

Case Study on Vulnerable Pedestrian: Garment Workers' Road Safety Education Source

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Abstract: *Roaming safer as vulnerable pedestrian are composite learning chores. Education is the focal prior for the growth of a nation. In the arena of acquiring knowledge, safety education governs a dynamic role in influencing the approaches and behaviors of pedestrians. So, road Safety education is a lifesaving advancement. For improving road safety education, it requires the involvement of diversified sources. Due to lack of consciousness and acquaintance, now a days pedestrian injuries commencing road traffic accident is a prominent public health concern all over the world. The objective of this study is to observe the percentage of refined pedestrian and to pinpoint the sources that may affect the vulnerable road user's behaviors to become safety concern. As the economy of Bangladesh is extensively hooked on the Ready Made Garments (RMG) industry and the mode of transport of these substantial percentage of user is walking, that's why for this research garment workers are nominated as vulnerable pedestrian. Numerous study supports that this domineering communal has toppled under intense extortion of road accident. To serve the purpose of this research near about 500 samples have been collected from 8 different renowned garment industries which are previously identified as most prominent road accident zones. This study demonstrates through logistic regression model to analyze and detect the edification source of this convinced civic of the society through noteworthy exploration in perception depending on innumerable aspect, which is going to be promoted as the development of safety educational view among the vulnerable pedestrian. Indeed, this study enhance the policy makers to corroborate this affected societies and take the plunge to increase pedestrian safety awareness in an incredible percentage through schooling of that notorious quota.*

Keywords: *Accident analysis, Garments worker, Pedestrian, Education*

1. Introduction

The Ready-made garment (RMG) industry occupies a unique position in Bangladesh economy. It is the largest exporting industry in Bangladesh, which experienced phenomenal growth during the last 25 years. Recently WTO has ranked Bangladesh as the 4th largest exporter of RMG in the world. This sector contributes for 75% of foreign currency earning for Bangladesh. Textiles and RMG sector contributes 13% of GDP and employs more than 3,000,000 people. It has brought benefit and blessings for millions of people in the country. This industry has played a significant role in elevating economic and living standard of millions of families all over the country [1]. Bangladesh's export earnings are mostly determined by the export of RMG to North American and European countries with 75% of total export earning coming from this sector. Quite understandably, the economic crisis in those countries unnerves this sector [2].

The economic performance of the apparel and textiles industry in developing countries has large impacts on employment opportunities (especially for women) and GDP as well. Bangladesh, a typical developing country, which is also considered as a leader in the RMG sector can be a good example to it. Since the start of its garment export industry in the late 1970s, Bangladesh has seen its RMG export levels grow steadily and has become a top global exporter. With around USD 15 billion in export value in calendar year 2010, the RMG industry is

currently Bangladesh's most important industry sector (13% share of GDP and total export share of over 75%) [3]. With 12% average annual growth rates, clothing exports are the key driving force behind GDP development (& percent CAGR from 1995 to 2010). With a current 5,000 RMG factories employing about 3.6 million workers from a total workforce of 74 million, Bangladesh is clearly ahead of Southeast Asian RMG suppliers in terms of capacity offered (e.g., Indonesia has about 2,450 factories, Vietnam 2,000, and Cambodia 260 factories)). Other markets, such as India and Pakistan, would have the potential to be high-volume supply markets, but high risk or structural workforce factors prevent utilization of their capacity [3]. Despite the beneficial growth of our RMG industry, challenges are still there. One of the biggest challenges currently faced by our RMG industry is to ensure workplace safety and better working conditions for the millions of garment workers. We are facing some safety problems in both garments environment and outside the garments. Safety need for the worker is mandatory to maintain in all the organization. However, without the facility of this necessary product a lot of accident is occur incurred every year in most of the company.

In Bangladesh, with a low level of motorization, the role of walk mode is quite significant. Indeed walking appears to be a major contributor to sustainable transport strategy. It is the motorists, not pedestrians, who normally receive much attention and a greater share of priority. Pedestrians deserve and need protection in the form of facilities by ensuring their legitimacy, safety and convenience. Pedestrians, being physically unprotected, are thus considered to be the most vulnerable user group and demand a priority consideration in road safety strategies [4]. Pedestrians are the most vulnerable road users in Bangladesh. Upto 50% of urban road accident deaths are pedestrians alone. In Dhaka Metropolitan City roads are hostile to pedestrians, and the danger and inconvenience of walking in turn leads people to use rickshaws CNG, baby taxis or other motor vehicles just make the traffic worse and the city more hostile to pedestrians – a vicious circle. Yet pedestrians have received far less attention than vehicular traffic.

