



## 1. Introduction

Bangladesh is a developing country. The textile and clothing (T&C) industries provide the single source of economic growth in Bangladesh's rapidly developing economy [1]. Exports of textiles and garments are the principal source of foreign exchange earnings [2]. By 2013, about 4.2 million people, mostly women, worked in Bangladesh's \$20 billion-a-year industry, export-oriented ready-made garment (RMG) industry. Bangladesh is second only to China, the world's second-largest apparel exporter of western brands [3]. One of the key resources of developing RMG is available work force and off course healthy work force. With predictions by McKinsey & Company of the industry will be tripled in size by 2020. Hence, manpower will be also work here almost tripled by 2020 [4]. This huge number of workers is not well aware of their health and work place environment. Or to earn daily's bread and butter they run for work restlessly. They might hear that "Health is Wealth" but sometimes they don't care. Or most of the cases work load given to them is not justified. They are over pressure always.

The Ready-Made Garments (RMG) sector has emerged as the biggest earner of foreign currency. Bangladesh is earning 75%-80% of its total export in US dollar value 19 billion in last fiscal year by the readymade garment sector. Behind of the huge earning about 3.6 million workers are working in 5150 factories. Washing (i.e. finishing) is a big significant part of RMG sector in Bangladesh now. About 0.4 million workers are working in washing industries in Bangladesh. A good number of researches have been conducted regarding garment workers. Unfortunately, in most of the studies industrial laundry workers were somehow ignored. Studies from different countries & reports regarding occupational health and safety showed that due to work place environment of the washing plant the different sections are at risk of different health problems including injuries. Moreover, due to lack of education & poor knowledge of health and hygiene the problem aggravates. As occupational health problems among laundry workers in Bangladesh have not documented widely- the current study is an attempt. Occupational health is the health status related to the occupation. An occupational health problem is any chronic ailment that occurs as a result of work or occupational activity. An occupational health problem is typically identified when it is shown that it is more prevalent in a given body of workers than in the general population, or in other worker populations.

Hence, the aim of this research is to find out the occupation related health problems among the laundry workers in the selected denim industries, to determine the work place environment of the respondents and to assess the socio-demographic characteristics of the respondents.

## 2. Methods

It was a Cross-sectional study. The study area was the selected denim industry in the Gazipur city, Bangladesh for four months from December 2013 to April 2014. For survey the study population were laundry workers who had occupation related health problems. Permission was obtained from the State University of Bangladesh, Permission was taken from managing director of the industry I visited, all respondents were informed regarding the purpose and objectives of the study before the interview, verbal informed consent was taken from the respondents, the privacy and confidentiality were strictly maintained during data collection and Respondents had the right to refuse & withdrawing them from the study at any moment was accepted.

### 2.1. Sample size and technique

Sample size was decided by Equation 1.

$$n = \frac{z^2 pq}{d^2} \quad (1)$$

Where, n= Required Sample Size; z= the value of standard normal deviation at a given confidence level=1.96 (which corresponds to 95% confidence level; p= Prevalence has been considered as 50% as no such study regarding health problems among laundry workers in Bangladesh was available. This was not known therefore, it was regarded 50% (0.5) q = (1-p) therefore, 1-0.5 = 0.5. d = Accepted margin of error (i.e.0.05). Putting these values in equation (1), n= 384.16. Thus, the sample size for this study was considered as 384.

Simple random sampling technique was applied in the current study. At first list of the denim industries of Gazipur district was collected from Government approve owners association (BGMEA). According the list there were 30 industries with washing plant. From them one industry was selected randomly. List of laundry workers was obtained from the selected denim industry. The respondents were selected from that list using internet random number generating software.

## 2.2. Inclusion and exclusion criteria

The inclusion and exclusion criteria are the workers age between 20-60 years who were working in denim washing plant with a minimum of 2 years' experience and respondents who were severely ill to participate in the study, respectively.

## 2.3. Data collection method and tool

Data collection method for this research was face to face interview was conducted with semi structured questionnaire, industry record review and observation. Interviewer administered questionnaire and a checklist for observing the workplace environment as per ILO&WHO recommendation were the data collection tool.

