The Prevalence and Risk Factors of Post-Traumatic Stress Disorder Among Workers Injured in Rana Plaza Building Collapse in Bangladesh

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Objectives *Prevalence and risk factors of PTSD among injured garment workers who survived a major factory collapse.*
Methods *Survivors receiving treatment or rehabilitation care at one year post event were surveyed, which included Post Traumatic Stress Disorder Checklist Specific version.*
Results *The respondents consisted of 181 people with a mean age of 27.7 years and a majority had less than high school education (91.2%). Multivariable logistic regression found that the odds of having PTSD was higher among married (OR: 3.2 [95% CI: 1.3–8.0]), those who used to work more than 70 hr/week (OR: 2.4 [1.1–5.3]), workers who used to hold higher job positions (OR: 2.6 [1.2–5.6]) or who had a concussion injury (OR: 3.7 [1.4–9.8]). Among the respondents, 83.4% remained unemployed, and only 57.3% (63 people) reported receiving a quarter or less of what they were promised as compensation.*
Conclusions *Probable PTSD was prevalent among surviving workers of the Rana Plaza building collapse in Bangladesh.*

BACKGROUND

Over the last few decades, Bangladesh has become a preferred location internationally for outsourcing garments production and is now one of the top garment exporters in the world [USAID, 2014]. However, the absence of adequate and appropriate policies, programs and practices of workplace health and safety has forced many Bangladeshi workers to work in hazardous conditions, for long hours, and for very low wages. Workers are likely to accept low wages as the poverty level, and unemployment rate are very high in this country. The minimum wage for garment workers was as low as about 3,000 Taka ($38) per month [Yardley, 2013] and was only recently raised to about 5,300 Taka in late 2013, as a result of negative media coverage and tremendous pressure from a wide range of stakeholders including local and international worker advocacy groups, Western buyers and brands, NGOs, and donor agencies and countries [Yardley, 2013]. In addition to poor wages and hazardous working conditions, there were structural problems in some of these factory buildings, and the fire safety systems were also frequently substandard. These conditions resulted in a series of catastrophic tragedies in the last few years in the vicinity of the capital city Dhaka where many of these factories are located. The most recent disaster was a multistory factory collapse (called Rana Plaza) that resulted in over 1,120 deaths and 2,000 injuries with many victims remaining missing [Bolle, 2014; Motlagh, 2014]. A factory fire (in Tazreen) killed around 150 workers a few months previously. Workers who survive these disasters face not only major physical ailments but also mental health sequelae. One such disorder is post-traumatic stress disorder (PTSD).

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PTSD has been reported to be associated with depression, substance abuse, sleeping difficulty, difficulty in finding employment, and an overall decrease in perceived health status [Brady, 2000; Cloitre, 2001; Maes, 2001]. PTSD has become an important health outcome of interest in recent years especially as a consequence of human conflicts and natural disasters. However, very little is known about development of PTSD and its risk factors in relation to industrial disasters in resource-poor countries. Untreated or ignored mental health issues may lead to slower recovery of physical ability among the injured individuals, failure of skill-trainings/re-employment programs they are enrolled in, and a sustained decline in overall well-being over time. Individuals with PTSD have been reported to miss more days of work, have higher rates of suicidal ideation and have more marital problems [Hidalgo and Davidson, 2000; Kessler, 2000]. The economic, social, personal, and family burden associated with PTSD is predicted to be very high, especially in resource-poor countries.

According to the Diagnostic and Statistical Manual *of Mental Disorders* (DSM), PTSD consists of three clusters of symptoms: intrusion, avoidance/numbing, and increased arousal. Intrusion occurs when the stressor (i.e., memory of the traumatic event) persists well after the event, often through flashbacks or uncontrollable memories of the event. Avoidance occurs when the individual intentionally or unintentionally avoids certain stimuli that remind him/her of the traumatic experience. Emotional numbing describes when a person is unable to feel positive emotions or feels distant from others. Finally, increased arousal includes hyper-vigilance and outbursts of anger or irritability. Researchers have proposed models that break down the risk factors for development of PTSD into pre-event, peri-event, and post-event [Maes, 2001; Cerda, 2013]. A modified version of this model is proposed by this research team (Fig. 1).