In terms of road usage, at some locations, pedestrians accounted for the highest number, representing nearly 62 percent of the total user groups in Dhaka, the capital of Bangladesh. In regard to safety, the pedestrians are of considerable cause for concern as they represent up to 72 percent of road traffic fatalities in Dhaka Metropolitan City. Pedestrian accidents are a serious and growing problem in Dhaka city. Low motorization levels, unplanned haphazard land use, road side industry, inadequate pedestrian facility and the severe lack of priority and attention given to pedestrians in the traditional transport planning and traffic management actions is the main causes of such dangerous situation. As we know the majority of the garments workers choose walking as their mode of transport and they fall under pedestrian category. Thus they are most vulnerable group and under massive threat. Proper safety education can help this cause of reducing the road traffic accidents of garment workers. Thus the target of this study was to find the garments worker who are getting safety education and who are not. Our objective of the study is to find out how much safety education the garments workers are getting and how it is affecting their safety. Safety education will raise their awareness and reduce the accidents of these garment workers. From the study we will be able to know among the garments workers which category of worker needs the safety education. By this study we can get information from sample that which category people have got their safety knowledge from which sources. As for example, readymade garments workers are divided into many categories based on their socio-economic, demographic features, for example, age, education, income etc. and many more. Considered sources of education are television, radio, newspapers and traffic police week. This study will help to identify which category people have gained traffic safety knowledge and which category of people don't get safety knowledge from the considered sources. From the policy perspective, this study will assist to identify the most vulnerable group of RMG workers who need safety education on priority basis.

2. Method

In this study, the target population for the random collection of survey samples consists of workers in the following garments factories:

- Sayem fashion ltd.
- Radiant sweater industries ltd
- Savar Sportswear company ltd.,
- Aziz Group Of Industries
- M/S Spicy Fashion Ltd.

- Goldstar Garment Ltd
- Big Boy's apparels ltd.
- Islam garments

2.1. Justification for choosing the sites:

The first two industries are located in a spot near the Dhaka- Mymensingh highway (Total no. of accidents 831, from 1998-2010), and third one is near Dhaka-Ashulia Highway, which are one of the most accident prone zones of Bangladesh where a large number of victims are shortlisted to garments workers only. Fourth one is located at Tejgaon industrial area, Dhaka, fifth one is located at Mirpur, sixth one is located at Shamoli & the last two is located at Gulshan area, Dhaka. These two are also accident prone zones (Total no of accident 9125, from 1998-2010) [5]. The authors believe that these garments would fix and fit to most average pictures of the situations throughout the Dhaka city regarding situations where garment industries are located alongside of a major highway.

2.2. Questionnaire Design

A study based on students' perception as pedestrian risk [6] was consulted for the design of questionnaires for this study. Some of the questions are directly relevant to this study and are accepted as it is; some has been curved to make it appropriate with the objective of the study. Pedestrian safety education was assessed by a scale using two terms with response categories "Yes" or "No" to measure whether the concerned worker has any safety knowledge. Later this response has been converted as dependent variable by expressing in binary variable (1= knowledge obtained from different sources. In our study the response variable get any safety knowledge or have no idea about safety education, is a binary or dichotomous variable

2.3. Statistical Modeling

Logistic regression model has been utilized in this study which is one of the most widely studied and applied statistical and econometric techniques. In this model, the logit is the natural logarithm of the odds or the likelihood ratio that the dependent variable is 1 (have safety education) as opposed to 0 (non-safety knowledge). The probability P of a hit-and-run is given by

$$Y = \text{logit}(P) = \ln(P/1-P) = \beta X \dots \dots \dots (1)$$

Where β is a vector of parameters to be estimated and X is a vector of independent variables. When an independent variable x_i increases by one unit, with all other factors remaining constant, the odds increase by a factor $\exp(\beta_i)$ which is called the odds ratio (OR) and ranges from 0 to positive infinity . It indicates the relative amount by which the odds of the outcome (safety knowledge) decrease ($OR > 1$) or increase ($OR < 1$) when the value of the corresponding independent variable increases by one unit.

