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Perception of Occupational Risk: The Case of Garments Workers in Bangladesh

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This study investigated occupational risk perceived by garments workers of Bangladesh. It seeks to focus on factors generating risk for workers. The risks are calculated based on the probability and severity level of the hazard generating factors. Random samples of 105 workers working in different sections of garments factories have been surveyed on a structured questionnaire for this research. SPSS Factor analysis reduced data to identify significant and highly correlated factors among 19 variables generating risk. Reliability was checked by Cronbach's Alpha provided the value of 0.899. From the findings, late wage payment, non-supportive work environment, sexual harassment, cotton dust, congested work area and noise are perceived as high risk occupational hazards by the garments workers.

Key words: Risk, garments, workers, Bangladesh

Field of Research: Human Resource Management

1. Introduction

The Readymade garment (RMG) industry of Bangladesh is the largest export receiving manufacturing sector. Bangladesh is now in the third position of global apparel market share. The average price of readymade clothes had dropped at least 15% in European and American high streets, superstores and supply chain (Export Promotion Bureau, 2017). After Rana Plaza tragedy, the President of USA suspended Bangladesh from Global System of Preference (GSP) on June 27, 2013 affecting the total supply chain of Bangladesh RMG and not included in the new GSP facilitated country list published in the new law on June 29, 2015 (Barua and Ansary, 2016). Also the working condition in RMG factories have been increasingly featured by western media as characterized by low wages, exposure to violence and a high work load (Steinisch *et al.*, 2014). Workplace hazards are generated from the workplace environment and associated risk may vary from manufacturing industry to service industry. The existence of workplace hazards cannot be underestimated as it is a suffering for people. Quantification of the hazards to prioritize the immediate elimination of the harmful hazards is very much essential to assure risk management (Elles, Villabona and Martelo, 2018). Various working environment associated factors are present in the workplace and combine them with worker's exposure to hazards to arrive at quantified assessment of risk. Hazard assessment and risk quantification has been implicated in developed countries of UK, USA, Europe from different

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contexts of paint, coal, mine, steel manufacturing industries (Tadic *et al.*, 2012). In Japan, risk assessment has been included as a bounded obligation (Horie, 2010).

To discuss other researches, the mostly researched areas in the field of occupational health and safety are psychosocial factors at the workplace, safety concerns at the workplace, safety climate, disease prevention, workplace politics, workplace spirituality, epileptic medication in the workplaces, safe management, exposure to chemicals and perception of risks (Sembe, 2017). Few researches in garments context of Bangladesh and global arena, evaluated the health condition of garments workers, health and safety compliances, self rated health outcomes to explain the occupational health and safety of garments industries (Zaman, 2013; Ali, 2019). (Chowdhury and Tanim, 2016) mentioned that, insufficient research has taken place in Bangladesh relating to occupational health and safety. Although, in developing countries, 80% of total global workforce resides but there is still lack of health and safety assurance in developing countries.

In a least develpoed country like Bangladesh, occupational hazard identification and risk assessment needs to be applied as a preventive measure of assuring health and safety. Most of the manufacturing organizations in Bangladesh do not have hazard identification and hazard evaluation system for the entire production process for labor. But, International Labor Organization insisted hazard evaluation and risk assessment systems work as preventive measure of health and safety assurance (Ilo, 2009). As, individual garment worker's risk perceptions about the current occupational hazards based on their daily routine task are vital, this particular research focusing hazard and risk of garment workers is a new edition from new context and new perspective. Elimination of occupational hazard and associated risk of the hazard is very much essential in today's industrial competitive era (Habiba, 2012). Abraham Maslow's Hierarchy of Needs Theory of 1943, a theory of human motivation states that, after meeting the physiological needs, people work to meet their need of safety, security and health and the lower order physiological and safety needs are associated with organizational culture (Jerome, 2013).

The Main Research Question is :
What are the accupational hazards perceived by the garments workers of Bangladesh? However, two following sub-questions are drawn from the main research question.

i. Among the physical hazards, chemical hazards, ergonomic stressors and psychosocial hazards which one is the most significant component of the occupational hazard?
ii. What are the significant hazards in terms of severity and impact?

