

EFFECT OF INDOOR CONDITION OF BANGLADESH FACTORY TO WORKERS HEALTH AND BEHAVIOR

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Article Info:

Article history:

Received date: 15.12.2021

Revised date: 13.01.2022

Accepted date: 25.02.2022

Published date: 08.03.2022

To cite this document:

Al Sayem Khan, M. A., & Ahmad, M. H. (2022). Effect Of Indoor Condition Of Bangladesh Factory To Workers Health And Behavior. *Journal of Tourism Hospitality and Environment Management*, 7 (27), 405-416.

DOI: 10.35631/JTHER.727032.

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Abstract:

The economic growth of Bangladesh depends very much on the garments industries. In Bangladesh, the garments industries contribute directly to the economic growth at about 6 percent of national economic growth rate. A huge number of factories are developed and scattered around Bangladesh. Most of the factories are clustered around the capital city Dhaka and invite thousands of rural inhabitants in search of a job in the city and hoping to lead better life. Today, Bangladesh already confirmed her position as a world-leading clothing exporter. The total workers in these garment industries are around 3.6 million out of 150 million total population. These factories manufacture different types of readymade garments products and export those products to many different countries around the world. However, a good number of factories are not well designed in term of their indoor conditions and which have direct influence in terms of workers' health and wellbeing. The poor indoor conditions may directly affect the employees' health where they can suffer from various illnesses over prolong durations. This study is aimed at finding out the indoor conditions that has the direct influence towards health and wellbeing of workers at the selected garment factories. For the purpose of this study, 14 factories at 6 different locations were selected. A field study was held to assess workers' health and wellbeing while working at the selected garment factories in Bangladesh. During the field study, the questionnaire survey was conducted among the random sample of 405 workers. The workers answered and provided the information about their factory current indoor conditions. From the questionnaire, it is found working environment caused certain illnesses and affected the workers' behavior while they are working at factories. The findings of this research will help introduce measure and guideline to the factory owners so that they can take significant steps to upgrade their management system to

improve and provide good indoor conditions for their workers and in term of business wise increase the production margin.

Keywords:

Worker's Health, Behavior, Factory Indoor Condition, Readymade Garments

Introduction

Being a developing country with a very strong agricultural background, Bangladesh has started its journey of the industrial sector with the Garment industry in 1976 (Habibur and Siddiqu, 2015). Currently, this garment sector is the largest export earner of Bangladesh. The quota of benefit and the low wages helped the country to become the world's second-largest apparel exporter (Farhanaz et al., 2015). It was found in research that in Bangladesh women are doing work on an average of 11 to 12 hours/day in the garment factory (Sikder et al., 2014). Needless to say, that the management of the company has a bigger responsibility to ensure that the workplace is free from hazards to employee's physical and mental health which is a legal right of the workers.



Figure 1: Internal Working Condition at Unplanned Design Factory

There is a huge number of factories which developed scattered way at whole Bangladesh. Nowadays, Bangladesh already confirmed its position as a world-leading clothing exporter. The total workers in these garment industries are around 3.6 million out of 150 million of the total population. These factories are separated as they produce different types of readymade garments products and export the products to many different countries around the world. Most of the factories are clustered around the capital city Dhaka and it invites thousands of rural inhabitants in search of a job and leads a better life. Among these factories, a good number of factories are not well outlined in terms of workers' health and indoor condition. The indoor condition directly affects the employees' health and for several days they suffer from various illnesses.

Literature Review

In Bangladesh, for nearly a decade the garment industry has been contributing to the country's economic growth, it reached an impressive 6 percent growth rate. Bangladesh is today one of the world's leading clothing exporters, and the garment industry employs 3.6 million workers out of a total population of over 150 million. Most of the nation's 4,500 factories are concentrated around the capital city of Dhaka and attract thousands of rural residents in search of jobs and a better life for their families. (Bangladesh Garments Workers, 2012).