3. Data Analysis and Model Development

A number of variables, assumed to have relations to the traffic safety perception of each garments worker interviewed were selected and assessed at a 90% confidence interval. In the final model 20 individual variables proved to have statistical significance. That means 20 variables are affecting to acquire or not acquire of safety knowledge. A total of 500 samples were collected. The formation of variables from the questionnaire survey as well as their mean and standard deviation is presented in Table 1. Some of the discarded variables from the final model for their statistical insignificance are number of kids in a family, marital status, education level etc.

TABLE I: Summary Statistics of Variable

Explanatory Variables		Description of Variables	Mean	Std. Dev.
Money	Transport cost <200tk	Transport Cost<=200tk = 1; Otherwise=0	0.106	0.308146
Explanatory Variables		Description of Variables	Mean	Std. Dev.
Age Category	Gender	Male=0; Female=1	0.18	0.384
	Age less than 18	<18=1; otherwise=0	0.032	0.176
	Age 18 to 20	18<Age<=20=1; otherwise=0	0.198	0.398
	Age 20 to 22	20<Age<=22=1; otherwise=0	0.262	0.44
	Age 22 to 24	22<Age<=24=1; otherwise=0	0.296	0.456
Monthly Income	Greater than equal 25	>=25=1; otherwise=0	0.212	0.409
	Income less than 5000	<5000=1; Otherwise=0	0.214	0.41
	Income 5000-10000	5000<income<10000=1; otherwise=0	0.554	0.497
	Income 10000-15000	10000<income<15000=1; otherwise=0	0.226	0.418
Number of Children	Income Greater than 15000	<15000=1; otherwise=0	0.006	0.077
	Living with Family Member	If living with family member=1; otherwise=0	0.514	0.5
	No Kid	No kid=1; otherwise=0	0.518	0.5
	One Kid	1 kid=1; otherwise=0	0.192	0.394
	Two Kids	2 kids; otherwise=0	0.19	0.392
Mode of Transport	More than two kids	3<= kid=1 ; Otherwise=0	0.1	0.3
	Any Accident seen	No=1; Otherwise= 0	0.476	0.503
	Any Relative Involved in Accident	No=1; Otherwise= 0	0.336	0.473
	Using Public Transit as mode of Transport	Public Transit=1; otherwise =0	0.322	0.467
	Using three wheelers (CNG driven) as mode of Transport	Three wheelers (CNG driven)=1; Otherwise=0	0.006	0.077
Walking Hours in a Week	Using Walk as mode of Transport	Walk=1; otherwise=0	0.468	0.499
	Using Cycle as mode of Transport	Cycle=1; otherwise=0	0.202	0.401
	Using Motorcycle as mode of Transport	Motorcycle=1; otherwise=0	0.002	0.044
	Using Car as mode of Transport	Car=1; otherwise=0	0	0
Physical Disability	Walking hour <1hr. per week	Walking hour <1= 1; otherwise=0	0.04	0.196
	Walking hour 1- 4 per week	1<Walking hour <4= 1; otherwise=0	0.514	0.5
	Walking hour 4-7 per week	4<Walking hour <7= 1; otherwise=0	0.24	0.427
	Walking hour 7- 10 per week	7<Walking hour <1= 1; otherwise=0	0.102	0.302
	Walking hour >10 per week	Walking hour >10= 1; otherwise=0	0.104	0.305
Location of Industry	No Defects	No defect=1; otherwise=0	0.854	0.353
	Hearing Problem	Hearing Prob=1; otherwise=0	0.042	0.2
	Walking problem	Walking prob=1; otherwise=0	0.034	0.181
	Other Physical problem	Other physical prob=1 ; otherwise=0	0.07	0.255
Home distance from workplace	Ashulia	Ashulia=1; Otherwise=0	0.278	0.448
	Dhaka-Mymensing	Dhaka- Mymensingh=1; Otherwise=0	0.216	0.411
	Gulshan	Gulshan=1; Otherwise=0	0.364	0.481
	Tejgaon	Tejgaon=1; otherwise =0	0.006	0.077
Working experience	Other Area	Other Area=1; Otherwise=0	0.136	0.343
	Home distance less than 1km	Home distance<1km=1; otherwise=0	0.584	0.493
	Home distance 1-3km	1 km<Home distance<3km=1; otherwise=0	0.29	0.454
	Home distance 3- 5km	3 km< Home distance <5km=1; otherwise=0	0.098	0.297
	Home distance > 5km	Home distance>5km=1; otherwise=0	0.028	0.165
	Any Accident seen	No=1; Otherwise= 0	0.476	0.503
	Any Relative Involved in Accident	No=1; Otherwise= 0	0.336	0.473
	Work experience <1 year	Work Exp.<1yr =1 ; otherwise =0	0.05	0.218
	Work experience 1- 3 years	1yr<Work Exp.<3yr =1 ; otherwise =0	0.294	0.456
	Work experience 3-5 years	3yr<Work Exp.<5yr =1 ; otherwise =0	0.26	0.439
	Work experience 5- 7 years	5yr<Work Exp.<7yr =1 ; otherwise =0	0.168	0.374
	Work experience 7- 10 years	7yr<Work Exp.<10yr =1 ; otherwise =0	0.138	0.345
	Work experience >10 years	Work Exp.>10yr =1 ; otherwise =0	0.09	0.286

