

**A Study of Physiological Responses Among the Textile Industry Workers
in Ichalkaranji City**

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ABSTRACT

The textile industry is a major labour intensive industry in today's world and employs approximately 60 million workers globally (ILO, 2009). The textile sector in India plays an important role in the country's economy, providing employment to a significant population in rural and urban areas. Ichalkaranji today is one of the fastest growing industrial areas in Maharashtra and has even been termed the “**Manchester of Maharashtra**” having mixed community from all parts of India. This is a cosmopolitan town by true means. The city's economy is driven predominantly by the textile industry. Based on the above cited literature and information the present study was conducted to different small scaled power loom sectors from Ichalkaranji area. Present study aimed to monitoring of physical fitness, correlation between BMI and fitness and identifies the causes of health hazards among the textile industry workers from Ichalkaranji city of Kolhapur district, Maharashtra. In the present study, attempts have been made for physiological evaluation of workers. For the present investigation 50 control and 50 exposed male workers were selected. After explaining the nature and importance of study to owner and workers were followed by interview and demographic data, information regarding quality of life and stress at workplace of workers were collected by using pre-designed standard questionnaire. The present study has revealed that the physiological responses like pulse rate, blood pressure and body mass index of the workers not much affected due to working in textile industry but, increased breathing rate and respiratory illness, self-reported asthma is more significant among the textile industry.

Physiological responses like respiratory rate, BMI, blood pressure and pulse rate shows the significant difference in expose group and control group.

KEY WORDS: Textile industry, physiological responses, workers.

INTRODUCTION

The archaeological surveys and studies have found that the people of “Harrapan civilization” knew weaving and the spinning of cotton four thousand years ago. Reference to weaving and spinning materials is found in the Vedic literature. There was textile trade in India during the early centuries. The origin of a block printed and resist-dyed fabrics, from Gujarat and found in tombs of foster, Egypt. This proves that the Indian export of cotton textiles to the Egypt. Large quantity of north Indian silk was traded through the silk route in China to the western countries. The Indian silk was often exchanged with the western countries for their spices in the barter system. During the industrial revolution and late 17th and 18th century there were large export of the Indian cotton to the western countries requisite to the European industries.

The textile industry is a major labour intensive industry in today’s world and employs approximately 60 million workers globally (ILO, 2009). In India the textile industry plays a significant role in the country's economy, providing employment to rural and urban areas. The state of Maharashtra in India with an estimated investment of US\$ 224 million on various textile projects is the biggest contributor to India’s textiles market (www.midcindia.org). The prominent textile clusters in Maharashtra are Kolhapur, Nashik, Solapur and Thane.

Ichalkaranji is one of the fastest growing industrial areas in Maharashtra and has even been termed the “**Manchester of Maharashtra**” having mixed community from all parts of India this is a cosmopolitan town by true means. The city's economy is driven predominantly by the textile industry. The textile industry is mainly dominated by local manufacturers and Marwari (Rajasthani) traders. In Ichalkaranji, about 25 yarn units with about 1.25 lakh power looms, 20,000 semi-automatic looms and 7,000 shuttle-less looms, with a daily turnover of

nearly ₹10 billion. The town produces one crore meters of yarn every day that translates into a business of ₹ 40 crore a day. The total production, 15% is directly exported while another 40% is for indirect export after processing. According to locals, over 50,000 weavers depend on their livelihood working in the power looms in town. The weaver community was overwhelmed by the mention of Ichalkaranji in the Finance Minister's speech and welcomed the cluster which, they say, will help them fare better in the global market (www.thehindu.com).

Broadly, the textile sector can be categorized as ginning, spinning, weaving, and finishing and garments units. Textile workers, especially in the spinning process, are exposed to a large amount of cotton dust with harmful effects on their lung function (WHO, 2008). Cotton dust exposure at textile industries adds considerably to the occupational burden of disease globally (Nafees *et al.*, 2013). Dangi and Bhise (2017) showed that, significant decrees in spirometric parameters and increases in respiratory illness among the cotton mill workers. Depending on the intensity and duration of exposure, byssinosis victims experience chest tightness, cough, phlegm, breathlessness, irritation of the respiratory tract, chronic respiratory disorder, chronic bronchitis, irreversible airway obstruction, wheezing, asthma, tuberculosis, lung-function loss, eye sight problems, skin diseases and, even, mortality (Alemu *et al.*, 2010). There is evidence from some studies in India about health risks to industry workers (Suryakar *et.al.*, 2010).