Strong protective policies, programs and practices in the workplace have improved workplace health and safety greatly in industrialized countries. Some of these reforms include application of improved ergonomics and industrial hygiene practices, timely medical care, thorough engineering assessment and controls, and better safety knowledge in workers and supervisors. The majority of workers who are evaluated and treated for work-related illness or injury return to work without unexpected delays or incur serious disability. Injured individuals have access to workers' compensation claims to cover most of their healthcare and wage loss costs. However, this is not the case in many countries like Bangladesh, where worker injuries and occupational and environmental health in general may be considered as a low priority to intervene by the policy makers. Therefore, the risk and consequences are both very severe for these workers. The risk factors and diagnosis of Post-Traumatic Stress Disorder (PTSD) have rarely been studied in a worker population post factory disasters in developing countries, and the aim of this study is to address some of these knowledge gaps with a focus on recently injured garment factory workers in Bangladesh.

METHODS

The study population consisted of the survivors from the Rana Plaza disaster who were receiving treatment and/or rehabilitation care at the Center of Rehabilitation of the Paralyzed (CRP) in Savar 1 year after the factory collapse. CRP is the largest non-government care provider in Bangladesh for people with injury and disability and happens to be located close to the factory that collapsed. A convenient sample of these workers was surveyed at the CRP facility between April 22, 2014 and May 22, 2014. This survey included general questions on the workers and two standardized health assessment tools: 1) the Post-Traumatic

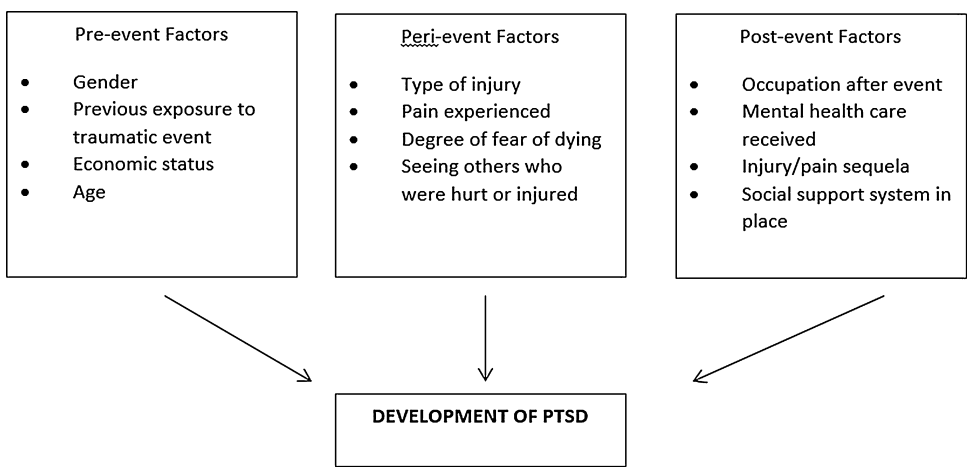

FIGURE 1. Conceptual model for PTSD development.

Stress Disorder Checklist Specific version (PCL-S) and 2) the World Health Organization Disability Assessment Schedule (WHODAS). The general questions collected data on demographics, work history at Rana Plaza, injury sustained as well as treatment or care received after the disaster (both physical and mental) and their current health status, economic conditions, employment profile, and type and amount of compensation received.

The WHODAS 2.0 was selected, because it has good cross-cultural sensitivity and takes a multi-dimensional look at disability [Ustun, et al, 2010]. Study protocol and translated instruments were reviewed by the research department of CRP and a disability expert from the German aid agency- Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ). The translated surveys were then piloted by a group of CRP-based health care providers on a sample of visiting care recipients for further modifications to improve clarity of the questions. The language was carefully selected so that workers with primary school level literacy could read, interpret, and answer. Finally, we recruited a team of students as local translators and survey administrators to aid the research team with conducting the study and collecting the data. These translators also helped in gaining consent from the participants and read the surveys when they needed assistance. The consent was written; if the participants could not read then the consent was read to the participants and they signed. The study participants were recruited by two means: 1) participants were interviewed after having a previously scheduled regular appointment with a physician, for physical therapy or vocational training at CRP and 2) some who lived in a nearby village were invited to come to CRP to participate in this study. All these participants were reimbursed for their time and travel expenses.

Data were manually entered into Microsoft Excel;Stata version 13 was used for statistical analysis. The primary outcome of interest was development of probable PTSD, which was assessed by PCL-S score. The cut-off score of PCL-S-50 was chosen to categorize the individuals. This cut-off was proposed by the developers of this instrument and has been subsequently used in other research studies with an 80% diagnostic power [Forbes, 2001]. This cut-off has a sensitivity of 0.78–0.82 and specificity of 0.83–0.86 [Blanchard et al., 1996]. Student's t or Wilcoxon rank sum tests were used to compare the means of continuous variables and χ^2 test and Fisher Exact tests were used to compare the proportions. Univariate and multivariable logistical regression modeling were used to evaluate the risk factors associated with probable PTSD diagnosis.