## 2.4. Data Management and analysis

All questionnaires were checked and rechecked thoroughly and meticulously for the completeness and the clarity of the information to exclude missing or inconsistent data. After editing, data were entered in suitable database. Necessary ranges and consistencies were built in the database. Data was analyzed with the means of SPSS version 16. Data was presented by frequency, percentage and table. Test of significance & cross tabulation was done to find out the association between socio-demographic characteristics & the health events.

## 3. Results

A cross-sectional study was conducted to determine the occupational health problems among 384 Laundry workers in a selected area of Bangladesh. The overall results of the study have been presented in tabular form.

The distribution of responds by their age group, sex, religion, education, marital status, monthly income, family member, type of house, working experience, working section, locomotion, Chemical exposure, Site of pain/discomfort, Type of pain, Severity of pain, time of pain, Respiratory problems, eye problems, ENT problems, skin problems, Digestive Problems, Chemical & Machine related problems, other problems, Type of injury, PPE and Treatment is shown in Table 1. In Table 2, association between working duration and health events is shown.

**Table 1: Distribution of responds and their frequency**

Distribution of responds by	Frequency (n)	Percentage (%)
<b>Age group (n=384)</b>		
18 - 30 years	175	45.6
31 - 40 years	152	39.6
Above 40 years	57	14.8
<b>Sex (n= 384)</b>		
Male	194	50.5
Female	190	49.5
<b>Religion (n=384)</b>		
Islam	371	96.6
Hindu	13	3.4
<b>Education (n=384)</b>		
Class I-V	337	87.8
Class VIII	43	11.2
SSC	3	0.8
HSC	1	0.3
<b>Marital status (n=384)</b>		
Married	379	98.7
Unmarried	5	1.3
<b>Monthly income (n=384)</b>		
Up to BDT 10000	26	6.8
BDT 10001-15000	168	43.8
BDT 15001-20000	180	46.9
Above BDT 20001	10	2.6
<b>Family member (n=384)</b>		
Up to 4 members	258	67.2
more than 4 members	126	32.8
<b>Types of House (n=384)</b>		
Building	20	5.2
Semi-building	364	94.8
<b>Working experience (n=384)</b>		
2 to 5 years	369	96.1
More than 5 years	15	3.9
<b>Working section (n=384)</b>		
Whisker	45	11.7
Hand Brash	54	14.1
Tacking & grinding	49	12.8
PP Spray	72	18.8
Wet process	112	29.2
3D & Resin spray	32	8.3
Laser	13	3.4
Logistic ( store, delivery, inventory)	7	1.8
<b>Locomotion (n=384)</b>		
Repetitive gesture	110	28.6
Sitting	48	12.5
Standing	349	90.9
Walking	31	8.1
Arms above shoulder	68	17.7
Repetitive hand movement	98	25.5

Bent	16	4.2
Turned	17	4.4
Lifting	11	2.9
Mechanical pressure on object	37	9.6
<b>Chemical exposure (n=384)</b>		
Wet cloth handling	78	20.3
Chemical handling	127	33.1
<b>Site of pain/discomfort (n=384)</b>		
Shoulder	110	28.6
Elbow	37	9.6
Wrist / hand	53	13.8
Upper back	59	15.4
Low back	134	34.9
Hip	14	3.6
Knee	32	8.3
Ankle/feet	59	15.4
<b>Type of pain (n=384)</b>		
Discomfort	238	62.0
Numbness	90	23.4
Tingling	6	1.6
Burning	34	8.9
Continuous irritable pain	16	4.2
<b>Severity of pain (n=384)</b>		
Mild	262	68.2
Moderate	110	28.6
Severe	12	3.1
<b>Time of pain (n=384)</b>		
Morning	44	11.5
Noon	28	7.3
Evening	26	6.8
Night	286	74.5
<b>Respiratory problems (n=352)</b>		
Breathing difficulty	80	22.7
Continuous cough	8	2.3
Frequent cough	220	62.5
Cough	36	10.2
Chest tightness	8	2.3
<b>Eye problems (n=196)</b>		
Red eye, watering eye, pain in eye	159	81.1
Hazy vision	28	14.3
Visual problem	9	4.6
<b>ENT problems (n=118)</b>		
Hearing problem	24	20.3
Running nose	12	10.2
Irritation in throat, throat pain.	82	69.5
<b>Skin Problems (n=73)</b>		
Contact dermatitis	14	19.2