The paper is organized under six sections. While Section one deals with introduction, Section 2 focuses on literature review. Research data and Methods are presented in Section 3. Section 4 contains findings and analysis of the results. Conclusions is presented in Section 5

2. Literature Review

Occupational health and safety is founded on hazard identification which is the process of identifying source or situation with the potential to cause harm in terms of

human injury or ill health. Risk assessment arising from hazard is the combination of the likelihood of hazardous event or exposure and severity of injury or ill health that can be caused by the event of exposure (González-muñoz and Chaurand, 2015) . Safety management process cannot be ensured without hazard identification, evaluation, suffered risk of people and numerical estimation of damaged risk (Taylor, Reinhold and Tint, 2010).

With the advancement of industrial revolution, introduction of new machineries and changes in workplace environment, employers and workers started to bear the losses of injuries, illnesses and deaths (Ahmad and Nawaz, 2016). People are more aware about the association of what type of work they do and the injuries or illnesses occurred from the works (Vandyck and Fianu, 2012). Organizations feel to improve their competences to improve their safety through proactive and systematic approach. To discuss the concepts of basic dependent and independent variables of this research, (Univers, 2013) has defined occupational hazard as the potential for adverse or harmful consequences associated with condition or activity that, if left uncontrolled, can result in injury, illness, property damage, business interruption, harm to the environment or negative impact on the reputation of the company. (Tziaferi *et al.*, 2011) defined risk assessment as a structured and systematic procedure that is dependent upon identification of the hazards and an appropriate estimation of risks in a workplace with a view to making inter-risk comparisons for purposes of their control or avoidance. Hazards can be classified as physical, chemical, biological, ergonomic stressors and psychosocial hazards (Vitharana, De Silva and De Silva, 2015). There are numerous hazards in almost every workplace. Millions of people die and are injured or become ill due to the result of these occupational hazards. Industrial machines are also involved in these occupational accidents.

Occupational hazard is a distressing problem now days. An unsafe and dissatisfying work environment has detrimental effects on the employees and work organization. An unsafe work environment adversely affect worker's motivation that tends to minimize effort towards work thereby lowering performance (Tebyetekerwa, Akankwasa and Marriam, 2017). (Kaya, 2015) mentioned that, for system approach, beside the methods used during the work: workplace planning, design of all production tools and devices, physical and psychosocial environmental factors affects worker satisfaction impacting productivity level. Workplace hazards and associated risk minimizes individual single factor productivity as well as all factor productivity by minimizing the output-input ratio (Rezaei *et al.*, 2015). Risky and hazardous workplace has direct impact on human resource management because trained and skilled workers become demotivated to work in a distressing environment. Workplace hazards impose risk on workers health and there are several addverse health effects of occupational hazards (Mardiana Yusuf, Eliyana and Novita Sari, 2012). In a least developed country of Bangladesh where garments is the largest manufacturing sector with highest number of workers than other industries, the risk associated with particular occupational hazards can be influenced by the probability of that hazard to be present and the impact of severity outcome of that hazard on the victim.

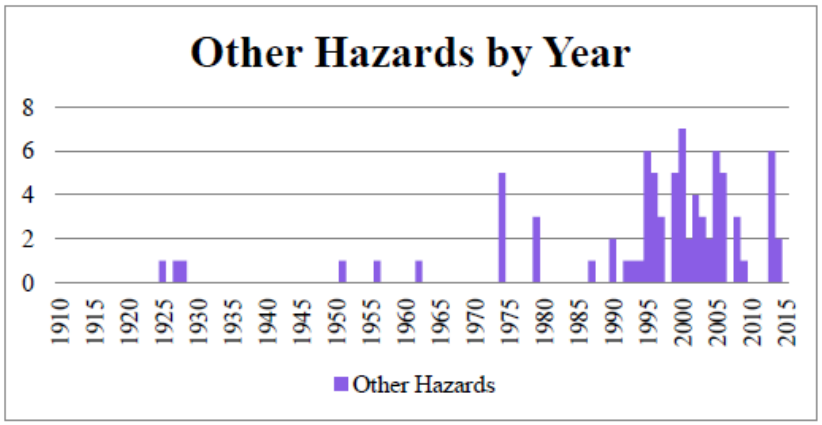
To review literature on risk of occupational hazard, Previously, several researchers, academicians identified and studied wide range of occupational hazards.