Figure 2: Internal Working Condition at Unplanned Design Factory

Work environment-related concerns had been prioritized in labor policy debates throughout the industrialized nations. Enhancing the general work condition has been declared the target of the European Union, as stated in the consolidated version of the Treaty establishing the European Community (Arrelano, 1991).

Additionally, there are two types of work environment in a factory which are-

- a) Conducive work environments
- b) Toxic work environments

A healthy working atmosphere gives a better experience to employees and enables them to manifest excellent abilities and performance. This type of working environment also bolsters self-actualizing behaviours.

Toxic work environments always give an unpleasant experience and at the same time, affects employees' behaviour. This environment strengthens low self-actualizing behaviours and it leads to the progress of negative traits of the employees' behavior (Kyko, 2005). The theory of a proper environment is well combined into environmental psychology literature (Alexander, 1970; Herring, Sziget, & Vischer, 1977; Preiser, 1983; Zeisel, 2005).

One study about noise in selected offices had readjusted a technique for measuring the indoor noise levels in indoor industrial environments. Employees in open-plan workspace tend to judge noise to be a primary source of discomfort and reduced productivity (Hedge, 1986; Oldham, 1988; Stokols & Scharf, 1990; Sundstrom, Herbert, & Brown, 1982). Acoustic comfort investigations had been concentrated on equating physical measures, such as signal-

to-noise ratios at different densities, background noise levels and intensities, and speech intelligibility under differing physical conditions, with occupant judgments of distraction and nuisance (Ayr, Cirillo, & Martellota, 2001; Chu & Warnock, 2002; Mital, McGlothlin, & Faard, 1992).

The sick building syndrome (SBS) is used to describe a situation in which the occupants of a building experience acute health or comfort-related effects that seem to be linked directly to the time spent in the building. No specific illness or cause can be identified. The complainants may be localized in a particular room or zone or may be widespread throughout the building (Indoor Air Facts No. 4). Cough, chest pain, shortness of breath on mild exertion, edema, palpitations, nosebleeds, cancers, pregnancy problems and miscarriages. Extrinsic allergic alveolitis, Legionnaire's disease, humidifier fever, pneumonia and occupational asthma are also known to occur (Breiman RF, Fraser DW 1992) The symptoms can be clinically defined and have clearly identifiable causes. The complainants may require prolonged recovery time after leaving the building.

It was recorded, in November 2012, a fire broke out at the Tazreen Fashions factory in Bangladesh, Dhaka which took at least 112 workers' lives. The Fire was generated by a short circuit on the ground floor of the factory building. The fire immediately spread up to nine floors where the factory workers were trapped due to narrow or blocked fire escapes. Many workers died inside the building because of the burn-in fire and the suffocation conditions due to smoke. Some workers lost their lives while trying an escape through the windows of the building.

Five months later, there is a collapse that happened at the Rana Plaza building which took the life of 1,134 garment workers of the factory and also injured hundreds of survivors. Rana Plaza was an eight-storied commercial building, which is later converted into a production unit on its upper levels. The workers of this factory were already been evacuated the day before after cracks were marked in the building. The factory management had concluded that workers return to work under the pressure of consignment deadlines. During the morning peak hours, the building just collapsed in on itself like at house of cards.

Aims & Objective

The objective of the study to find out the current condition of workers at factory in terms of

- Worker's work rate
- Worker's health
- Worker's behavior

The aim of the study was to find the worker's health and behavior of factory, while workers are experiencing work stress and illness because of the uncomfortable condition of workplace.

Significant of The Study

The result of the finding from the field study will lead to a design standard which can be used by the management and owner of the factory to increase profit margin by providing a better workplace for workers.

Methodology

The methodology will be explained which was employed to conduct the field study . The three main stages are:

- Data Collection

- Data Analysis
- Data Interpretation

The period of field survey was selected in the summer months and during these periods indoor temperature getting too high as the factories have highest electric consumption recorded. The survey was conducted around 4 months and from morning to night to cover all working shifts in the factories.