Eczema	12	16.4
Scabies	47	64.4
<b>Digestive Problems (n=305)</b>		
Constipation	101	33.1
Diarrhoea	22	7.2
Alternate diarrhoea & constipation	14	4.6
Burning sensation	70	23.0
Vomiting tendency	37	12.1
Dyspepsia	61	20.0
<b>Chemical &amp; Machine related problems (n=12)</b>		
Burn from heat	7	58.3
Flashing of face by steam	3	25.0
Electric shock	2	16.7
<b>Other problems (n=78)</b>		
Malnutrition	38	48.7
Palpitation	24	30.8
Mental Stress	12	15.4
Sinusitis	3	3.8
Hypertension	1	1.3
<b>Type of injury (n=16)</b>		
Blunt injury	8	50.0
Cut injury	2	12.5
Eye injury	5	31.25
Joint /bone fracture	1	6.25
<b>PPE (n=384)</b>		
Boot/Shoe	162	42.2
Gloves	213	55.5
Ear plug	19	4.9
Mask	362	94.3
Goggles	53	13.8
Heavy dress/apron	49	12.8
<b>Treatment (n=384)</b>		
In-house primary medical care unit	378	98.4
M.B.B.S doctor	3	0.8
Private hospital	1	0.3
Homeopathic	1	0.3
Village doctor	1	0.3

**Table 2: Association between working duration and health events**

Health problem	Duration		Total	Test of significance
	Up to 3 years	More than 3 years		
Skin	50 (17.9%)	23 (21.9%)	73 (19.0%)	$\chi^2=0.549, p=0.459$
Respiratory	250 (89.6%)	102 (97.1%)	352 (91.7%)	$\chi^2=4.730, p=.030$
Eye	146 (52.3%)	44 (41.9%)	190 (49.5%)	$\chi^2=2.913, p=0.088$

ENT	88 (31.7%)	30 (28.6%)	118 (30.8%)	$\chi^2=0.211$ ; $p=0.646$
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The distribution of respondents by working section and musculoskeletal problem and work place environment related information of the respondents are shown in Table 3 and Table 4, respectively.

**Table 3: Distribution of respondents by working section and musculoskeletal problem.**

Working section	Sites							
	Shoulder (%)	Elbow (%)	Wrist hand (%)	Upper back (%)	Low back (%)	Hip (%)	Knee (%)	Ankle feet (%)
Whisker	17.0	15.1	26.4	17.0	22.6	0.0	1.9	0.0
Hand Brash	15.9	4.8	22.2	23.8	25.4	0.0	4.8	3.2
Tacking & grinding	11.4	.0	6.3	13.9	31.6	1.3	10.1	25.3
PP Spray	43.4	2.4	3.6	8.4	28.9	0.0	4.8	8.4
Wet process	22.1	13.2	9.6	4.4	33.1	7.4	3.7	6.6
3D & Resin spray	18.8	8.3	8.3	6.2	14.6	2.1	14.6	27.1
Laser	21.1	0.0	0.0	21.1	15.8	0.0	10.5	31.6
Logistic (store, delivery, inventory)	23.1	7.7	7.7	30.8	15.4	0.0	7.7	7.7

**Table 4: Work place environment related information of the respondents**

Work Section	Ventilation	Temperature	Dust	Noise	Humidity
Whisker section	Good	Normal	Heavy	Normal	Normal
Hand brash section	Good	Normal	Heavy	Normal	Normal
Tacking & grinding section	Average	Moderate	Heavy	High	Moderate
PP spray section	Good	Normal	Mild	Moderate	Moderate
Wet process section	Average	High	Mild	High	Moderate
3D & resin spray section	Average	High	Mild	Moderate	Moderate
Laser section	Average	Cool	Mild	Normal	Low
Logistic department	Good	Normal	Mild	Normal	Normal

#### 4. Discussion

A cross-sectional study was conducted to determine the occupational health problems among 384 Laundry workers in a selected area of Bangladesh. Among the respondents male female ratio was almost equal. This chapter specially deals with discussion over the result findings in chapter four and their relation with various literatures. The readymade garment RMG industry in Bangladesh has experienced an unprecedented growth over the last three decades and become a fast growing industry in Bangladesh. This industry plays a vital role in the economy in terms of export earnings, employment generation, poverty alleviation and empowering the women. Exports of textiles and garments are the principal source of foreign exchange earnings.