Occupational hazards and risk level in five types of manufacturing (mechanical, printing, wood, plastic, clothing) small and medium enterprises in Estonia were analyzed (Reinhold, 2016). Another research by (Samantra, Datta and Mahapatra, 2016) revealed and developed the ranking of occupational hazards based on their consequences, probability and exposure in underground coal mine industry in India. The state of chemical safety in garments factories in Bangladesh from the perspective of corporate social responsibility and supply chain were also studied (Lindholm *et al.*, 2016). Chemical hazard is a serious issue in garments industry because 13 million people worldwide work in the garments industry are exposed to chemical solvents at the time of spot removing operations. Another research focused on chemical hazards in paint manufacturing industries in Nigeria. This research revealed self reported occupational problems (diseases) of 400 randomly selected workers from 6 paint factories (Awodele *et al.*, 2014).

Garments workers suffer from different kinds of diseases affecting productivity (Seabrook, 2013). Sewing machine operators suffer from musculoskeletal disorders, joint pain, respiratory problems, malnutrition etc. (Ahmed, 2014) as the operators sit in a particular chair for prolonged time with minimal movement of their body (Sharif, Islam and Kabir, 2015). Diseases are effects of different hazards which are considerably the causes. Most workers are challenged by psychosocial oppression because physical violence, abuse, overtime work, wages discrimination, informal recruitments; harassments are very common practices in RMG factories in Bangladesh. According to the publications of New York Times from 1910 to 2015, four main categories of workplace accidens in garments has been recorded which are building collapses, factory fires, child labour and number of workplace hazards have increased from 1995 to 2015 (Peterson, 2016). The following hypotheses are presented.

H1: Risk of occupational hazards (physical hazards, chemical hazards, psychosocial hazards and ergonomic stressors) is significant as perceived of workers
H2: Risk of occupational hazards (physical hazards, chemical hazards, psychosocial hazards and ergonomic stressors) is not significant as perceived of workers

Figure 1 : Workplace Hazards in Garments (Peterson, 2016)



In figure 1, other hazards are mostly related to internal physical environment , psychosocial environment and poor ergonomic structure (Peterson, 2016). The operationalization of the variables of this research are stated below.

Table 1: Definitions of Key Variables of Research

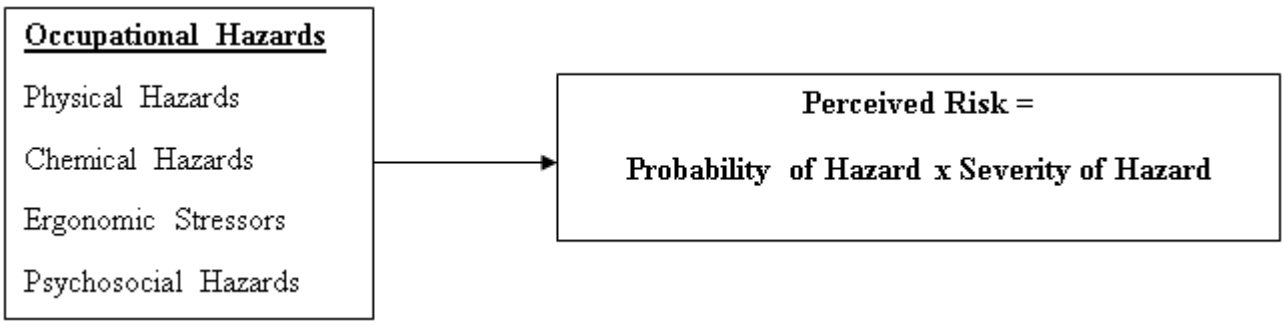
Variable	Operationalization	Source
Physical hazard	Generated from worker and workplace interfaces, physical work environment, energy. Principal forms are noise, extreme temperatures, vibrations, ionizing radiation, cold, heat, abnormal pressure, humidity .	(Teixeira *et al.*, 2017)
Chemical Hazard	Generated from chemical agents used in workplace and harmful emmission of chemicals	(Profile, 2018)
Ergonomic stressors	Generated from type of work with adjusted body position and working condition. Principal froms are improperly adjusted workstations, chairs, frequent lifting, poor posture, improper height of workstation .	(González-muñoz and Chaurand, 2015)
Psychosocial hazard	Generated from workload demand, double shift work, sexual harrassment, workplace violence, lack of respect, abuse by superior etc.	(Solaja, 2014)
Risk assessment	Risk R = Severity of harm x Probability of occurance	(Moatari-kazerouni, Chinniah and Agard, 2015)

