Economic burden of occupational illness on women workers in textile industry, Pakistan

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Abstract

The relationship between respiratory diseases and work in textile factories has long been identified in the literature, but the economic burden of illness has not been described. This study provides estimates of occupational illness among women textile workers and associated health cost. The analysis determines that women workers bear a significantly higher disease burden than the control group. Within worker, the risk of respiratory diseases is significantly higher for those who work overtime and longer hours per week. The estimated out of pocket health expenditures stand at Pakistan Rupees 647 in the stipulated time of 15 days. Given low wages of women workers, the out-of-pocket expenses drain a substantial proportion of monthly income of the workers. The research recommends that appropriate minimum dust standard should be set and monitored for the safety of the workers.

Introduction

The textile is a labour intensive industrial sector in many developing countries including Pakistan. It employs approximately 60 million workers globally, majority of them are women (ILO, 2009). Apart from employing millions of workers, the industry can also be highly polluting and contributes to indoor air and water pollution (Memon et al. 2008; Khan et al. 2015). The relationship between cotton dust and respiratory diseases has repeatedly been established in the literature (Wang,et al, 2003; Aleamu et al. 2010; Bates, et al. 2010;) but little attention has been paid on illness associated health cost borne by workers. From policy perspective, these estimates are very important in order to promulgation of minimum standards for the industry and assigning public funds for "workers' welfare and social security" (Khan, 2017). Therefore, research must clarify, not only a relationships between development of respiratory diseases and level of dust in textile mills, but also economic aspect of dust pollution which is missing in the literature.

The objective of this research is to provide this needed input by examining the economic burden of pollution on women workers in the textile industry in Pakistan. Data of 541 female textile workers were collected for analysis from 18 spinning mills. Data of comparable 513 non-textile women were also collected for comparison. The analysis validates that women workers bear a significantly higher disease burden than the control group. There appears to be a general trend of increasing risk of respiratory diseases for women, working overtime and longer hours/week. In terms of health cost, the ill workers expend Pakistan Rupees 647 out of their pockets in the stipulated time frame. Given low wages of workers, the out-of-pocket expenses put a significant financial burden on the workers. Hence, incidence of occupational illness and associated absence from work, also strain productivity and profitability of firms. It certainly makes an economic case for promulgation of minimum cotton dust standards in textile mills.

Research Methods

We carried out a case–control study in 18 textile mills of Faisalabad and Lahore districts using structured questionnaire (which is developed on Wang, et al. 2003). The study group (cases) consists of 541 women textile workers and control group consists of 513 non-textile women, either working in different industry/office or act as housewife. Following Jaiswal (2011), the controls were selected from the same households, so that workers and controls can be matched for socioeconomic and demographic attributes. The survey was administered from April-June 2015. Every worker was explained about the nature of the research and information required before interview. They were also informed about the confidentiality of the information. Therefore, data were collected after informed consent from each worker.

Analysis

The study used both descriptive and regression analysis. The descriptive analysis is used to explore workers socio-economic condition and health cost estimates while regression analysis includes measurement of dose-response function. The dose-response function measures relationship between the respiratory illnesses in workers and pollution in textile mills. In this model, dependent variables are respiratory diseases, e.g. byssinosis, phlegm, blood phlegm, chronic cough and wheeze which are defined as the presence of respiratory illnesses (Pr = 1) or not (Pr = 0) among individual workers during reference period. The explanatory variables are personal characteristics, house characteristics and work & factory characteristics. The personal characteristics include age of the worker which is defined in years. The house characteristics include three separate dummy variables e.g. 1 for separate kitchen, use of firewood for cooking and use of kerosene oil stove for cooking. The work and factory characteristics include work overtime and work hours/week. Overtime work is a binary variable i.e. 1 for work overtime and 0 otherwise; however, working hours/week is a continuous variable. The dependent variables take the form of binary response variable; hence the binary response Probit models are used. Empirical specification of the models is given below:

