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**STUDY ON THE KNOWLEDGE ON FIRE SAFETY MANAGEMENT AND PREVENTIVE
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STUDY ON THE KNOWLEDGE ON FIRE SAFETY MANAGEMENT AND PREVENTIVE ACTIONS OF SELECTED GARMENTS FACTORY WORKER IN DHAKA CITY

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ABSTRACT

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A cross-sectional study was conducted in purposively selected readymade garments (RMG) of Rampura, Mohakhali and Mirpur area of Dhaka city. This study was conducted to know the knowledge status on fire safety management and preventive actions of selected garments factory worker in Dhaka city. Data were collected on fire related factors, fire management and preventive actions, fire safety trainings, and level of fire safety knowledge. All the garments worker working in these garments were participated in the study and ultimately 176 were included and interviewed face to face with an interviewer administered pre tested semi-structured questionnaire. It was found that participants had good knowledge (over 80%) on all fire safety factors studied. In addition, the majority of the respondents mentioned the following comments on major categories of fire safety management and prevention. Such as electricity short circuit is the major cause of fire initiation, fabrics are the main combustible material of fire, maximum number of worker use exit door to exit in case of fire accident, most of the respondents aware of emergency exit door, they use water for relieving the person suffering from burning. Most of the respondents recognized emergency alarm during fire drill practice, and respondent having more than 3 years length of work experience had better knowledge than those of less than 3 years length of work experience. Therefore length of job experience of respondents had positive effect on their level of knowledge.

Key words: *readymade garments, women garments worker, fire safety factors, fire management, fire drill activities, length of service*

INTRODUCTION

Readymade Garments (RMG) manufacturing is the biggest industrial sector of Bangladesh. It is the key export-earning sector and striking force in the field of industrialization for Bangladesh. Around 3.6 million workers are employed in the textiles and clothing industry of which 2.8 million are women (Mahmud 2012). As Bangladesh is gradually making its position better it is using the garments sectors more exhaustively. In less than a decade the country increased its exports, foreign earnings, and contribution to the gross domestic product GDP by 4.39% in the year of 2008 (Ahmed and Hossain, 2009). RMG exports reached a steadfast figure of USD 17.91 billion in the fiscal year 2010-2011, accounting more than 78% of national export earnings, which was about 4-5% of the global total. It further contributes 10% to the country's GDP (Mahmud 2012). RMG products are exported mainly to the United States of America and the European Union. We can realize easily the amount what is mentioned above that how much important became the garments sector. The workers in the garment factories are almost illiterate and they have limited knowledge of human rights, working conditions and labor standards. Since 2006, more than 500 Bangladeshi workers have died in factory fires. In last 10 years there were more than 100 fires in factories in Bangladesh. In the garment industry, most deaths from fire are due to the inhalation of smoke or from workers falling to their death from multi-story factories as they try to escape. The garments industries of Bangladesh had no emergency exit, and workers trying to flee found the main exit locked. Fire extinguishers were left unused, either because they didn't work or workers didn't know how to use them. Unfortunately in Bangladesh, state safety regulation and intervention are extremely poor. In most cases in urban and sub-urban areas the factories get accommodated usually in bigger building constructed as residence or shopping markets and stampedes and casualties in those locations are dangerously frequent.

Facilities handling flammable substances face significant risks from various fire and explosion events. If the facility's fire systems are not suitable for managing the hazards, a fire could quickly get out of control and escalate, potentially resulting in a catastrophe. Over decades no worthwhile safety audit has been seen, not even any kind of investigation or positive measures from the RMG factory owners or inspection authorities who are primarily responsible for safety in the work place. The failure to implement safety measures in these sectors in Bangladesh has resulted in a condition where death and injury of workers has become alarming. Therefore, objectives of this study were to explore the knowledge level on fire safety management and prevention among the garments workers of selected garment factories of Dhaka city in Bangladesh.

