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Work-Related Health Symptoms, Personal Protective Equipment Use, and Environmental Risk Perceptions Among Textile Factory Workers: A Cross Sectional Study in Iraq

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Abstract: Textile factory workers may expose the individual to airborne particles, chemical agents and workload related stressors that may cause adverse health outcomes. Evidence from Iraq is limited, however, on issues such as symptom burden, use of PPE, and worker's views on risks. A cross-sectional survey was performed in the workplace among textile factory workers (N = 50). Data were gathered from a structured questionnaire on sociodemographic characteristics; work conditions (daily working hours, years of experience); PPE usage, health indicators (chronic disease, occupational disease, stress/anxiety); health symptoms related to work in the job and perceived environmental/community/economic impacts. Descriptive statistics in the form of frequencies and percentages were reported. The types of symptoms were summarized at a worker level among workers reporting symptoms related to work. The sample was mostly female (62%) and mostly middle-aged (41-50 years old: 46%; 51-60 years old: 30%). The dominant number of participants worked 6 hours/day (60%) and had 5-25 years of experience (80%). PPE use was low (28%). Chronic diseases were reported by 48% of workers, occupational diseases by 54% and stress/anxiety by 66%. Work-related health symptoms were reported by 54% of the participants. Among the symptomatic workers (n=27), the most common symptoms were related to exhaustion (51.85%), headache (25.92%), allergy-related symptoms (18.51%); asthma-related complaints and visual impairment were each reported by 7.4%. In terms of perceptions, 62% thought that the textile activity has an impact on the environment, 54% of them perceived an effect on local inhabitants and 66% perceived an effect on the local economy. Of those who response about environmental impact (n = 31), air pollution was the predominant type of perceived damage (83.87%). Textile factory workers had a high prevalence of work-related symptoms and psychosocial burden along with low PPE use and strong perceptions of air pollution-related harm. These findings provide an argument to reinforce PPE programs, enhance airborne exposures controls and ventilation and also integrate psychosocial risk management as an occupational health approach. Future studies need to include objective exposure measurement and analytic modeling in order to quantify determinants of symptoms.

Keywords: occupational health, textile industry, personal protective equipment, work-related symptoms, stress/anxiety, air pollution perception, Iraq.

Introduction

The garment industry and textile industry still contribute as one of the largest employers in most countries with the low- and middle-income groups but occupational risks to employees are enormous; high amounts of cotton and fiber dust, chemical compounds, extended unchanging postures, repeated pain, long working hours, and ineffective safety measures are all a big part of the job. The most recent reviews of the literature indicate that the health impact in textile and fashion facilities does not occur in one disease pattern, but in three main areas: respiratory illnesses, musculoskeletal diseases, and psychosocial pressures. [1][2]. The prevalence of respiratory hazards in textile facilities have