$$d_i^* = X_i\beta + e_i \ldots\ldots\ldots\ldots\ldots (1)$$

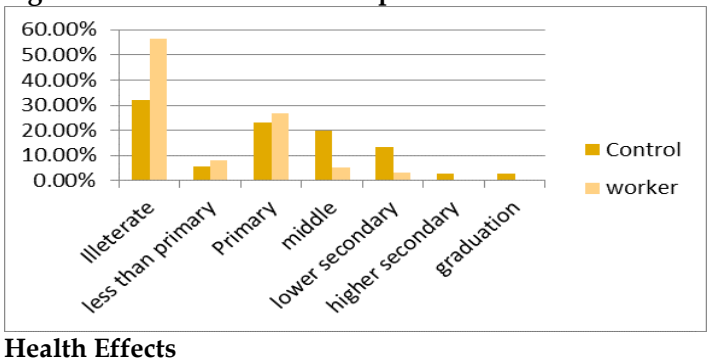
Where d_i^* is a latent variable, X_i is vector of independent variables, β is a vector of parameters, e_i is independent of X_i, and e | x ~ Normal (0, 1).

Descriptive Analysis

Worker's Demographic and Socio-Economic Characteristics

The survey shows that age of the female workers ranges between 12 to 52 years with average age of 26.23 years. While, the age of control group females ranges from 13 to 55 years, averaging approximately 30 years. The average monthly households' expenditures are Pakistan Rupees (RS) 19,196. The data specify that more than half of the workers (56%) are illiterate. Compared to workers, the education levels of control group are reasonably good with some of the workers having higher secondary & above education as well (see figure 1).

Figure 1: Education level of respondents

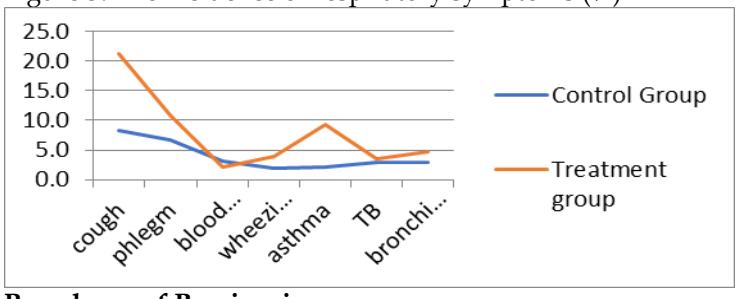


Health Effects

Workers in different departments of textile factories are normally exposed to hazardous dust and chemicals which result in adverse health outcomes. The survey also enquired from workers about

negative health effects due to exposure in the mills. The results shown in figure 3 revealed that most of respiratory symptoms are higher in treatment group than control group. The gap between treatment groups and control group is highest in the incidence of cough and asthma. Figure 3 postulates that more than 21 percent workers experienced cough during the reported period of 15 days compared to just over 8 percent of control group. The result also shows that about 9.3 percent workers have reported asthma problem compared to 4.1 percent by control group. Apart from most of respiratory diseases, the incidence of cough and prevalence of asthma in treatment group is more than double than control group which is evidently because of high dust level in the mills.

Figure 3: The incidence of respiratory symptoms (%)



Prevalence of Byssinosis

Byssinosis as practice was defined by Schilling's grading of the disease which is as follow:

"Grade 0: no symptoms of chest tightness or breathlessness on Monday
Grade 1/2: occasional chest tightness or breathing difficulty on the first day of the working week
Grade 1: chest tightness and/or breathlessness on Monday only.
Grade 2: chest tightness and/or breathlessness on Monday and other weekdays
Grade 3: Grade 2 symptoms accompanied by evidence of permanent impairment in capacity from reduced ventilator defect" (Khan, 2017).

The overall prevalence of byssinosis among textile workers is reported 16.8 percent. In terms of grades of byssinosis, about 12.5 percent are experiencing byssinosis symptom of Grade 1 and 3.5 of Grade 2, respectively. Moreover, about 0.8 percent have reported experience of grade ½ symptoms. The byssinosis estimates indicate that prevalence of disease is high in textile workers. The estimates however, corresponds to other studies in Pakistan (Farooque, et al. 2008; Khan, 2017).