METHODOLOGY

A cross-sectional study was conducted in purposively selected RMG of Rampura, Mohakhali and Mirpur area of Dhaka city. This study was conducted to know the knowledge status on fire safety management and preventive actions of selected garments factory worker in Dhaka city. Data were collected on fire related factors, fire management and preventive actions, fire safety trainings, and level of fire safety knowledge. All the garments worker working in these garments were participated in the study and ultimately 176 were included and interviewed face to face with an interviewer administered pre tested semi-structured questionnaire. This study

was conducted with the aim to find out the level of knowledge on fire safety among selected 5 garments worker in Dhaka city. A total 176 garment workers were selected to assess the level of knowledge on fire safety. Data were collected by interviewer administered questioner which was translated into local language (Bengali). Statistical analyses of the results were performed by using Statistical Package for Social Sciences (SPSS Inc, Chicago, IL, USA). The results in terms of values and figures were analyzed and during analysis frequency distribution for all the variables were worked out and produced in tabular form. A two tailed p value of 0.05 was considered significant at 95% CI (Confidence Interval) level.

RESULTS

The findings of the present cross-sectional study to the knowledge on fire safety management and preventive actions of selected garment factory workers in Dhaka city showed varied response on different fire factor by the participants. It was found the participants has good knowledge (over 80%) on all fire safety factors studied but less knowledge (36.4%) on exit strategy (Table 1).

Table 1. Distribution of respondents by knowledge on fire safety by multiple choice questioners (n = 167)

Knowledge on fire safety	Percentage (%)
Fire factor	94.9
Materials	93.2
Firefighting	98.3
Exit	84.7
Alarming	84.7
Exit strategy	36.4
Fire prevention	94.9
Fire management	91.5
Emergency exit	93.8
Burn management	92.0
Contents first aid	93.2
Fire drill	79.5
Fire sign	98.3

Multiple responses were found in case of knowledge on way of initiation of fire in the garments factory and it was found that the majority of respondents (93.4%) indicated electricity short circuit as the main cause of fire initiation (Table 2). Whereas, one third (28.7%) of the respondents stated burning due to cigarette followed by chemical (13.2%) and welding (4.8%) for initiating of fire.

Table 2. Distribution of respondents by knowledge on way of initiation of fire (n = 167)

Knowledge on way of initiation of fire	Percentage (%)
Electricity short circuit	93.4
Cigarette	28.7
Chemical	13.2
Welding	4.8

It was observed that most of the respondents (91.5%) know that fabrics are the main combustible material of fire in garments factory (Table 3). One third (29.3%) respondents stated paper as combustible material of fire, including wood, kerosene/patrol, or gas/ chemical.

Table 3. Distribution of respondents by knowledge on combustible material of fire (n = 164)

Knowledge on combustible material of fire	Percentage (%)
Fabrics	91.5
Paper	29.3
Wood	9.1
Kerosene/patrol	8.5
Gas/chemical	12.2

Results showed that maximum respondents use exit door to exit in case of fire accident, while nearly one third of them go safe place during accident (Table 4).

Table 4. Distribution of respondents by knowledge on exit from fire accident (n = 149)

Knowledge on exit from fire accident	Percentage (%)
Exit door	94.0
Safe place	28.2

It was revealed that regarding fire prevention action, among the respondents, more than three quarter (81.4%) answered in favour of 'stop gas burner', more than half (61.1%) suggested 'avoid to use problematic electric wire', more than one third (32.9%) stated 'stop to keep on electric switch on mode', and less than one third (24.6%) told to 'avoid throwing burnt cigarettes' for fire prevention (Table 5).

Table 5. Distribution of respondents by knowledge on fire prevention action (n = 167)

Knowledge on fire prevention action	Percentage (%)
Avoid throwing cigarette	24.6
Avoid to use problematic electric wire	61.1
Stop to keep on electric switch	32.9
Stop gas burner	81.4

Results showed that the strategy of exit from smoke taken by the respondents were either running from smoke source or taking shelter in open space (Table 6).

Table 6. Distribution of respondents by knowledge on exit strategy from smoke (n = 164)

Knowledge on exit strategy from smoke	Percentage (%)
Shelter in open space	53.1
Run from smoke	57.8

Regarding fire management, maximum respondents (92.5%) stated wood, fabrics, paper by water and foam (Table 7). However, some of the participants also claimed about gas ABC powder and liquid flammable foam & CO₂.

