Health implications in workers of a cutlery industrial complex from Pakistan: A preliminary survey

*ALI HUSSAIN¹, JAVED IQBAL QAZI², SHAHID ALI³, HAFIZ ABDULLAH SHAKIR⁴ & NADEEM ULLAH⁵.

¹, ², ⁴Microbial Biotechnology Laboratory, Department of Zoology, University of the Punjab, Lahore-54590, Pakistan.
³, ⁵Dendrochronology Laboratory, Department of Botany, Government College University, Lahore-54000, Pakistan.

ABSTRACT

Industrial health is a burning issue of developing countries where safety measures are practiced, if at all, at very low profile. Such a situation has been affecting health of workers employed in whetting and cleansing units of cutlery industries localized in different clusters at Wazirabad, a city of Pakistan. This paper reports a questionnaire based data of 270 workers for the first time in this regard. Cough was the major threat found in a highly significant proportion of workers (81%) of both working units. Overall ratio of cough patients dominated in whetting units (96%) over cleansing units (65%), whereas, productive cough was more prevalent among workers of both working units than dry cough. Symptoms of pulmonary tissue damage were more frequent (9%) in workers of whetting units who were found discharging blood in sputum. Other common disorders among workers of whetting units included dizziness (40%), headache (26%), backache (48%), occupational fatigue (47%), eye irritation (31%), vision difficulty (19%), skin allergy (20%) and persistent itch (28%). The corresponding figures for these ailments appeared as 27%, 19%, 43%, 51%, 28%, 19%, 22% and 21%, respectively in workers of cleansing units. Health problems in this industry possibly resulted from experiencing multi-metallic dust exposures. This alarming situation needs attention of public health welfare authorities.

Key words: Cleansing unit, Cutlery industry, Metallic dust, Occupational exposure, Whetting unit, Work stress.

INTRODUCTION

Billions of people are employed in different industries throughout the world and are directly related to the production. Injured and sick workers are not only a source of morbidity to themselves and their families but also affect the economy as a whole (Malik & Cheema, 2010). Despite considerable improvements in work place environment in developed countries, significant amount of money is spent on costs associated with work injuries and illnesses (Spiegel & Yassi, 1991). It is estimated that 2.2 million people die every year due to fatal injuries and illnesses caused by occupational hazards (ILO, 2005).

Most of the occupational diseases arise among workers as a result of exposures to airborne agents either in the form of particulates or dusts (Churg, 1988; Ohar, et al., 2004). Inhaled particulates are either deposited in the respiratory system or entered the circulatory system. Adverse health effects of
these pollutants may be immediate or can take years and even decades to develop. Whereas, levels of adverse effects are determined by the intensity and duration of the exposure, propensities of the involved pollutants, the extent of pollutants’ accumulation in the body and the sensitivity of the individual to their effects (Kiely, et al., 1997).

Deleterious health effects of occupation based exposures to omnifarious metals’ particulates and symptomatic studies of exposed workers are well known and include abdominal cramps, allergic dermatitis, anorexia, diarrhoea, gastrointestinal distress, hepatic necrosis, insomnia, interstitial pulmonary fibrosis, kidney dysfunction, liver dysfunction, lung cancer, muscle aches, nausea, neuropsychiatric disorders, proteinuria, siderosis, osteomalacia, weakness of joints and weight loss etc (Goyer & Clarkson, 2001; Buerke, et al., 2002; Antonini, 2003; Landis & Yu, 2004; Scragg, 2006; Siew, et al., 2008).

Health status of workers is particularly neglected in developing countries like Pakistan and needs special attention. There are nearly 200 industrial units (cutlery related) located at Wazirabad. Any cutlery industry has at least three working units (WU) i.e., whetting or grinding unit (WHU), cleansing unit (CLU) and packaging unit (PU). Workers of the PU served as control. The main objective of the present survey was to investigate the health status of workers bearing heavy exposures of metallic dust generated in the WHU and comparatively lesser exposures in the CLU.

MATERIALS AND METHODS

Description of working site
Wazirabad (32° 27′ N and 74° 7′ E) a well known industrial city (especially for the cutlery industry) had been famous throughout subcontinent even before partition days. Besides table cutlery items, knives (different sizes and designs), daggers, swords and scissors of export quality are manufactured here to earn more fame and foreign exchange to boost the economy of the beloved homeland. Most of the population of Wazirabad is attached to different sections of cutlery industry and the said cutlery industry is flourishing both in residential and non residential areas of this city.