To discuss the underpinning theories supporting the research, among the nine principles of safety management (Jain and Rao, 2010), the fourth principle states that, unsafe acts and unsafe conditions can be identified in advance and eliminated (Jain and Rao, 2010). Health and safety assurance is not only management's and stakeholder's responsibility but also individual worker's concern and awareness is crucial. Routine job design has association with health and safety impacting their labor productivity as garment workers spent almost most of their time in the confined environment (Koopmans *et al.*, 2014). An unhealthy working environment generates illnesses, accidents, injuries, fatalities which increases absenteeism, job dissatisfaction and decreases labor productivity (Shobe, 2018).

3. Data and Method

The framework of this research is given in the figure below.

Figure 2: Research Framework



In the above figure of research framework, occupational hazards are independent variables and risk is the dependent variable followed by the consequences and probability of the occupational hazards.

The objective of this research is to determine the key determinats of occupational hazards and to assess risk of the occupational hazards in the context of garments manufacturing industry in Bangladesh. This empirical research analyzed primary data collected from the workers of 5 leading garment factories of Bangladesh. The garments factories are randomly selected from the geographic cluster of Tetuljhara, Hemayetpur, Savar of Dhaka district. Garments list was collected from Mapped in Bangladesh project of BRAC where 26 garments factories have SEDEX/WRAP compliance certification In this study, 130 workers from different sections cutting, sewing, finishing, spot removal were interviewed to collect data associated with their perception of occupational hazards. To estimate the hazards in workplace, workers perception regarding the probability of hazard and severity of hazards negative outcome on health have been taken into consideration. Finally, excluding irrelevant surveys, 105 surveys were included in the analysis.

The sample size was statistically significant. According to (Mundfrom, Shaw and Ke, 2005) for factor analysis the sample size would be appropriate if the size is 3 to 20 times the number of variables and absolute ranges from 100 to over 1,000. In this research the number of variables is 19 and the number of data included is 105 which are approximately 5.5 times of the number of variables.

Both descriptive and inferential analyses were analyzed with the survey data. Descriptive statistics frequency table was used to describe the demographic profile of the respondents. Data reduction applied factor analysis to shortlist the most risky and severe workplace hazards perceived by the respondents. A structured survey questionnaire with 19 items, each item consisting severity and probability level were implicated during the survey. Questionnaire included items adopted from research papers with physical hazards 5 items, chemical hazards 5 items, ergonomic stressors 4 items and psychosocial hazards 5 items. Each 19 item has separate probability and severity questions with 5 item Likert scale. Risk can be assessed and presented, using matrices, by estimating probabilities and consequences in a qualitative manner or with quantitative values using Likert scale (Jeong and Lim, 2009).

Table 2: Risk Matrix (Karasan *et al.*, 2018)

Scale	Severity	Description	Frequency
1	Insignificant	Minimal impact	Never
2	Minor	Short term impact	Unlikely
3	Moderate	Significant impact	Occasional
4	Major	Major short term impact	Probable
5	Catastrophic	Major long term impact	Always

A risk matrix is a table that includes several categories of probability, frequency, or likelihood for its rows or columns and several categories of severity, consequences, or impact for its columns or rows (Amponsah-tawiah *et al.*, 2013) as shown in Table 2.

The risk assessment has been calculated and based on hazardous situation perceived or confronted by employees. The fundamental quantitative value of risk assessment in the equation is given below (Xiong *et al.*, 2019)

R = P X S ……..(1)

Where, R = Risk associated with a hazardous event,
P = Probability (or likelihood) of the occurrence of the hazardous event,
S = Severity or consequence of the event.