Table 7. Distribution of respondents by knowledge on fire management (n= 161)

Knowledge on fire management	Percentage (%)
Wood, fabrics, paper by water, foam	92.5
For liquid flammable foam, CO ₂	11.8
For gas ABC powder	15.5

In Table 8, results indicated that most of the respondents aware of emergency exit door (108.5%) but one fifth (20.0%) of them found to be indifferent about this emergency door of their factory.

Table 8. Distribution of respondents by knowledge on emergency exit door (n = 165)

Knowledge on emergency exit door	Percentage (%)
Yes	108.5
No	20.0

The way of burn management is an important activity to minimize the damage to the victims. The present study indicated that about 71.6% the worker will go for water for relieving suffering of burn injured person for managing burn accident instantly in garments factory, followed by refer to hospital, first aid treatment and dress change (Table 9).

Table 9. Distribution of respondents by knowledge on burn management (n = 162)

Knowledge on burn management	Percentage (%)
Water	71.6
Dress change	25.9
First aid treatment	27.2
Refer to hospital	62.3

Knowledge on the contents of first aid box is important for management of burning of a worker. In the present study, we found that most of the respondents think content should be dettol and cotton (85.4%), painkiller (75.6%) or gaz/bandage (57.3%) (Table 10). However, some of the respondents also thought about burning ointment and oral saline as the content of the first aid box while only few, could indicate local spray, scissors, blade, thread and needles as the necessary content of it.

Table 10. Distribution of respondents by knowledge on first aid box content (n = 164)

Knowledge on first aid box content	Percentage (%)
Painkiller	75.6
Dettol, cotton	85.4
Oral Saline	29.3
Gaz/bandage	57.3
Local spray	1.8
Burn ointment	39.6
Scissors, blade, thread & needle	12.8

Table 11 described the practice on fire drill activities in their garments. Most of the respondents (95.7%) stated emergency alarm, followed by open emergency door and very few only (5.0%) could recognize of operating fire extinguisher during fire drill practice.

Table 11. Distribution of respondents by knowledge on fire drill activities (n = 140)

Knowledge on fire drill activities	Percentage (%)
Emergency alarm on	95.7
Open emergency door	83.6
Operate fire extinguisher	5.0

Regarding different sign about fire safety, all respondent (100.0%) had familiar with fire extinguisher sign, followed by burn cigarette (53.2%), while less than one third respondents had idea either on operating different fire extinguishers sign or on fire danger sign, likewise, remaining very few respondents was familiar with fire action symbol and assembly point sign (Table 12).

Table 12. Distribution of respondents by knowledge on different fire sign (n = 173)

Knowledge on fire signs	Percentage (%)
Extinguisher	100.0
Burn cigarette	53.2
Assembly point	8.7
Danger sign	23.1
Fire action	9.8
Operating system of different extinguisher	24.9

Multiple responses on knowledge on carefulness of fire were conducted and the results indicated that the main way to inform other colleagues to become careful during fire accident instantly (Table 13). Among of the respondents more than three quarter (86.6%) stated by fire alarming, nearly one third (25.5%) by informing fire team, more than one third (32.9%) by running emergency exit door and remaining (15.4%) were avoiding to collect own belongings the way of alarming from fire.

Table 13. Distribution of respondents by knowledge on carefulness of fire (n = 149)

Knowledge on carefulness of fire	Percentage (%)
By fire alarm	86.6
By informing fire team	25.5
By running emergency exit door	32.9
By avoiding collect belongings	15.4

The level of knowledge fire safety management and prevention were varied considerably among three groups (Table 14). More than half (54.5%) of the respondents found satisfactory level of knowledge followed less than half (41.5%) with excellent knowledge and rest few (4.0%) had poor knowledge level on fire safety.