Based on the above cited literature and information the present study was conducted to different small scaled power loom sectors from Ichalkaranji area. Although present study was undertaken to correlate the physiological response of textile industry workers from Ichalkaranji area of Kolhapur district, Maharashtra.

Objectives of study

- To monitoring of physical fitness among the textile industry workers from Ichalkaranji city of Kolhapur district, Maharashtra.

- To study correlation between body mass index and fitness of the workers
- To identify the causes of health hazards in textile industry.

REVIEW OF LITERATURE

Physical fitness is an individual depends on the amount of oxygen which can be transported by the body to working muscles, and the efficiency of muscles to use that oxygen. The acquaintance interaction of modern life style, we are neglecting the natural physical activities and increased the risks among the society for the chronic diseases exclusively from coronary heart diseases. Predominantly cardio respiratory fitness is dependent on physical fitness index. Poor physical fitness showed a potent risk factor and stronger predictor of cardiovascular and causes morbidity and mortality than any other established risk factors (Sengupta and Sahoo, 2011). Several factors like heredity, environment, socioeconomic status, regular exercise, diet and nutrition, and proper rest is important for physical fitness (Khodnapur, *et.al.*, 2012).

Several studies have established that physical fitness and health can assist in the prevention of chronic progressive diseases, accordingly to provide improved health status and quality of life. A small increase in physical activity performances, mortality could be reduced by as much as 5-6% deaths per year (Powell and Blair, 1994). Pratt *et.al.*, (2003) suggested for any age group physical activity measured by standard questionnaire was accepted worldwide. Kulinna (2003) especially studied for student physical activity pattern: grade, gender and activity influence.

The World Health Organization (WHO) has set criteria for assessing underweight and overweight in both children and adults (WHO, 1995). The body mass index is a simple, inexpensive method measures body fat and correlate with feature health risk like hypertension, heart disease, diabetes mellitus, cardiovascular disease, gall bladder disease and various type of cancer (Chen *et.al.*, 2008; Canoy *et.al.*, 2013). The BMI and age were the

significant determinants hypertension across the human health resources (Hamayun *et.al.*, 2009; Malliga *et.al.*, 2013).

Physical fitness can be assessed by suitable cardiopulmonary fitness parameters like Physical Fitness Index (PFI in %) and maximal oxygen consumption that is VO₂max (ml/kg/min) by using Harvard step test. This test is introduced by Broucha *et.al.*, 1943 during world war II at Harvard university, for assessing the aerobic capacity of young athletic attaining that university. Radulovic *et.al.*, (2014) analyse the existence of the influence of anthropometric characteristics on measuring of anthropometric characteristics and functional ability by modified Harvard step test according to Bergman.

MATERIALS AND METHODS

Study area

Ichalkaranji is in western India about 425 km south-east of Mumbai and situated on the banks of Panchaganga river from Kolhapur district of Maharashtra. (<https://en.wikipedia.org/wiki/Ichalkaranji>). The city is growing rapidly as industrial area governed by a municipal council. Ichalkaranji City is known as Manchester of Maharashtra for its export of textile goods and textile manufacturing industry.

Selection of Subjects

The present investigation was carried out in different small scaled power loom sectors of Ichalkaranji city. The purpose of the study was to survey various power loom sectors. The sample size was randomly selected in this cross sectional descriptive study (Carine *et.al.*, 2012).

All adult subjects (≥ 18 years) given informed consent to participate in the study and consequently they were included in the present study. The participant who has previous history of diseases or any serious illness was excluded from the study. Subjects enrolled after

explaining the nature of the study and after obtaining written informed consent from each participant.

In the present study, attempts have been made for physiological evaluation of workers. For the present investigation 50 control and 50 exposed male workers were selected. After explaining the nature and importance of study to owner and worker the demographic data, information regarding quality of life and stresses at workplace of workers were collected by using pre-designed standard questionnaire.