4. Findings and Analysis

The survey questionnaire included demographic information of the respondents and probability and severity perception of 19 items occupational hazards as mentioned before. The first part of the questionnaire about the demographic information provided a clear demographic profile of the respondent's age, education, sex and job category. From the analysis, 27 male respondents and 78 female respondents were surveyed. Garments industry of Bangladesh is a labor intensive industry and most of the workers approximately 80% workers are female (BGMEA Annual Report, 2019). 47% respondents age group is 18-24 years, 36% respondent's age group is 25-35 years demonstrating that 83% of respondents are within the age group of 18 to 34 years. Job category of the respondents included 42 helpers, 55 operators, 5 cutting masters and 3 spot removal section workers. 81% of the respondents were only class eight passed which is indicating their poor level of education. The frequency table of job categories of respondents is mentioned below.

Table 3: Job Category of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Helper	42	40.0	40.0	40.0
	Operator	55	52.4	52.4	92.4
	Cutting section worker	5	4.8	4.8	97.1
	Spot removal worker	3	2.9	2.9	100.0
	Total	105	100.0	100.0	

The respondents were surveyed to rate how much time they are exposed to hazardous working environment by probability and the effect of the detriments by severity. After that, probability and severity have been transformed to calculated risk. To assess the risk factors that the respondents perceive as considerable exploratory factor analysis has been implied. Factor analysis is a statistical approach that analyzes interrelationships among a large number of variables and to explain the variables in terms of their common underlying dimensions or factors. Therefore principal component analysis with Varimax rotation was analyzed.

Table 4: KMO and Barlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.891
Bartlett's Test of Sphericity	Approx. Chi-Square	1620.741
	df	171
	Sig.	.000

Suitability of data should be ensured for factor analysis. All the variables tested by Kaiser-Meyer-Olkin (KMO) measure of sample adequacy (MSA) and Barlett's test of sphericity. Results from the table showed that the KMO measures the value 0.891 which is greater than 0.5 for satisfactory factor analysis to proceed. Also the significance level for Barlett's test of sphericity is 0.0 which is less than 0.05. Therefore KMO and Barlett's test confirmed the perfection of data for factor analysis. The reliability of data was tested and SPSS generated Cronbach's Alpha value of 0.899 which is good enough to represent the reliable data estimation.

Table 5: Reliability Statistics

Cronbach's Alpha	N of Items
.899	19

From SPSS factor analysis, communalities values mentioned in table 6 are high which means that the proportions of variation that can be explained by factors are quite satisfactory. The extraction values are good for factor analysis. Extraction communalities are estimates of variance in each variable accounted for by the components.

Table 6: Communalities

Variable	Initial	Extraction
RiskPH1	1.000	.749
RiskPH2	1.000	.743
RiskPH3	1.000	.825
RiskPH4	1.000	.706
RiskPH5	1.000	.837
RiskCH1	1.000	.501
RiskCH2	1.000	.970
RiskCH3	1.000	.673
RiskCH4	1.000	.547
RiskES1	1.000	.737
RiskES2	1.000	.556
RiskES3	1.000	.791
RiskES4	1.000	.642
RiskES5	1.000	.574
RiskPSY1	1.000	.754
RiskPSY2	1.000	.820
RiskPSY3	1.000	.964
RiskPSY4	1.000	.610
RiskPSY5	1.000	.839