Description of working units

i) Whetting unit
In this unit workers are entirely involved in whetting of roughly assembled cutlery products for fulfilling different purposes like metallic luster, shape and sharpness.

ii) Cleansing unit
The processed products after whetting are subjected to clean manually with the help of soaked lime or by buffing. Maximum cleanliness is attained by buffing comparative to that of soaked lime. That’s why almost all of the industries prefer to use buff than soaked lime. In the process of buffing, the attached fine metallic particulates become incorporated in the air and are ultimately inhaled by the workers.
i) **Packaging unit**

The cleaned and finally furnished products from CLU are brought in PU where these are packed into different sized packings.

**Working condition**

Workers attached to different branches of the cutlery industry have to work at least 8 hours a day in any WU. It was noticed during the survey that there were no proper arrangements for the metal-dust waste exhaust in both WU and the workers didn’t wear masks and use no protective glasses to save their chests and eyes, respectively.

**Nature of metallic dust**

Different alloys (mostly stainless steel and brass) which themselves are compounds of different metals are used to manufacture different parts of the said products. For example, stainless steel of cutlery purposes is the compound product of chromium, iron and nickel. Similarly, brass is a product of copper, lead, iron and zinc mixed in different proportions. Use of aluminium is also noticed in these industries. Thus as a whole dust exposure to Al, Cr, Cu, Fe, Ni, Pb and Zn is just possible.

**Plan of work and methodology**

A preliminary survey of 31 cutlery industries in which 270 workers were employed was carried out to define the plan of work. A questionnaire was designed to document thorough occupational history and symptoms associated with exposures to metallic dust of all monitored workers. Health assessment of workers was made by categorizing data on the basis of health hazards with respect to duration of jobs. For comparison, data of 90 individuals relevant to prescribed age groups from PU of cutlery industry were obtained and used as control as there was no any dust exposure in this WU. The collected data were tabulated and analyzed statistically to assess the occupational hazards present in these units and ultimately affecting the health of workers.

**RESULTS AND DISCUSSION**

Purpose of the present survey was to investigate the health status of workers employed in WHU and CLU of cutlery industries. Risk of various suspected and prevailing infections was assessed by categorizing data with respect to age of workers as well as longevity of exposure. In general, signs of workers of both WU were not too bad but the symptomatic pictures of these were amazingly the worst. Comparative analysis of disorders among workers of both WU is shown in the Fig., 1.

Both types of cough *i.e.*, dry (non-productive) and productive were the major threats found in all age groups of workers and the latter became a key threat for above 40 years old workers of cutlery industries. The overall ratio of cough patients was significantly higher reaching up to 96% in WHU than that of CLU, where it was 65%. It was found that productive cough was more common among the workers of both WU than dry cough. Almost 65% of the workers of WHU were suffering from productive cough as shown in the Table 1, whereas the
corresponding figure was 45 for the workers of CLU (Table 2). The percentage of workers suffering from dry cough was much lesser and was noted 31% for WHU and 20% in case of CLU. Prevalence of cough in occupationally exposed workers to metallic dust and fumes has also been reported previously (Jindal, et al., 2001).

**Fig., 1:** Comparative analysis of disorders among workers of both WU.

Presence of blood in the sputum of workers is an indication towards bronchial / pulmonary tissue damage. The ratio of this symptom was higher in workers of WHU and observed only in the age of above 40 years and the overall value reached up to 9% in this age group. It was noticed that almost all of the workers of WHU lying in age between 40 and 50 years have been linked to the profession since they started to earn around the age of 20 years. So, it can be deduced that long term exposures of these workers to metallic dust might be the cause of such pulmonary disorders. Comparable studies have also been reported by different researchers (Moulin, et al., 2000; Ahn, et al., 2006; Hoshuyama, et al., 2006).