Methods for Physiological Monitoring of Workers

A. Anthropological Measurements

i. Weight and Height:

The anthropological measurements of subjects like height and weight were recorded by using standard techniques such as non-stretch measuring tape and weight balance on a hard-floor surface respectively (Tehard *et.al.*, 2002).

ii. Body Mass Index (BMI)

The body mass index (BMI) is measure of weight adjust for height (Must and Andersons 2006, Tehard *et.al.*, 2002). It was calculated by Quetelet Index, which is a statistical measure of the weight of a person scaled according to height. It was developed in 1832 by the Belgian polymath Adolphe Quetelet (Safrit, 1986). The following formula is used for calculating the BMI.

$$BMI = \frac{\text{Weight in Kg}}{\text{Height in } m^2}$$

B. Physiological Responses

i. Body Temperature

The axial body temperature of subjects was recorded by clinical thermometer during the working condition.

ii. Respiration rate

The respiration rate is the rate at which a person breathes. It increases with fever and some illnesses. The best time to count the respiration rate is when a person is resting, perhaps after you take the person's pulse while your fingers are still on the person's wrist. The person's breathing is likely to change if he or she knows you are counting it.

- Count the number of times the chest rises in 1 full minute.
- Notice whether there is any sucking in beneath the ribs or any apparent wheezing or difficulty breathing.

iii. Pulse Rate

The pulse rate per minute of the subjects was recorded from carotid pulse during the working condition.

iv. Blood Pressure

The blood pressure (BP) of subjects was recorded by using sphygmomanometer during the working time. The sphygmomanometer was placed on a bench and blood pressure was recorded after the subject has rested for 5 min., and this measure precedes all other measures. Now, the subject seated with the arm resting on the bench, the elbow approximately at the level of the heart. The stethoscope was then placed over the brachial artery in the elbow pit. The pressure rapidly inflates the cuff to 180mmHg, then release air from the cuff at a moderate rate (3 mm/Sec). Listen with the stethoscope and simultaneously observe the sphygmomanometer. The first knocking sound (Korotkoff) is the subject's systolic pressure.

When the knocking sound disappears, that is the diastolic pressure (such as 120/80). The pressure in the left arm was recorded.

RESULTS AND DISCUSSION

The textile industry is a major labour intensive industry in today's world and employs approximately 60 million workers globally. The textile sector in India plays an important role in the country's economy, providing employment to a significant population in rural and urban areas. Ichalkaranji today is one of the fastest growing industrial areas in Maharashtra and having mixed community from all parts of India this is a cosmopolitan town by true means. The city's economy is driven predominantly by the textile industry.

Table 1: Physiological responses of exposed group

Age Group	Freq.	Respiratory rate (breathing/min)	BMI (%)	Blood Pressure (mmHg)		Pulse Rate (bpm)
				SBP	DBP	
20-30	8	35.37	20.96	120.62	79.62	77
30-40	11	33.72	25.57	126.54	80.90	79.54
40-50	19	37.51	23.53	125.21	87.26	87.31
50-60	7	32.57	22.37	125.71	84.28	81.71
60<	6	34	21.15	120.5	79.83	92.83
Total	51	173.18	113.60	618.59	411.91	418.40
Average	10.2	34.63	22.72	123.71	82.38	83.68
Median	8	34	22.37	125.21	80.90	81.71

Variance	27.7	3.58	3.62	8.53	10.92	40.64
SD	5.26	1.89	1.90	2.92	3.30	6.37
C.V	51.59	5.46	8.37	2.36	4.01	7.61

Table no. 1 revealed the physiological responses of exposed group like respiratory rate, BMI, blood pressure and pulse rate and statistical analysis of the physiological responses like average, median, variance and standard deviation in expose group according to age group. Respiratory rate was increased in all age group. All age group showed the normal BMI category and normal Blood pressure. The pulse rate of age group 20-30 shows normal range while, other age group showed increased pulse rate.

Table no. 2 revealed the physiological responses of control group. The statistical analysis shows the normal respiratory rate, BMI category and blood pressure in all the age group. All age group showed the normal. The pulse rate in all age group was normal except 60< age group.