Spent for transportati on purpose in a month	Transport cost 200- 500tk	200tk<Transport Cost<=500tk = 1; Otherwise=0	0.408	0.491955
	Transport cost 500-700tk	500tk<Transport Cost<=700tk = 1; Otherwise=0	0.258	0.437972
	Transport cost 700-1000tk	700tk<Transport Cost<=1000tk = 1; Otherwise=0	0.164	0.370646
	Transport cost >1000tk	Transport Cost>=1000tk = 1; Otherwise=0	0.064	0.244998

3.1. Model Result and discussion

The estimation results for the final model are shown in Table 2. Based on the p -values of the t -tests, 65 variables from 20 factors were found to be significant ($p \leq 0.05$) or marginally significant ($p \leq 0.1$).

TABLE II: Estimation Results of Logistic Regression Model

Number of observation				
=		499	LR chi2(20)	= 245.38
Pseudo R2	=	0.4684	Prob > chi2	= 0
Log likelihood = -139.24555				
Variables		Odds Ratio		P> z - value
Gender		0.153		<0.001
Age 20 – 22yrs.		2.212		0.062
Age 22- 24yrs.		2.579		0.024
Income 10000-15000		2.365		0.055
Living with Family Member		0.645		<0.001
More than two kids		4.351		0.012
Walking hour 1- 4 per week		4.024		<0.001
Walking hour 7- 10 per week		0.304		0.006
Ashulia		4.947		0.001
Gulshan		31.223		<0.001
Home distance less than 1km		12.261		0.007
Home distance 1-3km		6.382		0.034
Home distance 3- 5km		4.243		0.099
Any Accident seen		1.776		0.092
Work experience 5- 7 years		0.444		0.056
Using Walk as mode of Transport		0.235		0.012
Using Public Transport (Bus, Tempo) as mode of Transport		0.350		0.063
Hearing Problem		9.452		0.004
Any Relative Involved in Accident		0.474		0.051
Transport cost less than 200tk		2.363		0.087
constant		1.611		0.684

The odd ratio (.15) for gender is less than one which indicates that the female is well aware of safety knowledge comparing with their male counterpart. Perhaps female are more concerned about their safety issues and try to learn more about it. Both the age group >20 to 22 (odd ratio=2.212) and >22 to 24 receives less safety information comparing with other age categories. Perhaps more age of the worker are less concerned about their safety as they feel confident when aged and neglect safety issues.

If a RMG worker having monthly income in between 10000 tk.to 15000 tk. he doesn't receive safety education from different sources (OR=2.365). This income group is relatively at the higher income category among the RMG workers. Perhaps they are over confident due to their experience, hence ignore safety issues.