Selected sample of workers at factories' health condition will be analyzed with certain work activities. In this study, by questionnaire, it will identify the workers' health, illness of workers and workers work rate inside the factories. There are various kinds of rating scales to measure attitudes directly. (i.e. the person knows their attitude is being studied). The most widely used is the Likert scale (1932). In its final form, the Likert scale is a five (or seven) point scale which is used to allow the individual to represent how much they agree or disagree with a particular statement. The questionnaire survey was measured by Likert scale with five points.

Sample size can determine by both ways with formula and available calculator. Plug in the Z-score, standard of deviation, and confidence interval into the sample size calculator or use this sample size formula to work it out (Madhuri Thakur, 2020):

$$\text{Necessary Sample Size} = (Z\text{-score})^2 * \text{StdDev} * (1 - \text{StdDev}) / (\text{margin of error})^2$$

The Z-scores for the most common confidence levels:

- 90% – Z Score = 1.645
- 95% – Z Score = 1.96
- 99% – Z Score = 2.576

Here's a worked example, assuming chosen a 95% confidence level, 0.5 standard deviation, and a margin of error (confidence interval) of +/- 5%.

$$\begin{aligned} & ((1.96)^2 \times .5(.5)) / (.05)^2 \\ & (3.8416 \times .25) / .0025 \\ & .9604 / .0025 \\ & 384.16 \end{aligned}$$

385 respondents are needed

Above shown equation is for an unknown population size or a very large population size. If your population is smaller and known, then it preferable to use the sample size calculator.

Calculator

What margin of error do you need? % ⓘ
5% is a common choice

What confidence level do you need? % ⓘ
Typical choices are 90%, 95%, or 99%

How big is the population? ⓘ
If you don't know, use 100,000

What do you believe the likely sample proportion to be? % ⓘ
If you're not sure, leave this as 50%

Your recommended sample size is 373 ⓘ

Figure 3: Sample Size Calculator

(Source: online)

For the field study a minimum random sample size is 373 to 385. For a better result at questionnaire survey 405 nos of workers were selected for field survey which is evenly distributed to 135 workers in each section.

The random sample size of workers included both male and female workers where the age range was 18 to 40 years. The field study was held in 14 factories in 6 locations The field study was carried out for four months from April to July which is the hottest month in Bangladesh (BMD, 2002).

For the analysis of collected data from the questionnaire, SPSS Statistics 26 and excel were used.

Findings

In the field study, indoor factory environmental data is also collected that include internal air temperature, sound level, air humidity and also external weather data such as visibility, wind speed, and precipitation. In the collected data also include workers numbers, levels of factory, number of users per floor, management staff number per factory.

Table 1: Tabular Format of General Data Of Factory Indoor

Factory	Temp. °C	Wind speed mph	Sound level db	Workers
A	25-27	3	60-70	350
B	31	2	60	910
C	31	3	80-70	700
D	26-32	3	70-72	800
E	28-32	2	65-75	1400
F	24-32	3	70-73	600
G	28-33	2	75-80	1200
H	24-30	4	80	1200
I	27-33	3	75-78	900
J	27-30	3	65-70	800

K	27-33	3	68-72	750
L	30-34	4	72-75	900
M	24-30	3	60-68	1000
N	28-33	4	60-70	1200

From this field survey, it is found that most of the workers who sit beside the machinery or over installed machines on the floor, often suffer from various health hazards. In all the factories, the light-check in the sewing section and also at the quality control area for checking the quality of sewing, and find the defects of the products.

In these sections, some health problems are created in the worker's health. This sections' light generally creates a high contrast between work plane and surroundings to users and this cause serious issue in workers eye in the future. Long time sitting or standing for work purpose in the factory the worker's maximum face headache, body pain and related to these workers fall in fever.