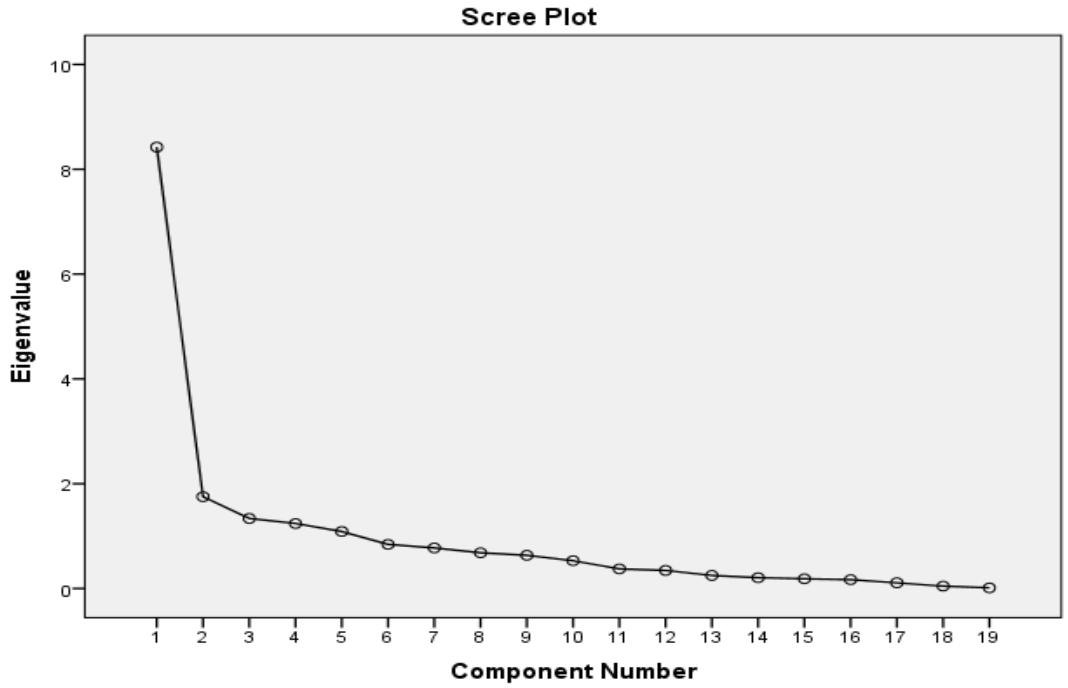
Extraction Method: Principal Component Analysis.

SPSS factor analysis of the 19 variables has extracted five components explaining cumulative 72.84% variation of the total variance. The four factors Eigenvalues which are greater than 1 are also extracted and plotted in the scree plot.

Table 7: Eigen Values Greater than 1 (5 components)

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	8.423	44.330	44.330
2	1.752	9.222	53.552
3	1.337	7.037	60.589
4	1.240	6.527	67.116
5	1.088	5.728	72.844

Figure 3: Scree Plot



The correlation matrix table analyzed the correlation of variables with 19 variables with each other and the significance level by p values which were found as statistically significant. By analyzing the factor loading, the correlation of each variable and significance level, a new construct can be formed and loaded for reducing data in the next phase of analysis. In this research, the factor loadings were considered as significant if the values are greater than 0.3.

Table 8: Rotated Component Matrix

	Component				
	1	2	3	4	5
RiskPH1	.018	-.016	-.015	.038	**.864**
RiskPH2	.065	.084	.815	.234	-.107
RiskPH3	-.145	-.118	.117	**.875**	.108
RiskPH4	-.032	.043	-.629	.486	-.266
RiskPH5	**.848**	.324	-.005	.111	.031
RiskCH1	.227	.546	.324	-.044	-.210
RiskCH2	**.940**	.283	.051	-.063	.026
RiskCH3	.504	.592	.009	-.240	.103
RiskCH4	.000	.663	-.307	-.008	-.119
RiskES1	.538	.655	.045	-.128	-.020
RiskES2	.694	.257	.083	-.043	.013
RiskES3	.606	.640	.116	-.036	.005
RiskES4	.037	.675	.191	.084	.377
RiskES5	.640	.231	-.036	.240	.229
RiskPSY1	**.847**	-.011	-.054	-.181	-.005
RiskPSY2	**.896**	-.007	.061	-.090	.072
RiskPSY3	**.931**	.297	.021	-.091	.035
RiskPSY4	**.733**	-.054	.103	-.080	-.229
RiskPSY5	**.883**	.205	.089	-.069	-.069

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 9 iterations.