Among the respondents of this current study, around forty five percent were in the age group of 18-30 years, forty percent were within 31-40 years and fourteen percent were above the age of 40 years

(mean age  $32.45 \pm 7.240$  years). It was reported that eighty seven percent respondents completed primary level of education, eleven percent completed secondary level of education. Almost all the respondents were married. Among the total respondent two-third had less than four members in their family. By monthly family income forty six percent had within BDT 15001- 20000, forty three percent had BDT 10001-15000 (mean  $15618.49 \pm 2918.55$  BDT). Ninety five percent respondents were found living in semi-building houses. The current study revealed that almost ninety six percent respondents were involved their occupation for (mean =  $2.98 \pm 1.236$  years). Among the respondents twenty nine percent were working in wet process section, more than eighteen percent were engaged in PP spray section, fourteen percent were working in hand brush section, more than twelve percent were in tacking & grinding section, more than eleven percent were engaged in whisker section, eight percent were working in 3d& resin section whereas three percent engaged in laser section.

Work related physical activities also assessed among the respondents which include Repetitive gesture (28.6%), sitting posture (12.5), standing posture (90.9%), (8.1%) had to work by walking, Arms above the height of the shoulder (17.7%). Similarly, (25.5%) Respondents required repetitive movements with the hands. (9.6%) respondents had to work with mechanical pressure with the hands on the object. (2.9%) respondent's work involved lifting weights. (4.2%) respondents required bent trunk and (4.4%) need to turned trunk during work. The mean time spent was  $2.29 \pm 0.654$  hours with Repetitive gesture,  $3.81 \pm 2.679$  hours with sitting posture,  $4.17 \pm 1.932$  hours with standing posture.  $3.55 \pm 0.898$  hours with repetitive hand movement.  $4.64 \pm 1.629$  hours involved with lifting weights,  $2.00 \pm 0.000$  hours for both arms above the height of the shoulder and mechanical pressure on the object.  $2.94 \pm 0.998$  hours with bent trunk and  $3.53 \pm 0.874$  hours with turned trunk.

The current study tried to find out the sites of pain. It was reported that among the respondents thirty five percent had low back pain, near about thirty percent were found suffering from shoulder pain, about sixteen percent found suffering from ankle/feet pain and upper back site pain. About fourteen percent had wrist/hand pain. All the respondents declared that they work daily for eight hours. Current study also tried to find out the distribution of respondents between working section and musculoskeletal problem. It was found that in whisker section 26.4% respondents suffered from wrist/hand pain, 22.6% had low back pain, 17.0% had shoulder pain and 15.1% had elbow pain. In hand brush section 25.4% suffered from low back pain, 23.8% had upper back pain, 22.2% had wrist/hand pain and 15.9% had shoulder pain. In tacking & grinding section 31.6% suffered from low back pain, 25.3% had ankle/feet pain. In PP spray section 43.4% suffered from shoulder pain and 28.9% had low back pain. In wet process section 33.1% suffered from low back pain, 22.1% had shoulder pain. Similarly, in 3D& resin spray section 27.1% suffered from ankle/feet pain, 18.8% had shoulder pain and 14.6% had low back and knee pain. In Laser section 31.6% suffered from ankle/feet pain, 21.1% had shoulder and upper back pain, 15.8% had low back pain. In logistic department 30.8% had upper back pain, 23.1% had shoulder pain and 15.4% suffered from low back pain.

In reference to musculoskeletal pain no such study was available related to denim washing plant workers but some information was found with same type of ergonomic locomotion among the construction workers, electrician and farmers.