Table 2: Tabular Format of Workers Illness or Diseases in Factory

Worker (%)	General Diseases	Days duration in % (monthly)
74	Headache	33.33
59	Cold & Cough	23.33
74	Fever	23.33
12	Gastric problem	6
7.5	Abdominal pain	6.6
56.7	Body pain	10
8.2	Ear pain	3.3
44.5	Eye pain	13.66
29.6	Dysentery	10
40.7	Leg pain	13.33
3.7	Dust allergy	6.66
3.7	Vomit	3.3
37.1	Skin irritation	23.33
10.37	Heat Stroke	13.33

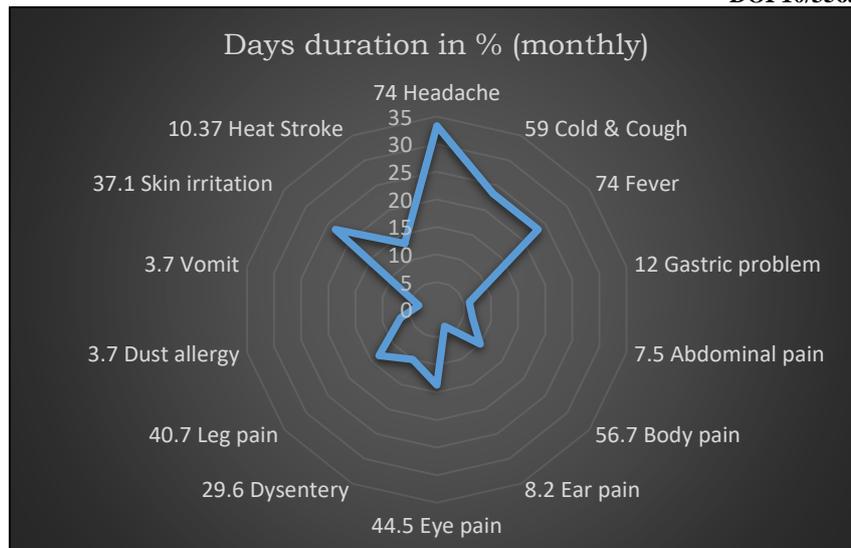


Figure 4: Graphical Format of Workers Illness or Diseases in Factory

From the above table 1, it is found that workers suffer various types of diseases when they are working in factories in different sections. The maximum types of diseases are stated in the table which is found during the field survey. According to findings, it is observed that 74% of sample size (405 workers) suffer from headache and fever, cold and cough around 59 % and 44.5% for eye pain. 56.7% of workers suffer from body pain and which is the main cause of all illness. Workers' illness has a direct effect on factory productions. For this reason, sometimes the factory owners cannot complete their goals and meet with financial problems.

Work activities that can influence workers' health were one of the observations in this field study. This observation was measured using a Likert scale. To measure this observation the scale used as 1=not observed and 5= highly observed. These activities of the factory which causes health hazardous of workers. The vibration occurs from machinery which is used at knitting, sewing and cutting and workers face it every day. Temperature and heat are also observed in the factories that are planned or unplanned. Long working hours beside the knitting machinery, the workers have issues in the ear where noise is mentioned as one of the contributing factors. Heat is also the main problem in the factory where the workers face maximum headache, body pain, dehydration and related to the workers having fever.

Table 3: Tabular Format of Work Activities Which Causes Diseases in Factory (Worker)

Observation Items	1	2	3	4	5
Vibration	219	75	111	0	0
Radiation	195	105	45	60	0
Vapors	273	72	60	0	0
Dust	36	15	294	60	0
Lead	405	0	0	0	0
Heat	174	81	78	72	0
Noise	0	63	240	42	60
Skin Irritation	45	123	171	66	0
Temperature	0	18	147	240	0
Manual Hardetury	405	0	0	0	0
Hazardous Chemical	405	0	0	0	0
Causing Agent	405	0	0	0	0

From the above table 3, it is found from the survey that various types of diseases occur in factories in different sections because of different activities. The maximum types of reasons which affect workers' health are state in the table which is found during the field survey. According to our findings, it is observed that 240 workers which are about 60% of the sample size (405 workers) voted for heat which is observed as the main cause of unhealthy environmental elements in the factory. 15% of workers voted about noise tolerance which occurs in factories near some machinery. Dust and Skin irritation was voted by 16% of workers for which workers mostly suffer while working in factories.

