2 where the highest reading was in week 5 that is 33.2 ℃ and 27.4 ℃ in Week 6. Both temperatures were recorded to be more than the OSHA Standards that is 25℃. The illumination values in the finishing departments were observed to be in the limits between 500-1000 lux and the noise level was also observed to within limits that is under 100 dBA.

The results accumulated have been tabulated, analysed and discussed in the following paras.

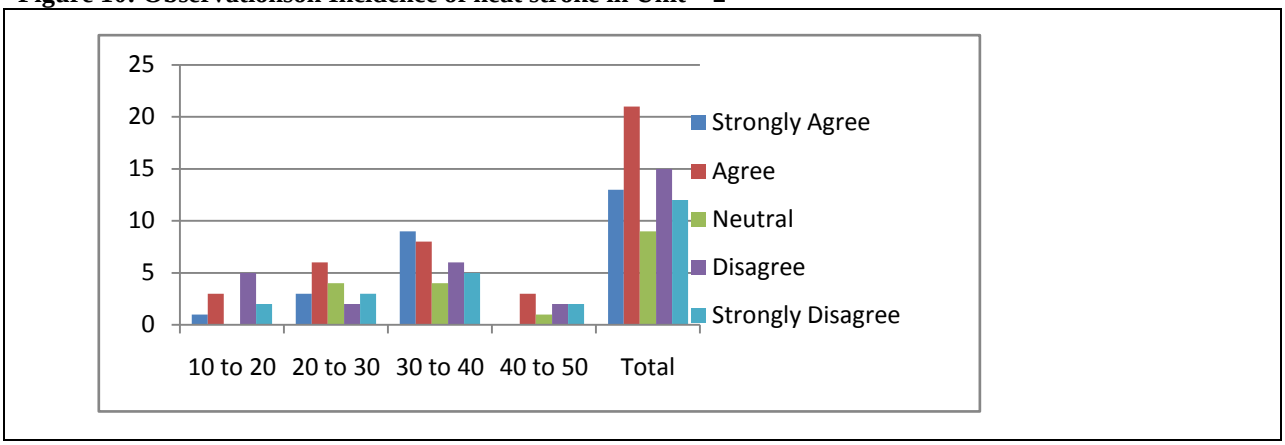
Table 5: Data Collection on Heat Stroke in Unit 1

Sr. No.	**Heat Stroke**					
	Response	**10 to 20**	**20 to 30**	**30 to 40**	**40 to 50**	**Total**
1	Strongly Agree	1	3	9	0	13
2	Agree	3	6	8	3	21
3	Neutral	0	4	4	1	9
4	Disagree	5	2	6	2	15
5	Strongly Disagree	2	3	5	2	12

Source : Authors Field Work

The workers were posed queries on the possibility of having heat stroke due to the factory work environment. The responses of the workers were taken on a Likert Scale. The results of only Unit -2 are being presented in Table 5. Results on the incidence of heat stroke among workers of Unit 2 have been depicted in Figure 10