Some important risk factors for MSDs were the magnitude of the loading (the amount of physical effort applied, the weights that are handled and forces to be resisted), and the duration and frequency of the activity. Similar study conducted in six trades in the USA determined the following to be the top five ergonomic problems: working in the same position for long periods (5.67); bending or twisting the



back in an awkward way (5.46); working in awkward or cramped positions (5.00); working when injured or hurt (4.69), and handling heavy materials or equipment (4.63). Another study mentioned the main reason for MSDs were an awkward work posture, and high use of physical force, Awkward postures and working in the same position for long periods were identified as the leading causes of work-related musculoskeletal symptoms. Study conducted by Chaklader MA and associates revealed that musculoskeletal disorders were found higher among the respondents who were engaged in construction work for 6 to 10 years (50.3%) and for 1 to 5 years (34.8%) which was found statistically significant ( $p < 0.05$ ). As sites of musculoskeletal disorder lower back (36.6%), wrist (28.4%), elbow (30.6%), neck & shoulder (26.2%), thighs and buttocks (19.7%), knee and ankle (19.1%) were reported. In a study nearly 30% of construction apprentices suffered from work-related low back pain within the previous 12 months. The second and third highest prevalence for work-related symptoms were in the wrist/hands (19.3%), and shoulders (12%) as well as upper back (12%). Research conducted among electricians in the USA determined the following anatomic regions to be the top five in terms of the frequency they were reported to be a problem: lower back (66.6%); knee (45.9%); wrist/hand (43.6%); neck (37.2%), and shoulder (37.1%). Study in Lithuania among the Construction Workers, the most common location of pain and/or discomfort was the lower back which was different in all eight groups of seniority (range: 10.51 % – 27.0 %). The complaint is considered the main reason for an awkward work posture, and high use of physical force. Very often, workers work leaned in static posture, running from 5 to 10 min. Workers also suffer pain and/or discomfort in ankles/feet (range: 12 % – 22.99 %), in neck – (range: 6.25 % – 19.63%), in shoulders – (range: 12% – 16.61 %), and in knees – (range: 4.55 % – 14.63%). Study by Osborne found that 56% of Irish farmers had experienced some type of MSD. The most commonly experienced MSDs were back pain (37%) and neck/shoulder pain (25%). Other MSDs experienced in the previous year included knee pain (9%), hand–wrist–elbow pain (9%), ankle/foot pain (9%) and hip pain (8%). Overall, MSDs were more common in farmers working longer hours ( $P, 0.05$ ).

Rosecrans and associates found MSD among 57.2% of their study participants. . The low back was the anatomical area with the highest prevalence of self-reported work- related pain (37.5%), followed by the shoulders (25.9%), knees (23.6%), and neck (22.4%). Study in South West Nigeria reported that 72.4% of the population had low back pain. Of them 51.9% respondents indicated that low back pain reduced their farming workload.

It was reported that among the respondents of the current study about three fourth suffered from pain mostly at night, more than one tenth had pain in the morning, more than one twelfth had pain in the afternoon and more than one fourteenth suffered from pain in the evening.

The current study found that among the respondents sixty two percent had discomfort, twenty four percent respondents had numbness, around nine percent had burning sensation, five percent had continuous irritable pain and two percent Respondents had tingling. Among the respondents about sixty nine percent had mild pain; twenty nine percent had moderate pain and near about four percent had severe pain. The current study found that 352 (91.7%) had respiratory problem among the total respondents sixty three percent were suffering from frequent cough, twenty three percent had breathing difficulty, near about eleven percent had cough and three percent had continuous cough and chest tightness. Among all respondents 196 (51%) had eye problem, of whom majority of the respondents 81.1% had suffering from red eye, watering eye, pain in eye.14.3% had hazy vision, 2.6% had eye injury and only 2.1% had visual problem. ENT Problem was reported among 118 (30.7%) respondents. Of them 69.5% had irritation in throat, throat pain. Beside this, 20.3% had hearing

problem, 10.2% had running nose. Among all respondents Skin problem was found in 73 (19.0%). Most of them 64.4% suffered from scabies. Beside this, 19.2% had contact dermatitis, 16.4% had eczema. It was reported that among all respondents chemical and machine related problem was found in 12 (3.1%). Of them 58.3% respondents were facing burn from heat, 25.0% were facing flashing of face by steam, 16.7% respondents had electric shock. Among total respondents 305 (79.4%) had digestive problem. Of them 33.1% had constipation, 23% had suffering from burning sensation, 20% had dyspepsia, 12.1% had vomiting tendency and 7.2% had diarrhoea. Among all respondents 78 (20.3%) had other health problem of whom majority 48.7% were suffering from malnutrition. 30.8% had palpitation, 15.4% were facing mental stress and 3.8% had sinusitis. It was reported that 2.9% (n=11) respondents were injured during working. Among them blunt injury was mostly 50.0% found. Beside this, 31.25% had eye injury and 12.5% were facing cut injury & only 6.25% had joint/bone fracture.