Table 2: Physiological responses of control group

Age Group	Freq.	Weight (kg)	Height (Inch)	Breathing Rate (breathing/min)	Blood Pressure (mmHg)		Pulse Rate (bpm)
					SBP	DBP	
20-30	10	64.7	5.46	22.1	120.7	80.4	71.7
30-40	10	61.1	5.37	22.7	119.1	80.1	70.8
40-50	10	66.1	5.45	24	120.6	79.7	72.2
50-60	10	62.9	5.35	28.7	125.5	82.3	76

Above 60	2	61	5.4	33	130	76	82
Total	42	315.8	27.03	130.5	615.9	398.5	372.7
Average	8.4	63.16	5.406	26.1	123.18	79.7	74.54
Median	10	63.8	5.41	23.35	120.65	80.25	71.95
Variance	12.8	4.99	0.002	21.58	20.33	5.2	21.328
SD	3.57	2.23	0.04	4.64	4.50	2.29	4.61
C.V	42.59	3.53	0.89	17.80	3.66	2.88	6.19

Figure 1 revealed the Body mass index in control and exposed group. Figure 2 showed the pulse rate in control and exposed group and Figure 3 revealed breathing rate in control and exposed subject. Figure 4 showed the systolic blood pressure and diastolic blood pressure in control and exposed group.