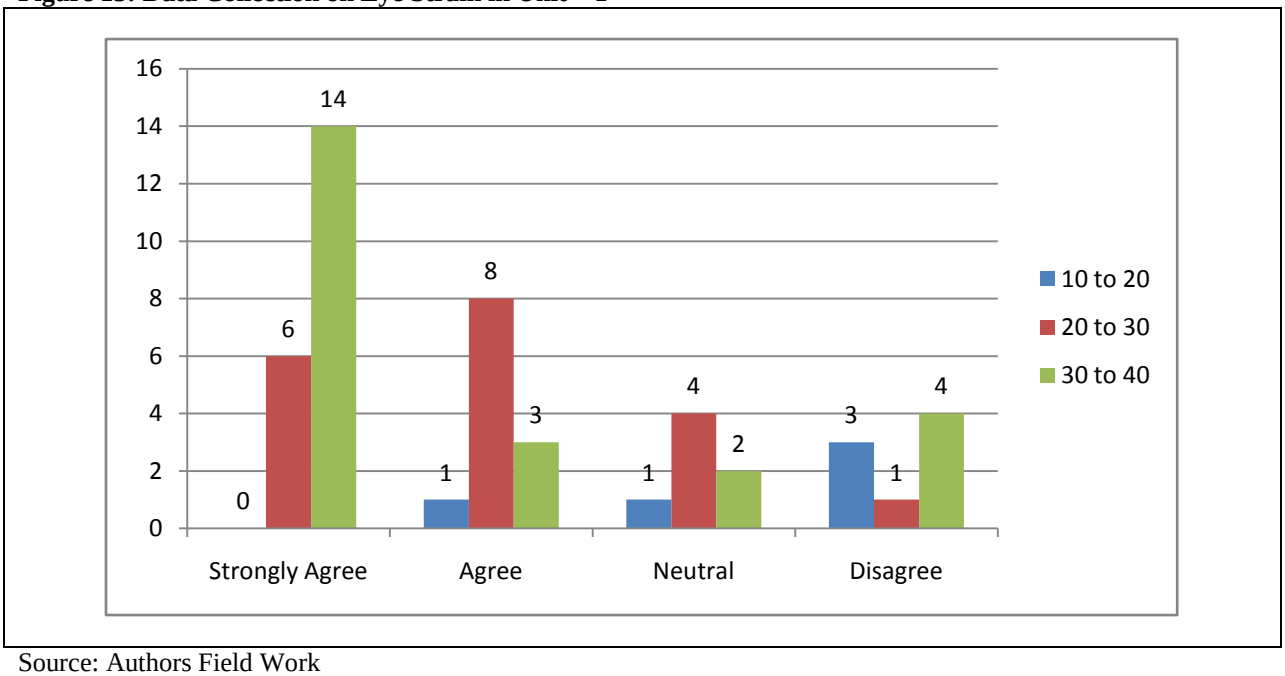
Figure 10: Observationson Incidence of heat stroke in Unit – 2



Source : Authors Field Work

An analysis of the incidence and frequency of occurrence of eye strain experienced by the workers was conducted where a larger proportion of the 30 to 40 years old workers reported that they had suffered tremendous eye strain in Unit 1 while in the same age category there were about one fourth who disagreed that they were experiencing any eye strain.