TABLE I. Characteristics of the Study Sample (n = 181): Rana Plaza Survivors

Variables		N (%) or mean (sd)
Demographics		
Females		110 (60.7%)
Mean age		27.8 (7.5)
Education		
	No schooling	42 (23.2%)
	<High school	123 (68%)
	>=High school	16 (8.8%)
Married		138 (76.2%)
No of dependents		2.6 (2.1)
Work related		
Average hours worked per week		80.7 (18.7)
Years worked in the factory		1.7 (1.8)
Job class		
	Supervisor/technician/engineer/other	78 (43.1%)
	General workers	103 (56.9%)
Department		
	Cutting	11 (6.1%)
	Sewing	113 (62.4%)
	Finishing	20 (11.1%)
	Quality control	18 (9.9%)
	Other	19 (10.5%)
Injury & care received		
Received treatment		177 (97.8%)
Type of injury*		
	Superficial	47 (26.0%)
	Fracture	77 (42.5%)
	Dislocation/sprain/strain	38 (21.0%)
	Amputation	8 (4.4%)
	Concussion, internal Injury	39 (21.6%)
	Crush/pressure injury	73 (40.3%)
Body parts injured*		
	Face/head	44 (24.3%)
	Neck	14 (7.7%)
	Back	93 (51.4%)
	Trunk/internal organ	39 (21.6%)
	Upper extremities	37 (20.4%)
	Lower extremities	85 (47.0%)
	Whole body	3 (1.7%)
	Other	4 (2.2%)
Days of hospital stay		24.5 (46.1)
Received counseling		67 (37.0%)

*The total is more than 100% as workers sustained multiple types of injury and multiple body parts were injured.

RESULTS

Of all the injured workers who were invited to participate, all but two participated; both were unable to participate due to continuing health problems. Table I shows the characteristics of the participants. Study participants consisted of 181 people of whom 110 (60.7%) were female. The mean age was 27.7 years. A majority had less than a high school education (n = 165, 91.2%) and were married (n = 138, 76.2%). On average, they had 2.6 dependents. They had worked for about 1.7 years at a garment factory

before the incident and reported to be working on average about 80.7 hr per week. They were earning about 9,786 Taka a month (approximately 130 USD/month or 0.40 cents/hr). General workers accounted for 56.9% and higher level employees such as supervisors, technicians or engineers accounted for the rest. Workers primarily worked in the sewing (62.4%) and finishing (11.1%) departments.

After the disaster, almost all of the participants (n = 177, 97.8%), received immediate treatment for physical ailments. Crush/compression injuries (n = 73, 40.3%) and fractures (n = 77, 42.5%) made up the major types of injuries. Average stay at the hospital was 24.5 days. Sixty seven (37.0%) of these participants received mental health counseling at some point during the one year after the disaster.

The prevalence of probable PTSD was 60.2% in this study population. As shown in Table II, probable PTSD prevalence was found to be higher in certain groups such as among those who were married [64.5% vs. 46.5%], working >70 hr per week [67.2% vs. 43.4%]; those with higher job class [73.1% vs. 50.5%] and those with a concussion injury [82.1% vs. 54.2%].

Logistic regression modeling was used to further evaluate the factors associated with probable PTSD. Table III shows the results of both univariate and multivariable logistic regression models. The final model was adjusted for gender, age, education, employment, number of dependents, years worked at the factory and those who received counseling. Those who were married (OR:3.23, 95%CI:1.30–8.04, *P*-value: 0.012), who used to work more than 70 hours per week (OR: 2.44, 95%CI:1.13–5.26, *P*-value: 0.023), who held higher job classes (OR:2.63, 95%CI:1.23–5.59, *P*-value: 0.012), and who sustained a concussion injury (OR: 3.68, 95%CI:1.38–9.81, *P*-value: 0.009) had significantly higher odds of having probable PTSD in the adjusted model.

In addition to the primary study outcome of PTSD, questions were also asked about current employment, compensation received, and economic status. These participants reported that their healthcare costs were paid for in part by the government, banks, foreign funds, and donation from various hospitals/health care facilities such as CRP. Family members also assisted paying for healthcare costs.