always been in the spinning, weaving and engagements surrounding the textiles undergo processing since they produce respirable dusts, the processes of dyeing, finishing and maintenance may include additional exposures to chemicals. Multi-year epidemiological activities have demonstrated that a prolonged occupational contact with cotton dust can result in prolonged respiratory symptoms, and current cotton-mill statistics is still documenting byssinosis and lung impairment in people who are exposed to occupational harm. As a result of these findings, it is clear that cotton dust is still a present occupational risk and not the issue of the past days of industry. [3][4]. Recent studies in the workplace have added weight to the biological and clinical importance of airborne on the textile mills. In a research of a textile mill in Myanmar, respirable dust at the place of weaving departments was accompanied by quantifiable decreases in lung work in a significant percentage of the workers. This is in combination to the longitudinal and multicentrical evidence of cotton-processing environments, an exposure- in relation to health relationship has to be expanded to impaired objective functional performances originating to respiratory symptoms. [3][4][5]. The workload of the occupation of textile and garment work is not limited to the respiratory system. Evidence on systematic reviews in the field of ready-made garments. The employees often have unsafe and open environments, repetitive stress, low pay, and physically strenuous jobs that lead to physical, and psychological vulnerabilities. Also, a cross-sectional study of a large group of garment workers in Bangladesh revealed common health complaints, particularly headache, cold and back pain, and worse psychosocial conditions in the workplace were linked to poorer self-reported health. These results support a multidimensional perspective of the textile-worker health incorporating ergonomic and psychosocial factors with dust and chemical exposure. [1][2][6]. PPE is thus a significant component of risk mitigation, particularly in situations where there is no complete exposure elimination or engineering controls. Nonetheless, there is a recent finding suggesting that the use of PPEs cannot be viewed as a yes/no worker behavior. Recent research demonstrates that knowledge, attitudes, performance, supervision, equipment availability, and workplace safety culture have a strong correlation with PPE uptake with a scoping review of the textile industry demonstrating training, organizational trust, and enforcement mechanisms to be recurring aspects of compliance. In line with these conceptualizations, the low PPE usage in textile factories should be analyzed as both an exposure-control gap (and) as an indicator of a more general organizational phenomenon of occupational health practice. [2][7][8]. The environmental impacts of textile production are also known throughout the valley chain such as excessive consumption of resources, contamination of chemicals, emissions, and the production of wastes. As these environmental burdens are accompanied by workplace exposure, scientifically it is justified to focus not only on work-related symptoms but also on the protective practices of workers and understanding of environmental risk. Based on this, a combination of investigations of health symptoms, use of PPE, and perceived environmental impact may present a more holistic occupational-health view of the textile factory work. [2][9].

Aim

To determine the prevalence of work-related health symptoms and describe PPE use, health indicators, and perceptions of environmental/community impact in textile factory workers.

Materials and Methods

Study Design and Setting

A cross-sectional work done at the workplace among textile factory workers in Iraq. The aims of the study were to describe work characteristics and conditions in the job, to estimate the prevalence of health outcomes and work-related symptoms, to assess the degree of personal protective equipment (PPE) use, and to document work perceptions of workers about environmental and community impacts associated with workplace activities.

Study Population and Selection Criteria

The study population consisted of employees who were actively involved in textile factory activities and closely associated activities, routine testing, handling textile materials, sample preparation and factory operations. Participants eligible were workers currently engaged in performing such duties

during the period the data was being collected and capable of providing informed consent and completing the questionnaire. People who did not participate with exposure-related factory tasks (purely administrative staff) were excluded from the main outcome analyses, as were those absent due to prolonged leave or those for whom data on the primary outcome cannot be recorded.

Sample Size and Recruitment

A total of 50 workers were included in the final data set. Recruitment was conducted using a facility-based method in which available and eligible workers in the facility were recruited at a time of the study period by establishing an agreement to participate, till the target number was reached. This method is often employed in an occupational context where the available workforce is not particularly large and access is constrained by the workplace schedule.

Data Collection Instrument and Procedure

Data were gathered from a structured questionnaire that was administered face to face. The tool was developed to collect sociodemographic data (including sex, age-range, and education stage) and work-related data (including years of occupation and working hours/day). It also recorded health indicators such as the presence of chronic disease, occupational disease history and stress/anxiety state as recorded by the questionnaire items.

Outcome Measures, Classification of Symptoms

Work related health symptoms were taken as the primary outcome measure. This variable was recorded as a binary response (yes/no) as to whether the participant reported any symptom attributed to workplace exposure or work conditions during the reference period used in the questionnaire. For participants reporting the presence of symptoms, additional multiple response questions were administered for symptom profile descriptions (exhaustion, headache, allergy manifestations, asthma-related symptoms, weakness/low energy and visual impaired), with each of these indicators reported as either present or absent.

Utilization and Perception Measures for PPE

PPE utilization was measured as one of the crucial exposure variables and was also recorded as a binary response (yes/no), indicating reported availability and/or routine utilization in agreement with the format of the questionnaire. In addition, workers were asked about perceived environmental damage and categorized type of perceived damage (air pollution versus land pollution) and perceived impacts on the local economy and the community using the response options contained in the tool.