Table 14. Distribution of respondents by knowledge level on fire safety (n = 149)

Knowledge level group	Percentage (%)
Poor knowledge	4.0
Satisfactory knowledge	54.5
Excellent knowledge	41.5

Results revealed that the respondent's service duration is associated with knowledge on fire safety (Table 15). Respondent having more than 3 years length of work experience had better knowledge than those of less than 3 years length of work experience as found statistically significant ($p < 0.05$) relationship with level of knowledge on fire safety. Therefore length of job experience of respondents had positive effect on their level of knowledge.

Table 15. Association between knowledge on fire safety and length of service

Knowledge level on service group	Knowledge level group				Test of significance	P - Value
	Poor	Average	Good	Total		
Less than 3 years	6 (7.7)*	54 (69.2)	18 (23.1)	78 (100.0)	$\chi^2 = 21.834$	0.000
More than 3 years	1 (1.0)	42 (42.9)	55 (56.1)	98 (100.0)		
Total	7 (4.0)	96 (54.5)	73 (41.5)	176 (100.0)		

* Values in parenthesis indicates percentage of the corresponding respondents

DISCUSSION

Burns constitute a major public health problem, and it is estimated that each year over 300000 people die from fire-related burn injuries (WHO 2008). The majority (over 95%) of these occurs in low- and middle-income countries and almost half occur in the WHO South-East Asia Region. Nearly 173000 Bangladeshi children are moderately or severely burnt every year. In Bangladesh, Colombia, Egypt and Pakistan, 17% of children with burns have a temporary disability and 18% have a permanent disability (WHO, Burns, retrieve from: <http://www.who.int/mediacentre/factsheets/fs365/en/>). Bangladesh's garment industry, the second-largest exporter of clothing after China, has a notoriously poor fire safety record. Since 2006, more than 500 Bangladeshi workers have died in factory fires.

Knowledge on fire related factors

The knowledge on way of initiation of fire is the first question of fire safety. The findings of this study provided a common drawback of fire accident in garments industry. In this study majority of respondents outlined the initiation of fire from electric short circuits. A small portion of respondents answered about burnt cigarette, chemical and others. Regarding combustible material for fire, more than ninety percent respondents answered 'fabrics' in the garments factory. It has improved the awareness of the respondents to avoid accident which was found different according to previously published different article of Bangladesh garments sector. All most all of the respondents stated to forward to the exit door serially and early to evacuate from accidental place. Firoz (2011) conducted survey on fire safety of readymade garments worker and he explained detailed on architectural design of readymade garments industry for remarking fire safety. According to his study the major reasons of fire accident such as stampede (25%), blocked exit route (21%), smoke (13%), suffocation (12%), fire itself (8%), and lack of ventilation (4%) in the readymade garments industry. The current study reports are very linked to findings of Ahmed Firoz's study in the sense of the causes of fire accident and evacuation strategy of fire accident. These two issues are more interlinked for fire safety.

Regarding carefulness about fire for own selves and others, it is significantly found that more than eighty percent respondent mentioned to follow the fire alarm and portion of respondent told to forward to emergency exit door, twenty five percent stated to inform fire team and only fifteen percent mentioned to avoid to take their belongings during emergency exit from any accident. For exit from smoke more than half of respondents answered to run away from smoke and nearly half of the respondent stated to take shelter in open space that is reflecting workers awareness of fire accident due to recent different fire accidents in Bangladesh.

Knowledge on fire management and preventive actions

Fire management is one of the important steps to prevent fire accident. The current study found most of the respondent has knowledge on fire management process like papers, fabrics and wood by water. It is good sign for household fire accident that they can prevent fire accident in their house. on the contrary it is alarming that the unavailability of water is very dangerous in the garments as respondents have less idea about other material to manage fire e.g., ABC powder, CO₂ gas etc. As a result fire accident in the garments factory day by day increasing due to lack of technical knowledge on fire management of workers.