With regard to employment, 151 (83.4%) of the participants remained unemployed. The 30 respondents who reported to have some earnings mentioned owning cattle, working in grocery shops/bakeries, or working as tailors. None of the respondents had returned to work in a garment factory.

A total of 101 individuals answered the question about compensation and stated that they had been promised to receive some compensation from different sources. However, only 63 people reported to have received a quarter or less of what they were promised. In addition, a total of 98 people reported that the compensation they received did not cover or only partially covered all the medical expenses and other financial losses incurred after the disaster. Only one participant stated that all of the costs incurred after the incident had been covered by the received compensation.

DISCUSSIONS

This study conducted on Rana Plaza survivors shows that one year after the incident, the prevalence of probable PTSD was very high (60.2%) in this population. This estimate is similar to other study findings that have reported PTSD prevalence between 25% and 75% post-one year after man-made disasters [Galea, 2005]. In our initial regression model, those with a higher disability score (WHODAS) were found to have a statistically significant risk of having PTSD. However, WHODAS score was not included in the multivariable model as both WHODAS and PTSD scales have overlapping mental health questions. The final model reported that being married, working for more than 70 hr per week, holding a high job class, or sustaining a concussion injury were highly associated to having probable PTSD.

PTSD is a highly prevalent health condition among affected individuals in post disaster settings. Immediate and effective intervention may help in early recovery in many cases. PTSD has been extensively studied in the USA among active duty military service members and veterans who sustained injury in the battlefields. According to the U.S. Department of Veteran Affairs (VA) and *PTSD Research Quarterly*, the PTSD diagnosis among veterans returning from operations in Afghanistan and Iraq is around 10–18% [Litz, 2009]. Currently there are several different methods of providing care for PTSD, each with varying degrees of efficacy. The International Society for Traumatic Stress Studies has released an evaluation of various methods of PTSD treatments; re-exposure therapy and cognitive processing therapy have been listed to be most effective.

There is much discussion in the current scientific literature about the association between PTSD and mild traumatic brain injuries (TBI) or concussions. Some studies reported an association between higher PCL-S scores and TBIs [Walker, 2014], others reported PTSD risk nearly doubled in those who experienced a TBI in combat [Yurgil, 2014]. No association between non-traumatic TBIs and PTSD has been observed, however, by one study [Hodge, 2014]. In our study population, there was a significant association found for those who reported having a concussion injury and having PTSD. Many different factors, including increased worry about life, have been shown to correlate with development of PTSD. In addition, actual anatomical damage in the brain as a result has been thought to play a role in PTSD development but there are still many unanswered questions in this regard [Lanius, 2006; Acosta, 2013].

TABLE II. Probable PTSD Prevalence by Characteristics Among Rana Plaza Survivors

	Probable PTSD		
	Yes (n = 109)	**No (n = 72)**	***P*-value**
Socio-demographics			
Gender			
Female	72 (65.5%)	38 (34.6%)	0.073
Male	37 (52.1%)	34 (47.9%)	
Age (Yrs)	28.0 (7.5)	27.4 (7.4)	0.649*
Education			
No schooling	27 (64.3%)	15 (35.7%)	0.610
Less than high school	74 (60.2%)	49 (39.2%)	
High school or greater	8 (50.0%)	8 (50.0%)	
Marital status			
Married	89 (64.5%)	49 (35.5%)	0.035
Not currently	20 (46.5%)	23 (53.5%)	
No. of dependents	2.4 (2.1)	2.8 (2.2)	0.239*
Current employment status			
Employed	16 (53.3%)	14 (46.7%)	0.399
No	93 (61.6%)	72 (38.4%)	
Work related			
Hours worked per week			
$\leq$70 hr	23 (43.4%)	30 (56.6%)	0.003
$>$70 hr	86 (67.2%)	42 (32.8%)	
Years worked in the factory	1.7 (1.7)	1.7 (1.7)	0.664*
Job in factory			
Supervisor/technician/engineer/other	57 (73.1%)	21 (26.9%)	0.002
General worker	52 (50.5%)	51 (49.5%)	
Injury & care			
Received treatment	106 (59.9%)	71 (40.1%)	0.541
Average hospital stay (days)	26.7 (51.3)	21.2 (36.4)	0.858*
Counseling received			
Yes	38 (56.7%)	29 (43.3%)	0.460
No	71 (62.3%)	43 (37.7%)	
Injury sustained			
Concussion	32 (82.1%)	7 (18.0%)	0.002
Crush	42 (57.5%)	31 (42.5%)	0.544
Fractures	44 (57.1%)	33 (42.9%)	0.467
Dislocation	21 (55.3%)	17 (44.7%)	0.482

Notes: *P*-values are from χ^2 test, *P-values are from Wilcoxon rank sum test.