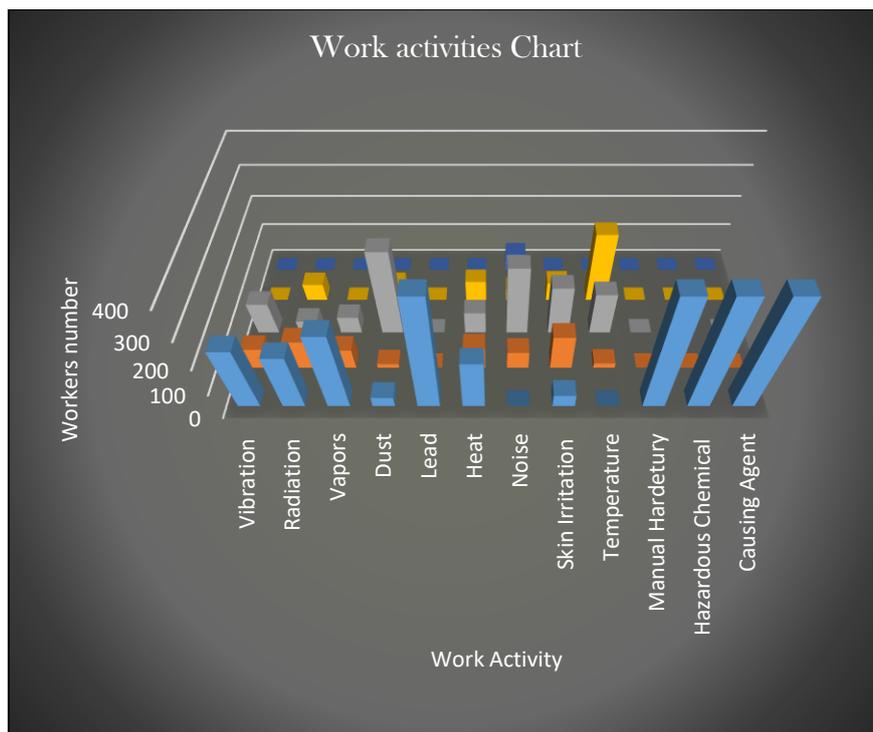


Figure 5: Graphical Format of Work Activities in Factory

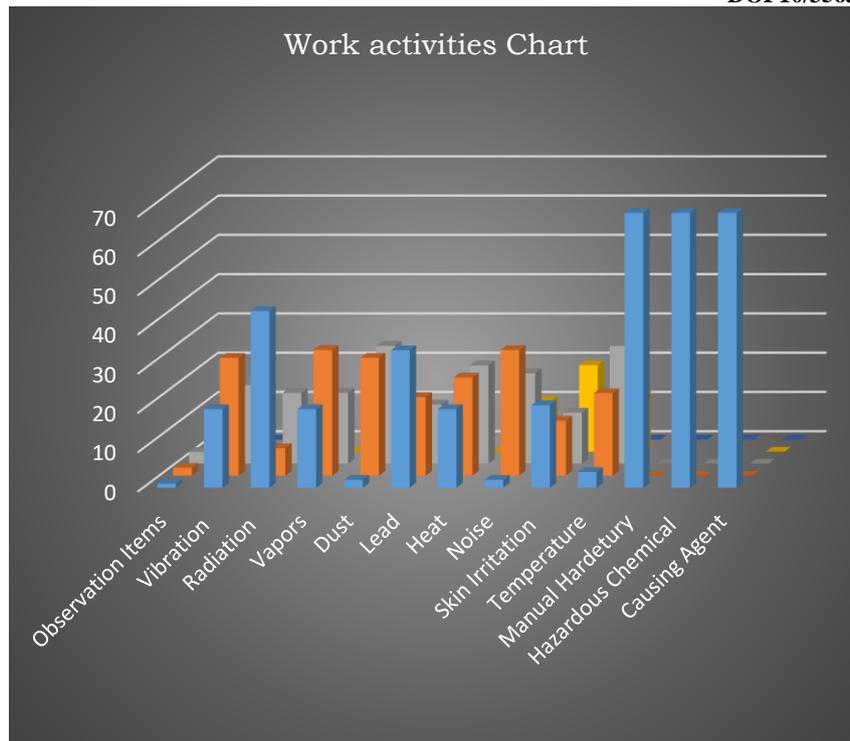


Figure 6: Graphical Format of Work Activities in Factory

Table 4 shows the questionnaire survey among the management staffs. 70 management staffs were involved in the questionnaire and observation survey. Among the management staff also an interview also held to get their observations about factory and workers health data.

Table 4: Tabular Format of Work Activities Which Causes Diseases in Factory (Staff)

Observation Items	1	2	3	4	5
Vibration	20	30	20	0	0
Radiation	45	7	18	0	0
Vapors	20	32	18	0	0
Dust	2	30	30	8	0
Lead	35	20	15	0	0
Heat	20	25	25	0	0
Noise	2	32	23	13	0
Skin Irritation	21	14	13	22	0
Temperature	4	21	30	15	0
Manual Hardtury	70	0	0	0	0
Hazardous Chemical	70	0	0	0	0
Causing Agent	70	0	0	0	0

Main Result

From the study about sick building syndrome are identified, and it was counted that employee suffered from some diseases which they experienced while working in the factory. The sickness which was identified from the study include fever, cold and cough, body pain, headache, eyes pain, skin irritation, gastric and abdominal pain etc. In the selected factory buildings, workers feel sick by multiple types of diseases which are pointed out by

questionnaire survey. From the field study, it is determined that around 74% of the workers' sample is undergoing headaches and fever which is happened 3 to 4 days in a month. This problem of illness undivesatingly affects the factory production margin. Other illness are cold and cough, almost 59% of the workers' sample underwent for 10 to 12 days of a month. Few more sickness is also found while recording the questionnaire survey results. In recorded data, it is also found that workers suffer from eyes pain around 44.5%, leg pain around 40.5%, skin irritation around 37.1%, dysentery around 29.6% for 5-6 days in a month. It is determined from the survey response that workers suffer from these various types of disease because of the indoor environment which is packed, less ventilated, less airflow. Factory owners should count these facts and take significant steps to provide a well-ventilated workplace and follow the machinery layout which is determined by designers.