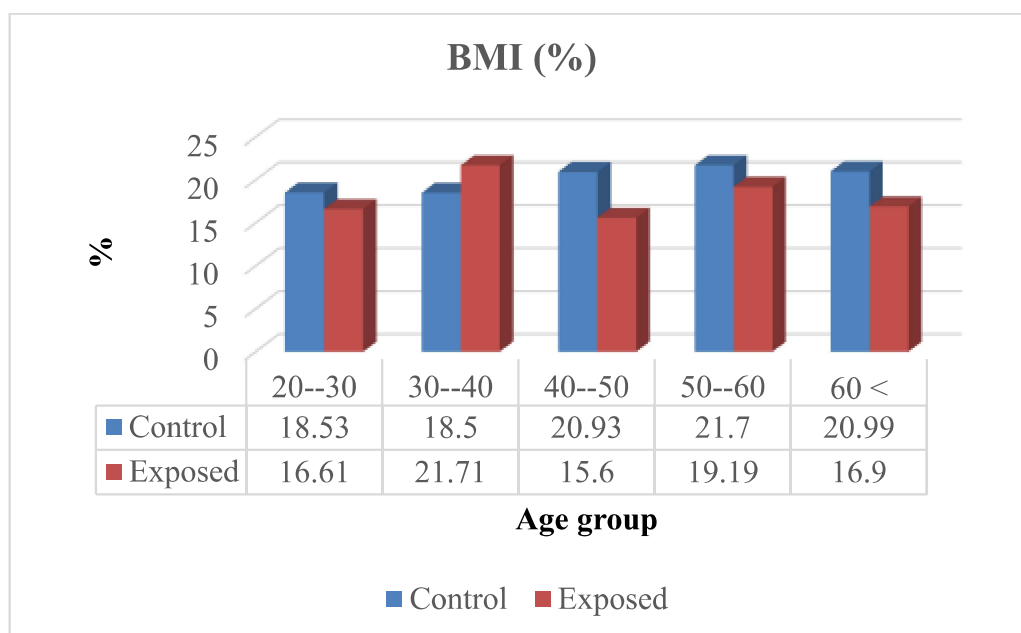


Figure 1: BMI of control and exposed subject

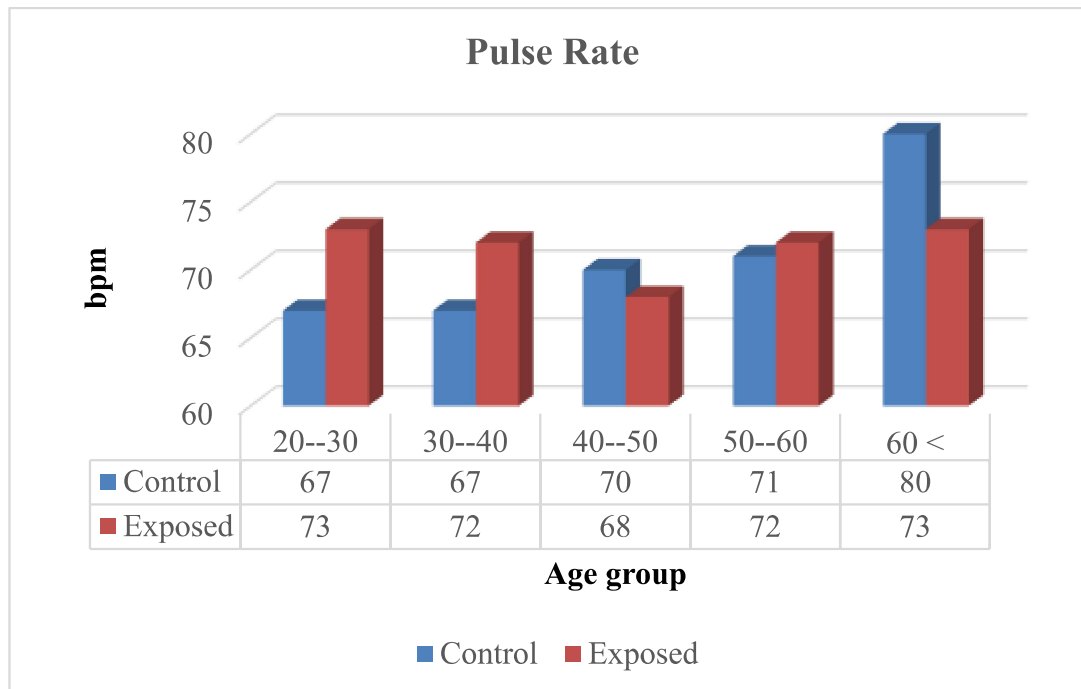


Figure 2: Pulse rate of control and exposed subject

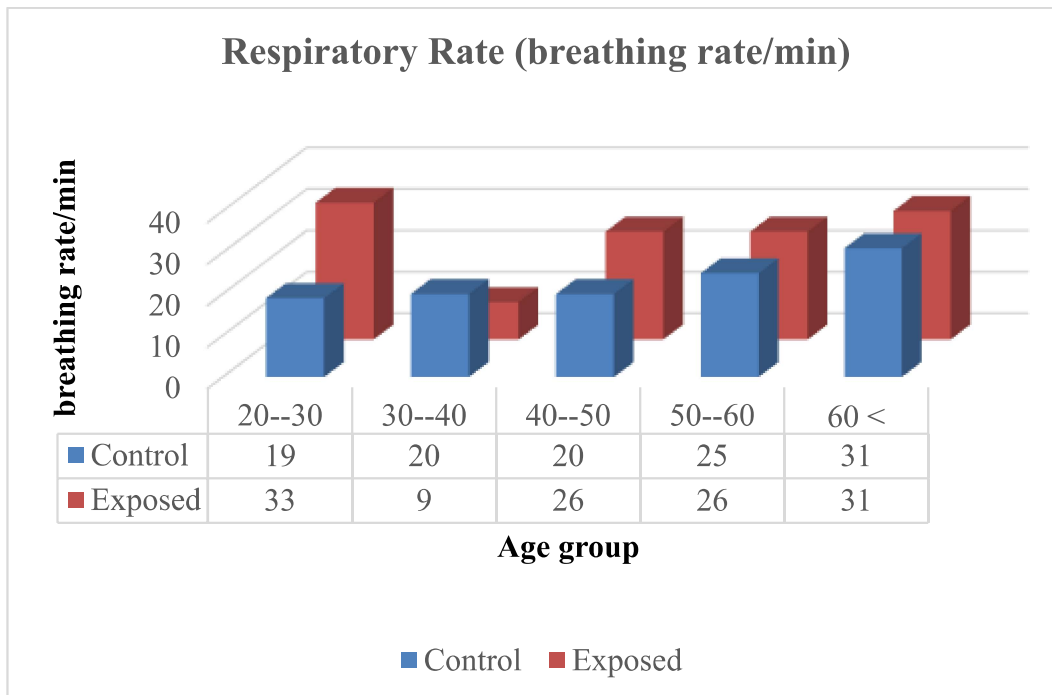


Figure 3: Respiratory rate of control and exposed subject

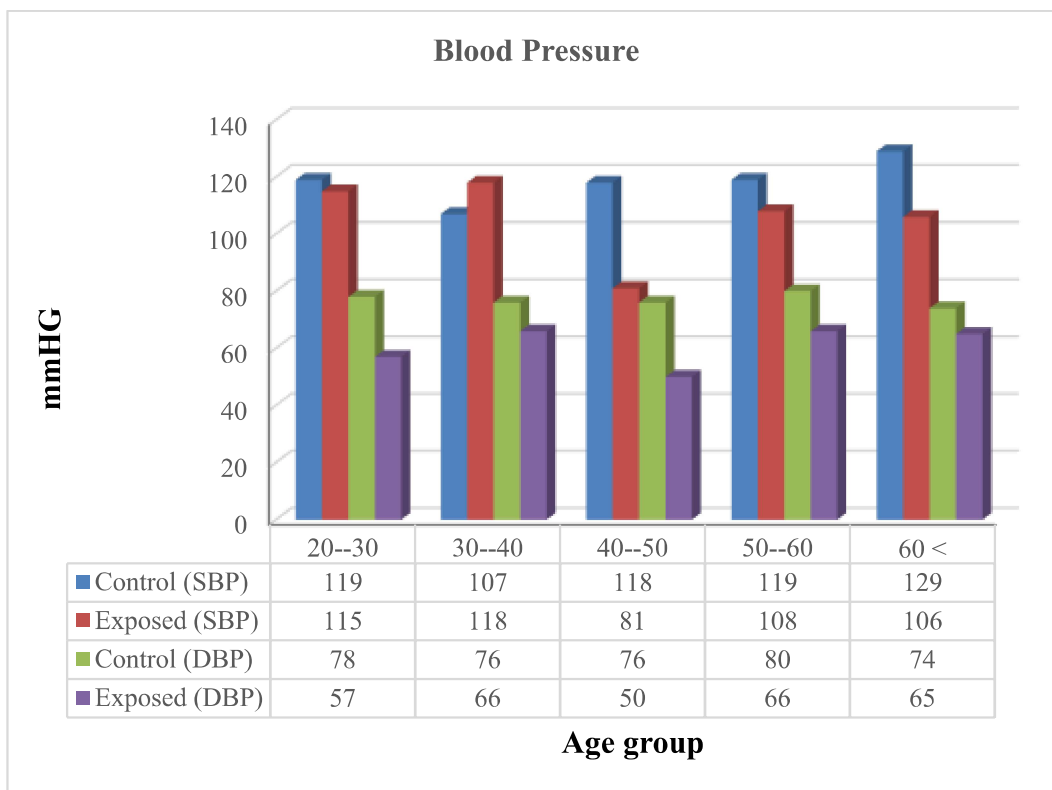


Figure 4: Blood pressure of control and exposed subject

The workers of textile industry show the medium and low socioeconomic status. In exposed group workers of age group 20-30, 40-50 and above 60 was in underweight category. The exposed group showed the increased pulse rate, breathing rate and poor fitness. Self-reported asthma and respiratory illness is significant in workers. The BMI is the most appropriate simple indicator by which weight-for-height can be related to health outcome. BMI considered as indirect measurement of nutritional status. The changes in nutritional status play an important role in the course of person’s health. Furthermore studies have shown that BMI levels correlated with body fat and with future health risk like hypertension, heart disease, diabetes mellitus, cardiovascular disease, gall bladder disease and various type of cancer. The Therefore proposed the use of BMI to monitor both under nutrition and

overweight. Must and Andersons (2006) defined Body Mass Index is measures of weight adjust for height. The measurement and analysis of body weights and heights have been recognized as general indices of health for many years, it is only comparatively recently that the World Health Organization(WHO) has set criteria for assessing underweight and overweight in both WHO children and adults (WHO, 1995). Shafique *et.al.* (2007) and Khan and Kraemer, 2009 have been examined the relationship between BMI and age, mortality, level of education, wealth index and other social variables in Bangladesh. The study revealed high prevalence of low fitness among obese subject and significant correlation between the selected indices of PFI and BMI.

CONCLUSIONS

Physical fitness is an individual depends on the amount of oxygen which can be transported by the body to working muscles, and the efficiency of muscles to use that oxygen. The acquaintance interaction of modern life style, we are neglecting the natural physical activities and increased the risks among the society for the chronic diseases exclusively from coronary heart diseases. Predominantly cardio respiratory fitness is dependent on physical fitness index. Physiological responses like respiratory rate, BMI, blood pressure and pulse rate shows the significant difference in expose group and control group. Apart from 30-40 and 50-60 age group showed the underweight BMI category, normal blood pressure, increased breathing rate and pulse rate than the control group. The BP in control and exposed group does not show any significant difference.

The presented study has revealed that, increased breathing rate and pulse rate in exposed group, Body mass index shows significant difference among the exposed and control group. Increased breathing rate, respiratory illness and self-reported asthma is more significant among the textile industry workers.

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CONFLICT OF INTREST: Non declared.

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