A study conducted by N Nahar, R N Ali and F Begum On Occupational health hazards in garment sector they found 52.22 percent of the respondents opined that they suffered from severe malnutrition, followed by 78.89 percent by musculoskeletal pain, 72.22 percent by eye strain, 68.89 percent by malnutrition, respectively [5]. Another study conducted by Vijitha De Silva, Truls Ostby On Occupational health problems among female garment factory workers in Sri Lanka; in their study they found that 15.6% were reporting musculoskeletal problems, the most prevalent complaint being lower back problems. 2.3% reported migraine and 5.3% tension headache. 5.6% had recent workplace injury, most of these (68.3%) were puncture injuries [6].

It was reported that all the respondents use personal protective equipment according their job required. Most of the respondents 94.3% worn mask, 55.5% used gloves. Similarly, 42.2% used boot/shoe & 13.8% used goggles. But I found that the workers were using ordinary cloth mask which was not effective for working in dusty condition. "N95 Respirators" – a special mask is effective for working in severe dusty environment. It must be mentioned that an ordinary cloth mask is a square shaped piece of cloth which is fixed through strings behind the ears or the head. The special kind of masks is convex shaped mechanical filter respirators made out of a combination of two or more materials like wool, plastic, glass and cellulose. The masks have a thin metal lining along the nose and are fixed with rubber stings behind the head. The double-layered masks named "N95 respirators" are famous for the prevention of public spread of viral and bacterial infections and surgical purposes. Even though a special type of these N95 masks is especially made for occupational purposes in a dusty environment, the provided protection remains on a basic level. The United States National Institute for Occupational Safety and Health (NIOSH) stated in its "Respiratory Protection Recommendations for Airborne Exposures to Crystalline Silica" in 2008 as followed: "NIOSH recommends the use of half-face piece particulate respirators with N95 or better filters for airborne exposures to crystalline silica at concentrations less than or equal to 0.5 mg/m<sup>3</sup>."

Further the Department of Environmental Health and Safety (EH&S) of Stanford University mentions in its "N95 respirator training" that N95 masks are disposable (one time use only) and that a regular fit-test should guarantee a good protection through proper size of the mask.

In the current study respiratory problem was found 89.6% , 97.1% among the respondents who had working experience up to 3 years and more than 3 years. Statistically it was found significant ( $p < 0.05$ ) that means there is association between respiratory problem and working duration. No statistical significant association was found between working experience and skin/eye/ENT problem as shown in Table 2.

The current study revealed that all the respondents were taken treatment as because primary health service facilities were available where they work. Among them majority of the respondents 98.4% were taken treatment from in-house primary medical care unit & 0.8% visited with M.B.B.S doctor while they were sick.

Work place environment acts as an aggravating factor in case of occupational health problem (c.f. Table 4). Usually temperature, humidity and noise is measured by Thermometer, hygrometer and noise dosimeter but the denim industry from where I collected data this equipments were not available. So, by perception I mentioned that in Wet process section and in 3D & resin spray section temperature was high, in tacking & grinding section temperature was moderate. Dust was heavy in whisker section, hand brash section and in tacking & grinding section. Similarly, Noise level was high in wet process and tacking & grinding section. Humidity was moderate in tacking & grinding, PP spray section, wet process and 3D & resin spray section.

## 5. Conclusion

The study concluded that,

- According the parameter related to work place environment as recommended by WHO & ILO the work place environment of this study is found satisfactory.
- Among the respondents almost ninety two percent had respiratory problem, more than half had eye problem, thirty percent respondents had ENT problem, one-fifth had skin problem , eighty percent had digestive problem.
- All the respondents were suffering from musculoskeletal problem.
- By site of pain, among them low back, shoulder, upper back and ankle/feet pain were prominent.

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