Regarding prevention action of fire accident, more than eighty percent respondent answered perfectly to stop the gas burner after cooking and it is very effective measure for household which is less relevant for garments

factory. Beside this, more than half of respondent told to avoid problematic electric wire while it is most effective preventive action for fire safety of garments factory in Bangladesh. It was found in an article that Garments factories or units are built unplanned. An entrepreneur can easily hire a building floor at any location in the country and can start garment business. Mirpur and Rampura are the two most common areas where about 600 garments factories are set up and run without any plan. Most of the buildings are multistoried and has very limited space for workers to get out into safety. In most cases in urban and sub-urban areas the factories get accommodated usually in bigger building constructed as residence or shopping markets and stampedes and casualties in those locations are dangerously high. The study also found very good findings that most of the respondents knows about the emergency exit door which is open always now though previously emergency exit door was closed before Tazreen fire accident and Rana plaza building collapse in Bangladesh. The Tarzeen factory fire incident has raised the level of awareness among the apparel makers. Factory owners are now paying their top attention to prevent any future incident like the recent fire accident.

Now factory owner and management are more aware to prevent any accident and it will be good for our country if the emergency exit door always open practice continue in future and regularly. Accidental death will be reduced from garments factory. A three quarter respondents told about water to manage burnt patient firstly and more than half of the respondents stated to refer in hospital while very few of respondents mentioned about changing the dress and use first aid box or home remedy for managing burnt person. On the content of first aid box, more than eighty percent of respondents told about savnol, cotton, more than seventy percent indicated of painkiller and other respondents told about remaining materials. It is found that more or less all of respondents have the knowledge on first aid box material at least workers are aware about this box.

Fire safety trainings

After couple of big accident in garments factory resulting death of more than thousands worker, factory owner and management are now conducting regular fire drill in the factory. While it is good lesson to aware about fire accident and exit urgently from factory. Around all of respondents told about emergency alarm and more than eighty percent mentioned emergency exit door open during fire drill as the fire prevention measures. As a result, workers are becoming more trained from fire drill in the factory regularly. Total six common sign used in the current study on fire accident which are existing in all garments factory though all respondents known only fire extinguisher, half of the respondent told about burnt cigarette, followed by less than quarter portion of respondents have known fire danger sign, mostly similar number of respondent told about operating system of different extinguisher and oppositely very few percentage of respondents were known about assembly point and fire action sign. There was an article about compliance checklist for garment industry regarding fire safety is listed such as sufficient fire extinguishers all in good working condition, fire extinguisher location list, fire extinguisher service checklist, fire extinguishers color background marking, evacuation drill (external) demo every six month, evacuation drill (external) file, evacuation drill (internal) every three month, evacuation drill (internal) file, sufficient fire safety trained employees, fire buckets to diesel storage area with water and sand, fire buckets to boiler room with water and sand, fire buckets to Genset room with water and sand, evacuation plan in all floor/ area, emergency exit, emergency exit in the open, emergency exit signage, emergency exit with outside open facility, signage emergency electrical switch off.

Level of Knowledge

The current study scored the level of knowledge of the respondents on fire safety management. Among the respondents more than half reported satisfactory knowledge and more than quarter found excellent knowledge on fire safety and a very few of them had poor knowledge on fire safety. There is no similar study conducted in Bangladesh to assess the knowledge on fire safety management. That's why it is difficult to compare the current study findings. The study also found that the respondent's service duration is associated with knowledge on fire safety. It also showed that more than 3 years length of work experience respondent had better knowledge than lesser of 3 years length of work experience respondents as found statistically significant ($p < 0.05$) relationship with level of knowledge on fire safety (Table 15). Therefore, length of job experience of respondents had positive effect on their level of knowledge.

CONCLUSION

From the aforesaid results and discussion it can be conclude that participants had good knowledge (over 80%) on all fire safety factors studied. In addition, the majority of the respondents mentioned the following comments on major categories of fire safety management and prevention. Such as electricity short circuit is the major cause of fire initiation, fabrics are the main combustible material of fire, maximum number of worker use exit door to exit in case of fire accident, most of the respondents aware of emergency exit door, they use water for relieving suffering of burn injured person, most of the respondents recognized emergency alarm during fire drill practice, and respondent having more than 3 years length of work experience had better knowledge than those of less than 3 years length of work experience. Therefore length of job experience of respondents had positive effect on their level of knowledge.

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