Some studies have reported strong social support to be protective against PTSD [Ozer, 2003; Pietrzak, 2009]; however, in this study, those who were married were more likely to report PTSD. One explanation is that in this highly socio-economically disadvantaged population in a developing country it is not likely that the spouses are aware of these health conditions and therefore not ready to provide any support. This could lead to more stress in the spousal relationship as a result. Other studies have supported this: increased relationship distress can cause PTSD rates to be higher [Manguno-mire, 2007]. Another cause could be related to the financial hardship coming out from such a disaster. As the majority of the participants remained unemployed, this could create relationship distress between spouses.

Having worked more hours and having a higher job position were also found to be predictors for probable PTSD development. It has been hypothesized before that having higher level of stress is associated with higher vulnerability to PTSD; this can explain why people in a position of higher responsibility would be more likely to develop probable PTSD. In addition, those who worked more hours might be

TABLE III. Logistic Regression Model for Probable Post-Traumatic Stress Disorder (PTSD) Among Study Participants

	Univariate model		Multivariable Model	
Variable	**OR**	**95%CI**	**OR**	**95%CI**
Gender				
Male	1		1	
Female	1.74	0.95–3.20	1.48	0.70–3.14
Age (years)	1.01	0.97–1.05	0.99	0.94–1.05
Education				
No schooling	1		1	
<High school	0.84	0.41–1.74	1.43	0.57-3.53
>=High school	0.56	0.17–1.78	0.93	0.21-4.03
Marital status				
Other	1		1	
Married	2.09	1.04–1.58	3.23	1.30–8.04
Dependents (number)	0.92	0.80–1.06	0.94	0.79–1.12
Current employment status				
Employed	1		1	
Unemployed	1.4	0.64–3.09	1.81	0.71–4.60
Hours worked per week				
≤70	1		1	
>70	2.67	1.39–5.15	2.44	1.13–5.26
Years of work experience	1	0.84–1.18		
Job class				
General workers	1		1	
Supervisor/tech/engineer	2.66	1.42–5.01	2.63	1.23–5.59
Days of hospital stay	1	0.99–1.01		
Counseling received				
No	1		1	
Yes	0.79	0.43–1.47	1.12	0.56–2.25
Concussion				
No	1		1	
Yes	3.86	1.60–9.32	3.68	1.38–9.81
Crush/compression injury				
No	1		1	
Yes	0.83	0.45–1.51	0.64	0.31–1.33
Fracture				
No	1			
Yes	0.8	0.44–1.45		
WHODAS score	1.18	1.11–1.26		

Notes: WHODAS scores was not used for final model due to significant correlation with PTSD score.

from lower socioeconomic status or suffering from greater financial hardship after the collapse. These factors could elevate the risk for probable PTSD.

Notably, there was no significant association found in this study between counseling received and having probable PTSD. One explanation can be that the care received by the survivors focused more on physical ailments and disability and the counseling they received might not have been that effective. Focused PTSD care/counseling in general may not available or be up-to-date in a resource-poor country like Bangladesh. This research identified an unmet and growing need of delivering PTSD related care in developing countries where factory workers and the population in general remain highly vulnerable to man-made and natural disasters.

These injured workers remain to be in desperate need of assistance as only 17% reported having some sort of gainful employment or are engaged in income generating activity. This economic vulnerability creates additional difficulty as these injured individuals continue to need high level of care for the numerous mental and physical health issues incurred after the disaster. The ongoing skill-redevelopment programs or employment and income generating programs and activities are yet to realize the full benefits. Most of these workers were severely injured and the high level of trauma experienced will obviously take more time to heal and re-integration into the workforce can take more time.

One of the secondary study objectives addressed promised and received compensation. An overwhelming majority of injured workers reported that they did not receive the full amount of compensation that they expected to receive from different sources. Of 101 respondents, only 2.2% stating they received what they were promised they would receive. In fact 57.3% reported receiving less than a quarter of what they were told they would receive. Multiple newspaper reports support this finding that timely and adequate compensation have not yet been disbursed to these workers for various reasons. However, this study finding was based on self-report from a group of severely injured workers who were living in extreme economic vulnerability. The respondents had reasons to be highly aggrieved and any assistance received might be under-reported with the hope that findings from such a study might help to generate more attention globally on their distressful conditions and may bring in more compensation for them. It is no surprise that only one interviewed person reported to have received an amount that recovered all the losses he/she incurred.