Data Management including Quality Control

To ensure the accuracy of the data, questionnaires were checked for completeness at the point of data collection. Responses were coded and entered into a statistical data set with the procedures that followed: cleaning, procedures that included range checks, consistency checks, especially assuring that symptom type responses were only analyzed for those who reported work-related symptoms. Missing data were compared by variable and data with missing values for the primary outcome were excluded from outcome-based analyses but otherwise analyses were performed by complete case method except when missingness was large.

Statistical Analysis

Sequential steps of statistical analysis were planned. First, categorical variables were described using frequencies and percentages to describe the profile of the workforce and to estimate the prevalence of chronic disease, occupational disease, occupational stress/anxiety, the use of PPE, and work-related symptoms. Second, among the workers with symptoms, the distribution of each type of reported symptoms was calculated using multiple-response procedures. Third, bivariate association testing was planned between the work-related symptoms (yes/no) and key predictors including PPE use, daily working hours, years of working experience, sex, age category, and education level using the chi-square test based on the assumptions and Fisher's exact test based on expected cell count size. Where appropriate, effect measures (odds ratios with 95% confidence intervals) were to be reported.

Multivariable Modeling: Strategy

A multivariable analysis plan was included in order to assess independent predictors of work-related symptoms. A binary logistic regression model was proposed having work-related symptoms as dependent variable and PPE use, working hours, experience, selected demographic variables as predictors. Given the sample size (N = 50), it would have limited the number of predictors and it would allow to combine some of the categories to reduce the instability of the model and avoid overfitting, presenting the adjusted odds ratios and 95% confidence intervals. A pH < 0.05 was set as a level of statistical significance.

Ethical Considerations

Ethical procedures were followed in the entire study. Participation was voluntary and based on informed consent, confidentiality was protected by excluding personal identification from the data set and results were only reported in aggregate form. Participants were informed that no one could discover out if they refused to participate or drop out and data collection was performed in a manner that was designed to keep the participant's privacy and not intrude upon normal work activities.

Results

Among 50 textile factory workers included in the study, females are the group that has been included (62%, n=31) whereas males represent 38% (n=19). This sex distribution summarizes the characteristics of the workforce in the study setting and must be taken into account in the interpretation of occupational outcomes and patterns of reporting of symptoms.

Table 1. Sex of textile factory workers (N = 50)

Sex	Number (n)	Percentage (%)
Male	19	38%
Female	31	62%
Total	50	100%

The age profile indicated a generally middle-aged workforce. The most common age group was 41-50 years (46%, n=23), and 51-60 years was the second most common age group (30%, n=15). Younger workers were less frequent, with the 31-40 years age class representing 18% (n=9) of workers while 20-30 years workers represented 6% (n=3). This pattern means that most of the participants were of ages in which cumulative occupational exposure and age-related co-morbidities might be more likely.

Table 2. Age distribution of textile factory workers (N = 50)

Age group (years)	Number (n)	Percentage (%)
20–30	3	6%
31–40	9	18%
41–50	23	46%
51-60	15	30%
Total	50	100%

The levels of educational attainment were primarily secondary and university level. The most common education was secondary (44%, n=22) then university education (30%, n=15). Intermediate education 16% of (n=8) and primary education 10% of (n=5). These distributions are important from a standpoint of occupational safety interpretation as education may manifest in risk awareness and practice of preventions.

Table 3. textile factory workers education achievement (N = 50)

Educational attainment	Number (n)	Percentage (%)
Primary education	5	10%
Intermediate education	8	16%
Secondary education	22	44%
University education	15	30%
Total	50	100%

Working hours were concentrated between 5 and 7 hours at a time. A majority of workers were in the range of 6 working hours/day (60%, n=30). In comparison, 22% (n=11) worked 7 hours/day, 16% (n=8) worked 8 hours/day and only 2% (n=1) worked 5 hours/day. Working hours might serve as a surrogate of time of daily exposure, relevant when assessing the burden of symptoms.