Symptoms of dizziness and headache were also more frequent among workers of WHU where their ratios reached up to 40% and 26%, respectively. While in CLU the corresponding figures were 27 and 19, respectively. Monat-Descamps & Deschamps (2012) have reviewed nervous system disorders including dizziness and headaches induced by occupational and environmental toxic exposures. Of these exposures metals were considered to be the key causative agents of such troubles. According to Pruss-ustun, et al. (2004) long-term exposure to copper can result in dizziness, headaches and vomiting. Occupational exposures to metals including Al, Cr, Cu, Fe, Ni, Pb and Zn and their detrimental health effects have also been reported by other researchers.
(Goyer & Clarkson, 2001; Buerke, et al., 2002; Antonini, 2003; Landis & Yu, 2004; Scrugg, 2006; Siew, et al., 2008; Becker, et al., 2010). In case of workers of WHU, noise of the working grinders might be another cause of headaches among these workers. Correlation of noise with headaches is well known (Ohstrom, 2002; Kumar, et al., 2010). Owing to this reason headaches might be less common among workers of CLU.

Table 1: Comparison of various disorders among workers of WHU and control population of different age groups.

<table>
<thead>
<tr>
<th>Disease / Disorder</th>
<th>Age group (Years)</th>
<th>Overall %age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21-25</td>
<td>26-30</td>
</tr>
<tr>
<td>Dizziness</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Headache</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Backache</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Occupational fatigue</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Persistent dry cough</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Persistent productive cough</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Blood in sputum</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Eye irritation</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Vision difficulty</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Skin allergy</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Persistent itch</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Values represent No. of positive cases for the respective parameter; ‘C’ stands for control and ‘E’ stands for exposed; Number of individuals for all age groups is the same and is 15

Table 2: Comparison of various disorders among workers of CLU and control population of different age groups.

<table>
<thead>
<tr>
<th>Disease / Disorder</th>
<th>Age group (Years)</th>
<th>Overall %age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21-25</td>
<td>26-30</td>
</tr>
<tr>
<td>Dizziness</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Headache</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Backache</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Occupational fatigue</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Persistent dry cough</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Persistent productive cough</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Blood in sputum</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Eye irritation</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Vision difficulty</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Skin allergy</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Persistent itch</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Values represent number of positive cases for the respective parameter
‘C’ stands for control and ‘E’ stands for exposed
Number of individuals for all age groups is the same and is 15
Fig. 2: Comparison of various disorders among workers of WHU and CLU with control population of different age groups with respect to duration of their jobs.

Backache and work related fatigue have been and still are the imminent dangers for occupationally exposed workers. According to Joseph (2013) work related stress is a problem of great concerned to employees as well as employers. The ratios of workers suffering from backaches were equally higher for both WU and statistically the values were higher significantly. So, here it can be depicted that both of the above mentioned stresses are not only the indigenous hazards of cutlery industry but also extending among workers of other industries. As backaches and occupational fatigue have been reported among workers of ammunition factory (Pinar, et al., 2013), car manufacturing industry (Ghaffari, et al., 2006), coal mining (Widanarko, et al., 2012) and steel industry (Malik & Cheema, 2010).

Irritation of eyes and difficulty in vision were equally common among workers of both WU. Occupational exposure to heavy metals and irritation of eyes has already been investigated (Water Treatment Solutions (Cu), 1998; Pruss-ustun, et al., 2004). Ratios of workers suffering from persistent itch and skin allergy were also nearly the same for both WU reaching up to 28% and 22%, respectively. Altered allergic reactions of the skin have been reported by many researches in occupationally exposed workers to metals (Peters, et al., 1991; Mondol, et al., 2011).

Keeping in view the above facts, it can be said that the overall trend of disease is increasing indirectly with age and directly with job duration as shown in the Fig 2. Our findings of the present investigation have threatening support from a previous study in which Qazi et al. (2009) exposed mice to a WHU in the same city for about 10 weeks and reported that the nuclei as well as cell’s sizes of lungs of the experimental animals decreased as compared to the controls. Moreover, number of bi / multinucleate cells in the exposed animals increased over 100% than the control values. In the light of these informations, tissue
health of chronically exposed workers thus needs to be assessed. On the other hand, purpose of industrialists should not only minting money but they must have to spend significant proportions of their earnings towards the work safety and workers' welfare. In addition, workers' welfare societies / authorities should have a proper check and balance of the industries for keeping the workers and working condition safe.

REFERENCES