Limitations of this study include inability to recruit more of the affected individuals. We collected data from 181 of the estimated 500 Rana plaza victims who received care at CRP. The study population had a larger proportion of male workers compared to the proportion of males who usually work in the garment sector. This could either be due to the fact that men seek out medical care more frequently or they have a greater cultural/social capacity to access care. We took a convenience sampling approach and workers with extremely severe injuries, or minor injuries, might not be coming to the CRP any longer for receiving care and hence were excluded. Although this study suggests that physical disability is related to having PTSD, longitudinal studies are needed to examine retention of PTSD over time. Another limitation of this study is that the DSM-V was released during this study, which separates avoidance and numbing into two distinct

categories (because avoidance must now be demonstrated for a diagnosis of PTSD regardless of other symptoms). In addition, the DSM-V broadened the arousal category to include additional subcategories. The PCL-S was designed with the original criteria of the DSM-IV. However, the original definition of PTSD in the DSM-IV is still included within the definition in the DSM-V and the health consequences have not been changed. This study did not collect data for other co-morbid conditions such as depression or previous TBI, which might influence health outcomes as reported by this population.

This study highlights a need of training mental health care professionals in resource poor countries. Educating the general public on mental health disorders like PTSD is also necessary as many in Bangladesh may not know about or view this as a disabling condition. Finally, this study suggests that the type of injury sustained and level of physical disability incurred may help in identifying injured population who are at high risk for developing PTSD.

The garment industry in Bangladesh continues to grow, both in terms of production and number of workers. Bangladesh currently has more than 4,500 garment factories, which employ more than 4 million workers. Most of these workers are young women (17–35 years) who migrate to the capital city Dhaka and its vicinity from rural areas. The industry is critical to the national economy as a primary source of employment and foreign currency. The United States and Europe have been the major buyers of garments from Bangladesh.

Facing intense international pressure to improve working and living conditions of garment workers, the Bangladesh government amended the country's labor law in July, 2013, which 1) established a welfare fund for employees, 2) made it easier for workers to unionize, and 3) added some protections on fire and building safety (strengthening requirements for permits when a factory adds floors). Despite criticism from worker advocates about the weaknesses of the amended laws, it remains to be seen how the government and foreign buyers and brands' interventions improve the living conditions of workers and ensure a safer working environment. As of 2012, Bangladesh had by far the lowest minimum wage among the top five exporters of garments to the US [Wages, 2012]. In November of 2013, Bangladesh passed legislation increasing the minimum wage by 77% to 5300 Taka. This change came in response to mass protests by garment workers that shut down nearly 250 factories [Devnath, 2014]. The United States Agency for International Development [USAID, 2014] prepared a report in July, 2014, describing possible programs that could further improve conditions for workers in Bangladesh. The goals that USAID outlines include increasing worker representation (through increased unionization, coordination between unions in various sectors, and incentivizing labor-management cooperation), empowering women workers (protecting them from gender-based violence and increasing the number of women in management roles), and improving labor peace (by training workers in alternative means of protest and by increasing communication between workers, management and police) [USAID, 2014].

The ILO Constitution sets forth the principle that workers should be protected from sickness, disease and injury arising from their employment. Due to mounting social and public pressure and rising consumer expectations, enterprises are increasingly being expected to go beyond their legal requirements and act more responsibly. Creating workplaces that are safe, healthy, and prevent illness, is one way in which companies can meet these rising expectations. This can have the additional benefit of improving productivity and competitiveness. Workplace injuries, illnesses and deaths cause physical, financial and emotional hardships for individual workers and their families. This financial hardship also affects the employers as well by losing skilled workers, morale, productivity, work loss, and property damage. Simple workplace programs, policies and practices, like having firefighting capability and access to appropriate emergency exits could have prevented many of the horrifying and fatalities in Bangladesh. In addition, regular review by certified inspectors of building structures would ensure electrical and foundational safety in many of these factories.

Health and safety prevention measures to protect the workforce are crucial in rapidly industrializing countries, and Bangladesh has become a global test case to show how a country can benefit economically from an outsourced industry and at the same time improve the health, safety and well-being of its workers. This study also suggests that foreign retailers who promised to pay for some of the treatment and rehabilitation costs for these workers have not fulfilled their promises.

ETHICS

Human subject ethics approval for this study was obtained from the School of Medicine at UT Health Science Center, Texas and from the Center of Rehabilitation of the Paralyzed (CRP) in Bangladesh.

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