From the rotated component matrix, component 5 is most highly correlated with risk of physical hazard (risk of noise for machineries), component 4 is most highly correlated with risk of physical hazard (risk of Congested work are), component 1 is most highly correlated with risk of physical hazard 5 (risk of cotton dust), psychosocial hazard1(risk of verbal abuse),psychosocial hazard2 (Risk of sexual harassment), psychosocial hazard3(risk of work life imbalance due to Late wage payment), psychosocial hazard 4 (risk of long working hour), psychosocial hazard 5 (risk of non-supportive work environment).

The components comprised low correlation value with the variables used for research are physical hazards risk such as risk of noise for coworkers Speech, risk of extreme temperature, risk of cotton dust. The chemical hazards with low correlation value from rotated component matrix are risk of chemical agents exposed area risk of using prohibited chemical agents, risk of not using personal protective equipment, risk of carelessness of workers about chemical agents. The other ergonomic stressors that has been analyzed for the research but insignificant correlation has been obtained are risk of repetitive movements, risk of inappropriate posture, risk of vibration of machine, risk of working with obsolete machine and risk of working with improper height sitting arrangements.

From the above factor analysis, risk of noise for machineries, congested work area, cotton dust, verbal abuse, sexual harassment, late wage payment, long working hour and non-supportive work environment have been perceived as highly correlated perceived by the garments workers. The further factor loading of these 8 variables extracted two components explaining cumulative 72.65% variation of the total variance. The two factors Eigenvalues which are greater than 1 are also extracted and plotted in the scree plot.

Table 9: Rotated Component Matrix

	Component		
	1	2	Variable
RiskPSY3	.964		Late wage payment
RiskPSY5	.923		Non supportive work environment
RiskPSY2	.906		Sexual harassment
RiskPH5	.877		Cotton dust
RiskPSY1	.848		Verbal abuse
RiskPSY4	.735		Long working hour
RiskPH1		.840	Noise for machineries
RiskPH3		.602	Congested work area

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

According to the rotated component matrix psychosocial hazards with high component matrix are late wage payment and non-supportive work environment and sexual harassment. On the other hand, risk due to cotton dust, congested work area and noise are comprising high values in rotated component matrix. Henceforth, the null hypothesis has been rejected that means Risk of occupational hazards (physical hazards, chemical hazards, psychosocial hazards and ergonomic stressors) is significant as perceived of workers.

According to H. W. Heinrich's "Domino Theory", occupational hazards are the causes of negative health outcomes and consequences of some hazardous incidents (Jain and Rao,2010). As this research is based on the hazards experienced and perceived by workers, the risk estimated variables are the causes of self-reported negative health outcomes as determined by researchers. To ensure a healthy workplace garments should focus to reduce the defined risk variables that enhance the satisfaction level of workers.

5. Conclusion

Initially, the research has explored the variables or indicators that can best explain the occupational hazard of garment workers in Bangladesh. After exploration of the variables or indicators, the quantitative measurements derived from the survey results analyzed the current state of the situation of the garments industry in terms of the phenomenon. This research analyzed the consequences or adverse health (physical and mental) outcomes of the workers associated with the hazards. Risk estimation is a new phenomenon in a least developing country like Bangladesh. The quantification of risk associated with the workplace hazards helped to prioritized the occupational hazards and take necessary steps to mitigate the hazards and associated risk.

Readymade garment industry is a human capital based organization. This industry sector is very important for the economic growth of Bangladesh and struggling for the last few years to fulfill the international requirements to improve the workplace environment. There is a huge scope of development in this industry sector to improve the workplace and survive in the global competition. In the western context, there are numerous and varieties of examples in occupational health and safety

research. Several researchers mentioned the occupational hazards and its effect on decreased productivity and performance in other contexts. In Bangladesh, most researchers analyzed self-reported health situations of garments workers but exploration of hazards as negative catalysts in workplace environment will give a new direction of research to propagate in the era of health and safety. The research limitations included the worker's reluctant attitude to participate in the research survey due to high work load and work life imbalance propaganda.

The findings obtained from risk estimation will definitely add value in the research context of occupational safety and health for survival in the global competition, betterment of the garments workers and buyer's compliance requirement. Employers can upgrade their workplace environment and facilities by considering the opinion of workers, buyers, stakeholders and policy makers. Identification and minimization of occupational risk can upgrade the Bangladesh garments market value and demand.

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