Health Cost

The illness estimates clarify that cotton dust in textile mills causes respiratory diseases which are, ultimately, affecting productivity, performance, work absence and welfare of the workers. It is, therefore, time to turn our attention toward the burden of illness in textile mills. The cost of illness estimates provides us monetary value of economic burden of illness, while estimates of time lost in seeking medication represent social cost to workers and their families. Moreover, the estimates of work days lost exhibit productivity losses to employers in addition to illness compensation. The health cost results delineate that the mean treatment cost to worker is RS 181.94 during the 15 days period. The mean medical cost to control group is RS 256.16 which is significantly higher than treatment group.

It can be interpreted that a close look at the number of observations for treatment group and control group in table 1 shows that the reason of low cost of treatment to workers is due to the facility of free treatment at social security hospitals to large fraction of workers. The mean value of lost wages due to illness is RS 378.57 for the same period. In terms of social burden of the illness, the estimate shows that, on average, a worker lost approximately 20 minutes in traveling and 12 minutes for waiting for medical treatment. The average work absence is just above 8 hours. The absence from work due to illness put a substantial strain on productivity and cost of doing business. It certainly makes an economic case for implementation of occupational safety and health standards in textile mills.

Results of Empirical Model

The results of the regression analysis for incidence of respiratory diseases and their relationship with explanatory variables are reported in Table 2. The results show that workers who work overtime

have significantly higher probability of byssinosis symptoms than workers who do not work overtime. Similarly, positive relationship holds between working hours per week and incidence of byssinosis. These findings are in congruence with the findings of other researchers, which expressed that workers who work longer hours in the textile mills are primarily affected by byssinosis (Alemue et al. 2010). Among the house characteristics, the result of separate kitchen shows negative relationships with byssinosis and use of firewood in relation to natural gas for cooking yields positive relationships with byssinosis. These results are in-line with the expectations. In terms of other respiratory diseases, the work overtime is the only consistent and significant parameter with most of the respiratory diseases, suggesting that overtime work increases the likelihood of respiratory diseases incidence in women textile workers.

Conclusion

The present study provides estimates of respiratory diseases and associated economic burden in women textile workers. The result indicates that overtime work and work hours per week appeared as important determinants of respiratory morbidities in women mill workers. The respiratory illnesses contributed to increased visits to doctor. The health cost analysis reveals that women workers bear substantial out of pocket health cost which is attributed check-up fee, medication and work days lost. The average cost is PKRs. 647 in specified 15 days period. Given low wages of women workers, the out-of-pocket expenses drain a substantial proportion of monthly income of the workers. The research recommends that byssinosis should be made compensable disease and minimum standard for cotton dust should be set.

References

Alemu, K., Kumie, A. and Davey, G., 2010. Byssinosis and other respiratory symptoms among factory workers in Akaki textile factory, Ethiopia. *Ethiopian Journal of Health Development*, *24*(2).

Bates, D.V., Gotsch, A.R., Brooks, S., Landrigan, P.J., Hankinson, J.L. and Merchant, J.A., 1992. Prevention of occupational lung disease. *Chest*, *102*(3), pp.257S-276S.

Farooque, M.I., Khan, B., Aziz, F., Moosa, M., Raheel, M., Kumar, S. and Mansuri, F.A., 2008. Students' Corner-Byssinosis: As seen in cotton spinning mill workers of Karachi. *JPMA. The Journal of the Pakistan Medical Association*, *58*(2), p.95.

Freeman III, A.M., Herriges, J.A. and Kling, C.L., 2014. *The measurement of environmental and resource values: theory and methods*. Routledge.

Grossman, M., 1972. On the concept of health capital and the demand for health. *Journal of Political economy*, *80*(2), pp.223-255.

Harrington, W. and Portney, P.R., 1987. Valuing the benefits of health and safety regulation. *Journal of urban Economics*, *22*(1), pp.101-112.

Hameed, H.S., ALY, H.A. and El Latif, O.A., 2012. An intervention study to evaluate compliance with personal protective equipment among workers at Textile industry. *J of Am Sci*, *8*, pp.117-21.