Table 4. The working hours of the textile factory workers per day (N=50)

Daily working hours	Number (n)	Percentage (%)
5 hours/day	1	2%
6 hours/day	30	60%
7 hours/day	11	22%
8 hours/day	8	16%
Total	50	100%

The work force was quite experienced. Two categories of experience prevailed in the sample: 5-15 years (40% or 20 people) and 16-25 years (40% or 20 people). Workers with 26 to 35 years had a total of 16% (n=8) and 2 with 36 to 45 years had a total of 4% (n=2). This distribution indicates considerable long-term exposure in most subjects and justifies testing outcomes which are potentially related to accumulative exposure at work.

Table 5. Working experience of textile factory workers (N = 50)

Professional experience (years)	Number (n)	Percentage (%)
5–15	20	40%
16–25	20	40%
26–35	8	16%
36–45	2	4%

PPE usage was minimal in a study group. Only 28% (n=14) of them reported PPE use, while 72% (n=36) reported the non-use of PPE. This finding is central for occupational risk interpretation as inadequate use of PPE may result in higher exposure to irritants and other risks in the workplace which may contribute to the observed prevalence of symptoms.

Table 6. Personal protective equipment (PPE) use in textile factory workers (N = 50)

PPE use	Number (n)	Percentage (%)
Yes	14	28%
No	36	72%
Total	50	100%

Health of the population showed a considerable burden. Nearly half of the participants mentioned chronic diseases (48 percent, n=24) and more than half mentioned occupational diseases (54 percent, n=27). In addition, stress/anxiety was very common (66%, n=33). Together, these outcomes indicate that physical health concerns and psychosocial strain co-exist within this workforce, which might have an effect on experiences of symptoms as well as on reporting of symptoms.

Table 7. Reported health conditions of textile factory workers (N = 50)

Health condition	Yes: Number (n)	Yes: Percentage (%)	No: Number (n)	No: Percentage (%)	Total (N)
Chronic diseases	24	48%	26	50%	50
Occupational diseases	27	54%	23	46%	50
Anxiety or stress	33	66%	17	34%	50

Work-related health symptoms were reported very often. A total of 54% (n=27) said that they experienced health symptoms attributed to their work in the factory compared with 46% (n=23) who reported no work-related symptoms. This proportion reflects a significant occupational symptom burden and gives the baseline of the primary outcome in the subsequent association testing against potential occupational factors (PPE use, working hours and experience).

Table 8. Work related health symptoms for textile factory workers (N = 50)

Do you suffer from health symptoms caused by working in the factory?	Number (n)	Percentage (%)
Yes	27	54%
No	23	46%
Total	50	100%

Among the symptomatic workers (n=27), the most common symptoms were exhaustion (51.85%, n=14), headache (25.92%, n=7) and allergy-related symptoms (18.51%, n=5). Less frequent but clinically relevant symptoms were asthma related symptoms (7.4%, n=2) and complaints of visual impairment (7.4%, n=2). This symptom pattern indicates that fatigue and headache are the main symptoms of the disease burden with a lower percentage indicating symptoms linked to the respiratory or eye.

Table 9. Specific health problems for symptomatic workers (n = 27)

Specific health issue	Yes: Number (n)	Yes: Percentage (%)	No: Number (n)	No: Percentage (%)	Total (n)
Exhaustion	14	51.85%	13	48.14%	27
Headache	7	25.92%	20	74.07%	27
Allergy	5	18.51%	22	81.48%	27
Asthma	2	7.4%	25	92.59%	27
Visual impairments	2	7.4%	25	92.59%	27

Participants led significant perceptions about impacts more general to textile-related activity. Most of the workers believed that the textile industry has an influence in the environment (62%, n=31). Additionally, 54% (n=27) were of the notion that the factory influences local residents, and 66% (n=33) were of the notion that the factory influences the local economy. These perceptions help to give environmental health considerations a place of relevance in addition to occupational health outcomes.

