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EFFECTS OF OCCUPATIONAL BENZENE EXPOSURE AMONG SHOEMAKERS IN KARACHI

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ABSTRACT

The present study was carried out to investigate the effect of benzene exposure on some hematological parameters and work related symptoms among workers of shoemaking units in Karachi. A total of 60 subjects (30 exposed and 30 control workers) in the age range of 20-55 years participated in the study. The results revealed a significant decrease in the erythrocyte account and hemoglobin levels among the exposed workers as compared to controls ($P<0.05$) while the leukocytes and platelets count were not significantly different in the two groups. The prevalence of work related symptoms was significantly higher in the benzene exposed shoemakers when compared with control subjects ($P<0.01$). Our data confirmed the association between occupational benzene exposure and deviation in hematological parameters and between the role of occupational exposure in the development of work related symptoms.

Key words: Benzene exposure, hematological changes, work related symptoms, shoemakers, Karachi.

INTRODUCTION

Hazardous compounds such as benzene, toluene, and xylene are widely used in various industries including shoemaking, spray painting, automobile repair and paint manufacturing. Harmful effects of these solvents include haematotoxic and leukogenic effects (Lan *et al*., 2004). Although there have been many reports published in various parts of the world on exposure of benzene among workers (Schnatter *et al*., 2005; Steinsvag et al., 2007) or of the general population (Kang *et al*., 2005). Despite extensive research, questions remain regarding the mechanisms by which benzene exerts its effects. Whereas the toxicity of benzene has been extensively studied, reports on the hematological effects of benzene among shoemakers are scanty and none from the present study area. The aim of the present study was to investigate the hematological alterations and prevalence of work related symptoms among shoemakers facing occupational exposure of benzene in Karachi.

MATERIALS AND METHODS

The present study was carried out during October-December, 2011 in two groups differing in benzene exposure. The study group consisted of 30 exposed and 30 control subjects n the age range of 20-55 years. The exposed subjects were recruited from 20 small shoe making units located in the *Nazimabad, Landhi* and *Quaidabad* areas of Karachi, while the control subjects were recruited from bank and hospital staff in the same area. Date on occupational history and work related symptoms were collected using a self administered structured questionnaire consisting of 15 questions. The subjects were asked to fill in the questionnaire and were assisted if had poor literacy skills. The prevalence of the work related symptoms was calculated by the method of Ukai *et al*. (1993) as: Number of positive answers by the group / Number of subjects in the group x Number of questions x 100 (%).

The inclusion criterion for exposed workers was daily exposure of at least 8 hours for ten years. The height, weight and blood pressure of those subjects who met the criterion was measured. Weight was measured by an electronic scale, height by using a fix stadia rod and blood pressure by using mercury Sphygmomanometer. 2 ml of venous blood of each subject was drawn using 20G needle attached with a plastic needle. Blood was immediately transferred into EDTA vials and used to determine hematological parameters which include Hematocrit, Erythrocyte count, Leukocyte count and Platelet count. Hematological parameters were determined using Coulter Model S-IV. The nominal variables were expressed as number and percentages while continuous variables were presented as mean ± SD. Statistical analysis included χ^2 test carried out using SPSS version (10.0) and $P<0.05$ was considered significant.

RESULTS AND DISCUSSION

Table 1 shows that age, height and weight of both the study groups were not significantly different from each other. Among benzene exposed shoemakers the prevalence of work related symptoms were several times higher as compared to the controls. In the present study the mean erythrocyte count and hemoglobin levels in benzene exposed shoemakers were found to be decreased significantly when compared with control subjects ($P<0.05$). While the leukocytes count and platelet count of exposed subjects were lowered as compared to control subjects but this difference could not reach statistical significance (Table 2). These findings also support the previous reports dealing with the hemotoxic effects of occupational benzene exposure. There have been numerous studies of benzene-induced hemotoxicity (Verma *et al*., 2000; Steinsvåg *et al*., 2007; Schnatter *et al*., 2005; Lan *et al*., 2004), but few have been able to study effects at low levels of exposure. Stockstad (2004) found no evidence of a threshold for hemotoxic effects of benzene and suggested that exposure to <5 ppm benzene could result in hematological suppression. Occupational exposure decreased WBCs in petrochemical workers exposed to <10 ppm benzene Lamm and Grünwald, (2006) and Lan *et al.* (2005) reported that WBCs and other cell types were declined in workers exposed to <5 ppm benzene. In contrast, Kang *et al.* (2005) did not identify decreased blood cell counts based on routine monitoring of workers exposed to low levels of benzene. The prevalence of nasal irritation, skin irritation, cough, loss of appetite and unusual smelling was significantly higher ($P<0.05$) in the exposed workers as compared to control subjects (Table 3). While as compared to controls the difference in the prevalence of headache, nausea, fatigue and sore throat was statistically significant at $P<0.01$ in exposed workers. These findings are in consistence with the previous studies in which higher prevalence of work related symptoms have been reported among benzene exposed workers.

Table 1. General characteristics of study subjects.

Variables	Controls (n=30)	Exposed workers (n=30)
Age (years)	44.3 ± 4.2	42.6 ± 6.3
Height (inches)	68.6 ± 6.8	66.9 ± 8.2
Weight (Kg)	74.4 ± 8.9	76.8 ± 4.3
Years of exposure	-	18.9 ± 4.3
Systolic blood pressure (mmHg)	118.20 ± 15.14	120.41 ± 12.21
Diastolic blood pressure (mmHg)	78.65 ± 10.55	76.22 ± 9.54
Smokers	14 (46.6%)	9(30.0%)
Non-smokers	16(53.4%)	19(63.4%)
Ex-smokers	-	2(6.6%)

Table 2. Hematological parameters of study groups.

Variables	Controls (n=30)	Exposed workers (n=30)	P value
Hematocrit (%)	44.2 ± 1.3	43.4 ± 1.8	0.54
Hemoglobin (g/dl)	14.2 ± 0.2	10.1 ± 1.1	0.05
Erythrocytes (10^6/mm^3)	5.11 ± 0.11	3.8 ± 0.6	0.05
Leukocytes (10^3/mm^3)	7.41 ± 0.3	7.81 ± 0.2	0.85
Platelets (10^3/mm^3)	381 ± 84	322 ± 48	0.45

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Table 3. Prevalence of work related symptoms in study groups.

Symptoms	Controls (n=30)	Exposed workers (n=30)	P value
Headache	3 (10.0%)	24 (80.0%)	0.01
Dizziness	1 (3.3%)	3 (10.0%)	0.51
Nausea	2 (6.6%)	23 (76.6%)	0.01
Nasal irritation	2 (6.6%)	20 (66.6%)	0.05
Fatigue	3 (10.0%)	26 (86.6%)	0.01
Cough	4 (13.3%)	21 (70.0%)	0.05
Sore throat	2 (6.6%)	28 (93.3%)	0.01
Eye burning	2 (6.6%)	4 (%13.3)	0.24
Loss of appetite	5 (16.6%)	22 (73.3%)	0.05
Skin irritation	3 (10.0%)	18 (60.0%)	0.05
Unusual taste	1 (3.3%)	2 (6.6%)	0.35
Unusual smell	3 (10.0%)	18 (60.0%)	0.05
Weight loss	4(13.3%)	11(36.6%)	0.42
Insomnia	2(6.6%)	3(10.0%)	0.58
Muscle pain	2(6.6%)	4(13.3%)	0.32

Data tested by χ^2 test

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