ILO, 2009. World Day for Safety and Health at Work 2009, Facts on safety and health at work. International Labour Organization, Geneva

Jaiswal, A., 2011. A study of the occupational health function among female textile workers. *International Journal of Sociology and anthropology*, *3*(3), p.109.

Jiang, C.Q., Lam, T.H., Kong, C., Cui, C.A., Huang, H.K., Chen, D.C., He, J.M., Xian, P.Z. and Chen, Y.H., 1995. Byssinosis in Guangzhou, China. *Occupational and environmental medicine*, *52*(4), pp.268-272.

Khan, M. 2017. The Health Burden of Dust Pollution in the Textile Industry of Faisalabad, Pakistan, South Asian Network for Development and Environmental Economics (SANDEE). SANDEE Working Paper No. 123–17. Available at: www.sandeeonline.org

Khan, A.W., Moshammer, H.M. and Kundi, M., 2015. Industrial hygiene, occupational safety and respiratory symptoms in the Pakistani cotton industry. *BMJ open*, *5*(4), p.e007266.

Memon, I., Panhwar, A., Rohra, D.K., Azam, S.I. and Khan, N., 2008. Prevalence of byssinosis in spinning and textile workers of Karachi, Pakistan. *Archives of environmental & occupational health*, *63*(3), pp.137-142.

Wang, X.R., Eisen, E.A., Zhang, H.X., Sun, B.X., Dai, H.L., Pan, L.D., Wegman, D.H., Olenchock, S.A. and Christiani, D.C., 2003. Respiratory symptoms and cotton dust exposure; results of a 15 year follow up observation. *Occupational and environmental medicine*, *60*(12), pp.935-941.

Variable name	Treatment Group			Control Group		
	Observation	Mean	Std. Dev	Observation	Mean	Std. Dev
Medical cost	215	181.94	274.1	112	256.16	332.57
Travel Cost	214	38.41	42.46	109	13.99	31.79
Travel time	214	19.49	13.23	112	11.56	17.76
Waiting time	208	20.12	18.53	110	12.28	17.25
Hours Absent	124	8.08	1.64	-	-	-
Wage lost	121	378.57	100.73	-	-	-

Table 1: Descriptive Statistics of Health Cost

	Dependent Variables				
Independent Variables	Byssinosis	phlegm	Blood phlegm	Chronic Cough	Wheeze
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Personal characteristics					
Age (years)	.0052 (.009)	.0152 (.010)	.0331** (.016)	.0081 (.009)	-.0067 (.016)
House characteristics					
Separate kitchen (1=yes, no=0)	-.4305 *** (.154)	.5136 ** (.219)	.1366 (.361)	.7716 *** (.882)	.4187 (.305)
Use of firewood dummy	.4061*** (.138)	-.0004 (.191)	.3502 (.248)	.2144 (.133)	-.3068 (.245)
Use of kerosene dummy	-.1174 (.184)	.2758 (.210)	-.6220 (.495)	.0310 (.1880)	.3484 (.289)
Work & Factory characteristics					
Work overtime (1=yes, no=0)	.6491 *** (.214)	.8520 *** (.215)	1.285 *** (.295)	2645 (.202)	-.3808 (.460)
Work Hours/week	.023043 ** (.010)	-.0012 (.011)	.0016 (.019)	.0147 (.010)	.0376 (.020)
Constant	-2.0968 ** (.729)	-2.45 *** (.792)	-3.355 ** (1.309)	-1.799 *** (.714)	-3.947 *** (1.365)
Observations	541	541	541	541	541
LR chi2(11)	30.76***	29.39***	32.89***	39.98***	8.98
Log likelihood	-228.11	-171.70	-62.507	-259.89	-77.805
Pseudo R2	0.063	0.078	0.208	0.071	0.054
Standard errors are in parenthesis *** =significant @1%; **= significant @5%; *= significant @10%					

Table 2: The Probit Regression Analysis of Incidence of Respiratory Diseases