Table 10. Perceived environmental, community and economic impacts (N = 50)

Question	Yes: Number (n)	Yes: Percentage (%)	No: Number (n)	No: Percentage (%)	Total (N)
Does the textile industry impact the environment?	31	62%	19	38%	50
Do you think the factory affects the local population?	27	54%	23	46%	50
Do you think the factory affects the local economy?	33	66%	17	34%	50

It was seen that among the people who think that textile industry is affected in the environment (n=31), most of them said that the dominant types of damage is air pollution (83.87%, n=26) and 16.12% (n=5) said it is land pollution. The preponderance of air pollution perception is consistent with the occupational issues concerning textile-related settings and can be used as justification for focusing on airborne exposure control measures in recommendations.

Table 11. Type of environmental harm among workers that expected environmental harm (n = 31)

Type of environmental damage	Number (n)	Percentage (%)
Land pollution	5	16.12%
Air pollution	26	83.87%
Total	31	100%

Discussion

The cross-sectional research revealed that, there was a significant occupational health burden of the textile factory workers in Iraq. Over fifty twenty percent of the participants noted work related symptoms and exhaustion and headache were the most common complaints of symptomatic workers. Concurrently, there was a high presence of stress/anxiety and low use of PPE. A combination of the findings when provided suggests that the observed burden cannot be attributed by a single exposure pathway; instead, it is more likely to be a manifestation of the joint effect of dust and indoor environmental exposures, physically demanding work conditions, and psychosocial strain. This general tendency is in line with modern evidence that textile and garment workers tend to develop respiratory, physical, and psychological health issues rather than associated disorders [10][11][12][13][14]. This interpretation is supported by the demographic and occupation type of the present sample. Majority of workers in the current study were middle aged and possessed a relatively long work experience that is more likely to experience cumulative occupational exposure. Existing research in the textile industry indicated that, the longer the working time span, the greater the chances that respiratory diseases, increased symptom complaints and poorer lung conditions [especially in the spinning and weaving departments of the sector, which consume a lot of dust). Since this is the case, symptom burden as experienced in the current study cannot be seen merely as the short-term discomfort but rather as a probable result of the repetitive and long-term workplace exposures over time [4]. One of the most important findings in the present study is the low rate of PPE use. This is of epidemiological significance as at times PPE is an important secondary barrier, when elimination or engineering control of exposures is not achieved. More current evidence suggests that access to equipment is not the only factor influencing PPE adherence, but also knowledge among workers, attitudes, safety culture, and perceptions of risk. Occupational risk perception in textile workers in particular has been reported to be associated with understanding of the exposure to hazards, e.g. dust, chemicals, and noise. Thus, the poor PPE adoption level in the current workforce is to be viewed as an adjustable occupational safety issue at the individual worker and management levels. [15][16][17][18]. The exhaustion, which is predominant in the current study, could be a combination of workload factors and environmental stressors. Textile and garment work is traditionally linked with the repetitious work, thermal discomfort, insufficient rest time, and poor conditions inside the buildings. Tropical garment workers have recently provided evidence to indicate that heat stress has been perceived to have a negative impact on health and productivity, and environmental stressors in industrial indoor workplaces have been found in relation to fatigue and diminished well-being. Moreover, the saliency of headache in the present study is in line with an objective of study that indicated that indoor environmental pollution as well as the nature of occupation can cause nonspecific, albeit important, complaints like headache, irritation, and decreased work tolerance. The prevalence of exhaustion and headache in the data at hand is, therefore, probably a response of physical stress and discomfort of the environment in the factory environment. [19][20][21][22]. Even though the results do not reveal respiratory symptoms as the most frequent complaints, the rest of the works still confirms a respiratory meaning of textile work environments. Exposure to cotton dust and other particulates is a confirmed hazards of textile environments, and research in Pakistan and other similar environments still reports byssinosis, respiratory symptoms, and poor lung health of exposed textile workers. Moreover, an indoor environmental pollution study in textile industry has indicated high levels of particulate and pollutant concentration significantly higher compared to control environments. Thus, despite the dominant role of exhaustion and headache as the most commonly reported complaints in the present study, the presence of low PPE utilization and the deep belief in air pollution in the given study confirms the feasibility of the current inhalational exposure as a significant background determinant [4](Rahman *et al.*, 2020). The prevalence of the stress/anxiety of the current study should be considered as one of the main findings of occupational health as opposed to another. Workers in the textile and garment industries have been known to be exposed to psychosocial stressors which include work pressure, inadequate control, economic pressure, inadequate social support and demands of the shift. A high occurrence of work-related stress was found on textile workers in Ethiopia and the other study on textile workers found that depression was related to poor social support, rotating shifts, on-the-job injury, old age and even chronic disease. Studies commissioned on ready-made garment workers in