From the analysis it is also found that the workers in a month had 4-7 days that they felt sick. Sometimes the workers take leave or come to work with sickness. When they work with unhealthy condition of health, they don't have any good mood to work which directly affect their behavior. When they are working in workplace where its uncomfortable, they will take their break and go out from working floor area to get fresh air, rest for a while, drink water or take a small walk. The workers took this break sometimes on lunch time or in the working time. Workers go out from the floor and take fresh air which is not sufficient inside the work space.

Workers behavior toward own job scope is also affected because their physical condition is not good enough. This prolongs effect of 5-10 days directly will affect the production. Irritable mood, depressed, reluctance to work is common among the workers behavior while they are working at factories which indoor condition is not healthy. From the field study, it also found that from 12.00 pm to 5.00 pm is not preferable by employees to work in the factories. The thermal indoor condition is not preferable because of over-crowded, less ventilation, less airflow and increasing indoor temperature.

Conclusion

The main purpose of this study is to analyze the indoor condition for workers in their workplaces, or inside factory buildings in Bangladesh to find out the current condition of workers health and behavior. The field study recounted the point of workers' work rate for the whole day while they are working in the factories. The findings of this survey will help to make a guideline which will help the owner to take necessary steps at their factories to provide a better working indoor condition. When the workers get better workplace then it will help the owner to increase the production margin.

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