Figure 13: Data Collection on Eye Strain in Unit – 1

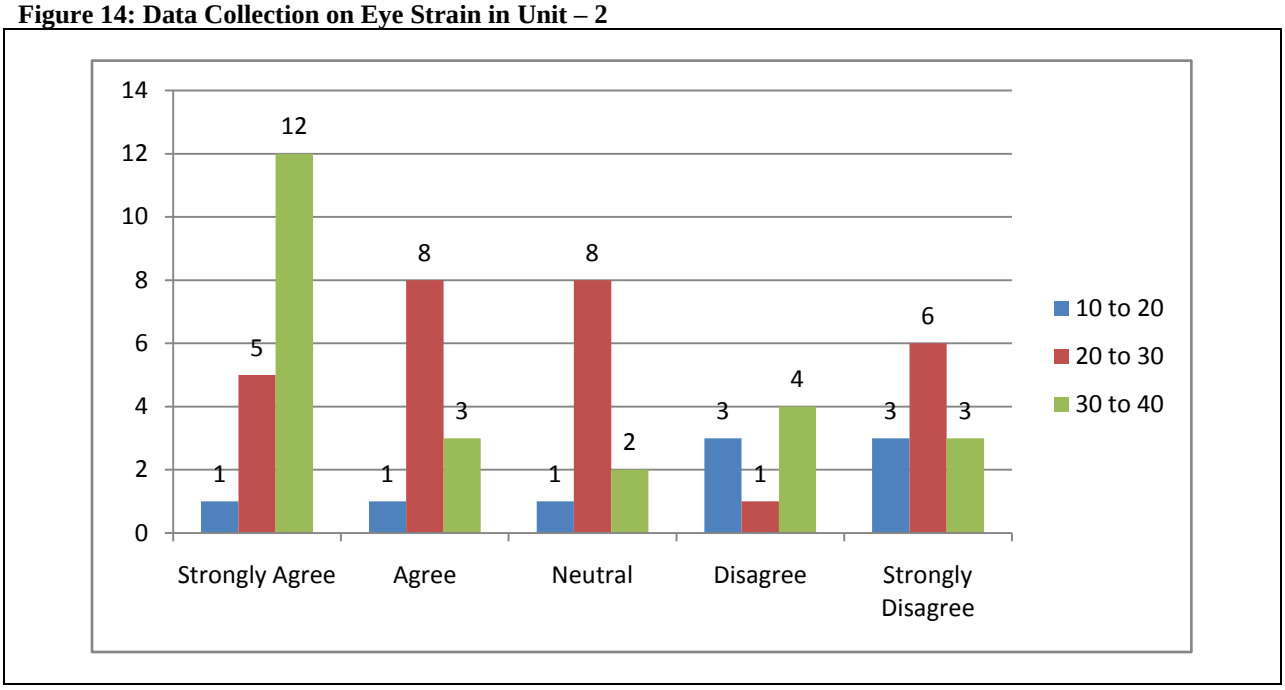


Source: Authors Field Work

Similarly in Unit 2 also the largest proportion of those in the age group of 30 to 40 years old were complaining of eye strain while interestingly the larger proportion of 20 to 30 years old

were neutral and a similar proportion n this category agreed to the fact that they were experiencing eye strain.

Figure 14: Data Collection on Eye Strain in Unit – 2



Source : Authors Field Work

Thus, overall the findings are in tune with the hypothesis that the environmental balance with in the premises of the garment manufacturing units. The workers were being subjected to temperatures, illumination and noise levels that were barely conducive to human tolerance as per the OSHA standards. The conditions were found to be all the more severe in the case of temperature control. The relevant interventions for creating a more controlled environment were informed about to the Units and they agreed to implement them forthwith. Two interesting facts highlighted by the study were firstly the workers were largely unaware of the hazards they were exposing themselves to and secondly there was the presence of several cases of ill-health which were rooted in the work environment. There is tremendous scope to conduct such environmental audits among other garment manufacturing units in the northern regions of the country.

Conclusion

Observations and data given by the factory management, besides a number of health problems being detected among the workers out of the total strength of 350 workers in the cutting, sewing and finishing sections of both Unit and Unit 2. A sample of 80 workers from Unit 1 and 70 from Unit 2 was taken from all three cutting, sewing and finishing areas respectively. The male workers being more in number than the female workers in both the organizations a representative sample was taken. Greater exposure of the male workers to the health hazards was apparent among the male workers when compared to females.

Most workers were observed to be not aware of or were not taking adequate precautions. They suffered from heat stroke, nausea, poor lighting causing poor vision and hearing problems with

frequent headaches due to the noise. The responses of the males, aged 20 to 40 and above who were employed in the cutting, sewing and finishing section were interviewed in depth to ascertain their experiences of poor vision, nausea, heat stroke and hearing problems. Their responses were complemented with their views given on a questionnaire through the option of Likert scale analysis. It was observed that most of the workers reported that they had experienced at least some episodes of ill health and had suffered at some time any or a combination of heat stroke, nausea, poor vision and hearing problems after they joined.

Thus it can be concluded that despite the greatest precautions the workers were unaware of the environment hazards of continued exposure to physically debilitating hazards that impacted severely on the health of the workers. There were several ways of ensuring the levels of exposure, which were intimated to the units understudy. The major findings was that OSHA standards are the current human endurance comparative measure. There is an urgent need to revisit the already set standards as also the health benefits accrued to the workers in the garment manufacturing units for insuring quality work environments that enhance the health and fitness levels of the work force. Ergonomically controlled work environments are conducive to overall productivity.

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