



Occupational health hazards on shoe makers exposed to organic solvents

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Abstract : *In this study an attempt was made to identify the influence of occupation on the health of workers engaged in footwear industries. The Exposed Group, involved in various manufacturing processes and the Control Group of the same strength, involved only in stitching jobs from the same footwear industry, were selected. Workers of both groups belonged to the same range of age, weight and height. But the statistical evaluation of Peak Expiratory Flow Rate (PEFR) of the exposed and the control groups showed significant result, with the control groups exhibiting higher values. Liver function test of Exposed and Control Groups showed no significant difference.*

Key words : *Leather Industry, Respiratory Diseases, PEFR.*

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Introduction :

The footwear industry is a significant segment of the leather industry in India, which ranks second among the footwear producing countries next to China (Szubert et. al., 2001). Shoemakers and their health however have attracted less attention than the shoes themselves. Employees in the shoe manufacturing unit are routinely exposed to a mixture of organic solvents used in cleaning and as solvents of glues, degreasers etc (Todd et. al., 2008), which have been reported to increase the risk for acute and chronic health problems among shoemakers (Nijem et. al., 2001). Acute poisoning of these adhesives may lead to respiratory and cardiovascular failure and death (Tiwari, 2005). The study by Paggiaro et. al., (1985) showed clinical and functional respiratory features of workers exposed to organic solvents from glue or other adhesives.

The study by Szadkowska et. al., (2003), on health effects of occupational exposure among shoemakers, provided evidence that workers in the shoe production and repair are associated with an enhanced risk for cancer by leather dust deposition in their lungs. An attempt was made in this study to assay the effect of organic solvents on shoemakers

by monitoring its consequences on respiratory system and their liver functions.

Materials and Methods :

The study was conducted in BATA Shoe Factory, situated in Digha, Patna. In the present study, 10 male (20 to 30 years of age) footwear manufacturing workers were randomly selected. These workers performed various jobs in shoe manufacturing process namely measuring, cutting, applying adhesives, fitting job and finishing. In control group, 10 male subjects of the same age group, having same range of height (155 to 175 cm), weight (40 to 70 kg), and year of experience (08 to 10 years) were selected. The subjects of the control group were involved only in stitching jobs required for footwear making processes belonging to the same footwear manufacturing units. Measurement of the physical parameters was also done, the stature and weight of the exposed and control groups were measured by Martin's Anthropometer and weighing machine (9 crown) respectively. Measurement of Peak Expiratory Flow Rate (PEFR) was performed in standing position holding the Peak Flow Meter horizontally. Subjects were asked to take deep breath as far as possible and then blow out as hard and as quickly as possible and the PEFR was compared with the predicted PEFR (Mehta,2000). For the Liver function test, blood samples were analyzed with the help of the Auto Blood Analyzer for the contents (U/L) of Serum Glutamic Pyruvate Transaminase (SGPT) and Serum Glutamic Oxaloacetic Transaminase (SGOT).

Results and Discussion :

The workers from both the groups worked for an average of 12.7 hours a day for six days a week. Problems faced by shoemakers were suffocation, eye irritation, nausea, dizziness, skin diseases, asthma and regular cough (Table 1).

Table 1. Health problems of the respondents (N=10)

| Exposed group | Control Group | Control Group |
|--------------------------------|---------------------|---------------------|
| Regular working hours in a day | 12.7 | 12.7 |
| No. of working days in a week | 6 | 6 |
| Health problems : | Response Percentage | Response Percentage |
| Suffocation | 100 | 100 |
| Eye irritation | 100 | 100 |
| Nausea | 100 | 100 |
| Dizziness | 100 | 100 |
| Skin diseases | 100 | 100 |
| Asthama | 100 | 100 |
| Regular cough | 20 | 10 |
| Hypertension | 10 | 0 |

Student's t-test was performed to compare the age, weight and height of Exposed and Control groups. Both the groups belonged to same age, weight and height and had minor non-significant differences (Table 2).

Table 2. Statistical evaluation of different parameters between the Exposed and Control groups (N=10)

| Parameters | Exposed Group (Mean ± SD) | Control Group (Mean ± SD) | t-test | Remarks |
|-------------|---------------------------|---------------------------|--------|---------------------------|
| Age (year) | 24.4 (±3.63) | 26.3 (±3.00) | 1.804 | P=0.67 Non-significant |
| Weight (kg) | 49.1 (±4.35) | 50.5 (±13.30) | 0.412 | P=0.68 Non-significant |
| Height (cm) | 163.4 (±4.46) | 163.0 (±5.12) | 0.229 | P=0.07 Non-significant |

Both groups are affected by the harmful effects of glues and adhesives used in footwear making processes, and their effect is not limited to workers exposed to organic solvents (Table 3).

Table 3. Statistical relationship of PEFR between Exposed and Control groups (N=10)

| Subjects | Predicted PEFR (liter / min) (Mean ±SD) | Observed PEFR (liter / min) (Mean ±SD) | t-test | Remarks | Percentage |
|---------------|---|--|--------|------------------------|------------|
| Exposed group | 541.8±17.47 | 389.0 ± 89.9 | 7.462 | P=0,000 Significant | 28.2 |
| Control group | 542.5±18.92 | 493.6 ± 52.12 | 3.232 | P=0,000 Significant | 9.12 |

No difference was found in the SGPT and SGOT levels of the workers exposed to organic solvents and of the control group (Table 4).

Table 4. Comparison of the Liver enzymes between the two examined groups.

| Parameter | Exposed Group (10) | | Control Group (10) | | Remarks |
|------------|--------------------|------|--------------------|------|----------------------------|
| | Mean | SD | Mean | SD | |
| SGPT (U/L) | 3.7 | 0.22 | 3.8 | 0.22 | P=0.001 Not significant |
| SGOT (U/L) | 5.7 | 0.35 | 5.7 | 0.35 | P=0.001 Not significant |

From the present study it may be concluded that the workers who are engaged in different footwear manufacturing activities, which involve exposure to leather dust and various toxic adhesives in the working environment have significantly lower Peak Expiratory Flow Rate than their predicted PEFR value.

It seems that inhalation of the leather dust and toxic adhesives during work may cause deposition of small particles along the lining of alveoli that decreases the ventilation perfusion ratio and thus reduces the lung capacity and the PEFR value.

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