Personal life also seems to have influence on safety consciousness of workers. The workers who belongs to a family (OR=0.64) appear to be more concerned about road traffic safety knowledge acquisition compared to the workers who have no family responsibility. A probable reason could be carelessness caused by lack of "feelings of responsibility" by non-family workers. The study also finds a keen relationship between the numbers of children under a worker's parentage and the worker's road safety awareness. The odd ratio is 4.35 for people who have more than two kids. This result indicates that having more kids make the RMG workers less cautious about their safety. More kids perhaps make workers busier to earn their livelihood and it is likely that they get less chance to gather safety information.

Our model result justifies that eye- witness of an accident make does not make more conscious of acquiring safety knowledge (OR= 1.77). Unfortunately direct observation of an accident doesn't have any impact on the mind of the RMG worker by taking initiative of gaining traffic safety knowledge. May be the workers are too busy with their work that they forget the incident. However, the result is reverse if any relative of the RMG worker involved in the accident (OR=0.47). As it's a case of relative this group of worker may not forget the incident and more cautious about their safety issues by acquiring knowledge.

Workers who use public transit and walk as their main mode of transport are more prone to get road safety knowledge from different sources (OR= 0.35 and OR=0.24 respectively). Perhaps these groups feel that they are more vulnerable comparing to those who use other mode. Therefore, they give more emphasis on safety.

As expected, workers who walk less (<4 hrs. but>1hrs in a week) receives less safety knowledge (OR=4.02) and workers who walk more (<10 hrs. but > 7hrs.) gathers more safety knowledge from different sources (OR= 0.30). Perhaps more walking group is more aware about the hazards on roads that are why they are more interested about safety issues. On the other hand, less walking group are less cautious about safety issues may be because of less exposure to traffic hazard. People who have working experience 5-7 years are more aware to gather safety education from various sources. Probably after working several years they are calm and composed and understanding the importance of safety.

As expected if the distance between home and workplace is less, the tendency of receiving traffic safety knowledge is negative (OR= 12.26; OR= 6.38 and OR= 4.24 respectively for Home distance less than 1km; Home distance 1-3km; Home distance 3- 5km). As the workers of these categories does not travel more traffic safety consciousness may not be grown to them as they are less expose to traffic. Result in Table 2 shows that if a worker is in a low spending group for transportation purpose he is less interested to gain safety knowledge(OR=2.36). It is likely that this group represents the lowest income group and they are concerned about safety knowledge.

Location of the industry was found to have influence of receiving safety education. Workers having their workplace at Ashulia are less interested to gain safety knowledge (OR 4.95). The reason of this finding is not very clear as these industries are generally established beside the highway. As expected, the workers in the industries in Gulshan area are less concerned about safety knowledge (OR= 31.22). Gulshan area is a residential area within the city center and low- speed traffic is observed due to traffic congestion. Due to less vehicle speed the workers feel less threat regarding safety which perhaps makes them less concern about safety issues.

According to the result of the study physical condition of the workers plays a significant role in case of receiving safety education. Specifically, RMG workers who have hearing problem are not interested to take safety education from different sources (OR= 9.45).The result is expected as physically challenged person having hearing problem are facing difficulties to capture any campaign regarding safety. Therefore, they may be less interested of acquiring safety education.

4. Conclusion

This study was conducted among 500 garments' workers to capture the actual scenario of the penetration of road safety knowledge dissemination. The objective of the study was to investigate the factors which influence of getting safety education/knowledge from different sources. This study identified the target group of garment workers who are vulnerable from road safety perspective and require safety education. This study helped to select the garments workers who have least knowledge or no knowledge of traffic safety. The results of this study can be used for planning traffic safety campaigns for the most vulnerable RMG workers based on their self-reported traffic safety perceptions. It can also be considered as a pilot study for a national study to find ways to minimize the traffic related injuries among the RMG workers of this country. If a training program on traffic safety is to be organized throughout the nation, there will be huge cost involved in this process.

This study reveals that not everyone in the industry needs training on traffic safety. For example, according to our study a RMG worker will be in vulnerable group if he has the following characteristics and require safety training on urgent basis: (i) Age 20- 24 (ii) Income 10000- 15000 tk. (iii) Having more than two kids (iv) working in an industry situated in Ashulia or Gulshan area (v) walking 1-4hrs in a week (vi) Distance between home and workplace is between zero to five kilometer (viii) Transport cost less than 200tk in a month (ix) having hearing problem (x) observed any accident.

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