Bangladesh have also found a similar association between bad psychosocial working conditions and work-family strain and poorer self-reported health complaints. Combined these data lend weight to the inference that the presence of high stress/anxiety load in the present study could probably be viewed as belonging to the same occupational-health pattern as opposed to a non-related background phenomenon. The other interesting result is that the participants have a great perception of the impact of textile activity on the environment with air pollution being the most predominant perceived type of harm. Scientifically, this perception is plausible. Workplace textile industry has been linked to high amount of indoor particle pollution and the general occupational safety literature shows that risk perception among workers may contribute to the safety behavior and adherence. Practically this implies that worker perception in the current study can be used as a measure of environmental concern as well as a possible point of change of intervention. In cases where hazards of workers in the air are already perceived, specific communication and active safety programme can be more effective in making them follow safe practices. Occupationally speaking, the available results justify a combination of interventions as opposed to corrective options. Provision of PPE will not probably be effective unless training, supervision and a more robust safety climate is provided. Simultaneously, the presence of upstream engineering and administrative controls will be critical, in particular, enhanced ventilation, dust suppression, mitigation of heat and proper work-rest organization. Moreover, the extended morbidity of a workers of textile industry cannot be disregarded. The recent data has also been used to point out the large musculoskeletal issue rate amongst garment employees, and thus the safeguarding of health of textile sector has to tackle physical ergonomics alongside with respiratory and psychosocial hazard. Combining self-reported results with objective measures like particle monitoring, ventilation testing, spirometry, and proven mental-health tools to study human trafficking in Iraq in the future would increase these methods.

Strengths and limitations

One of its greatest attributes is that multiple dimensions (symptoms, PPE, chronic/occupational illness indicators, stress/anxiety and environmental perceptions) are captured providing a more whole-of-occupational health framing. Limitations are below: cross-sectional study (no proof-counter evidence to hypothesis), self-reported measure (possibly reporting bias), small sample size (may affect stability and precision of findings in separately fitted models and estimates effect sizes). Future work should include the use of objective exposure measures [particulate monitoring] and standardized symptom/mental health instruments and testing of interventions aimed to reduce exposure and enhance PPE adherence.

Conclusion

This cross-sectional study on textile factory workers in Iraq showed that there is a significant occupational health burden. More than 50% of participants cited work-related symptoms; the most common symptoms mentioned were exhaustion and headache. PPE was not widely used and stress/anxiety was highly prevalent, suggesting that both physical exposures and psychosocial are important in this area of work.

The findings are consistent with the need for integrated occupational health interventions. Examples of priority actions include strengthening the availability and adherence to PPE, including through training and supervision, improving ventilation and dust/airborne exposure control, and administrative measures, such as task rotation and scheduled rest breaks. In parallel, psychosocial risk management (workload review, stress screening, and referral pathways) should become a part of the job corners of the occupational health management practice.

Future studies should increase sample size and consider assessing exposure objectively (particulate monitoring, ventilation indicators, and noise measurement) and using standardized symptom/mental health measurement tools so as to better quantify exposure response relationships and target the impact of interventions to reduce exposure over time.

Ethical Approval and Consent to Participate

Prior to collection of data, ethical approval was received from the relevant institutional/local ethics committee. All participants gave informed consent before their participation. Participation was

voluntary, personal identifiers were removed for confidentiality and the data were analyzed and reported in aggregated form.

Consent for Publication

Not applicable. No identifiable personal data, images or individual level identifiers are reported in this manuscript.

Competing Interests

The authors state that they have no competing interests.

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Abbreviations

PPE=Personal Protective Equipment

OSH Occupational safety and Health

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