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Evaluation of health risks among the workers employed in tannery industry in Pakistan

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Abstract

Chromium is widely used in the tanning industry, and tannery workers are under constant threat of adverse health effects due to occupational exposure. In this study of 332 tannery workers from Sheikhpura and Peshawar, both male and female with age ranging from 20 to 50 years old were selected for the assessment of health risks. Tannery workers were interviewed and underwent clinical examination. A control group of 112 individuals from the same age without chromium exposure were also selected. A total of 164 tannery workers with age ranging 20-35, were included. The sterility problem was found to be 22% in male and 25% in female in contrast to the 3% in the male controls and 1% in female controls. While the survival rate of children was observed to be 69% of male and 67% in female in contrast to that observed in controls, which was 94% in male and 92% in female. In addition, 22% females had an abortion problem, while 2% were found following birth control procedures. Stillbirth problems were found to be 23% in female in contrast to that 3% were found in controls.

Keywords: Health risks, workers employed, tannery industry, Pakistan

1. Introduction

Tannery workers are exposed to many physical and chemical hazards. Sheikhpura is the major leather processing center in Punjab province, Pakistan. Leather production includes many processes with different exposures, which can be hazardous for the health of the workers [1-3]. The use of some compounds in the tanning process is considered carcinogenic for the workers like benzene-based dyes and formaldehyde [4, 5]. In tanneries workers are exposed to a mixture of solvents, dyes, chromium salts and processing chemicals. Chromium may enter the body by breathing and by direct skin contact; therefore, workers are exposed to this element, mainly in the inorganic Cr (III) form [6-8]. They are also exposed to leather dust, which contains chromium in the protein-bound form and toxic irritant gases. These exposures may result in the development of skin and lung cancers and there may be other occupational diseases that occur through infection and exposure to dust, chemicals and physical factors [9-11]. As chromium is an irritant, it can cause perforations in the nasal septum, respiratory problems, dermatitis, gastrointestinal, hepatic and renal impairments [12]. In the leather tanning process, during skin contact, chromium has the potential to bind with the skin proteins of the workers, producing complex antigen which leads to hypersensitivity and dermatitis. Chromium leather in industries can cause carcinoma of the larynx and lung parenchyma and paranasal sinuses in workers [13-14]. The aim of the research work was to find out the evaluation of health risks among the workers employed in tannery industry in Pakistan.

2. Materials and Methods

In this study of 332 tannery workers from Sheikhpura and Peshawar, both male and female with age ranging from 20 to 50 were selected for the assessment of health risks. Tannery workers were interviewed and underwent clinical examination.

In order to determine the health status of the tannery workers, the following information was obtained through face-to-face interviews: their ages, smoking habits, previous jobs, and health issues.

3. Results and Discussion

The study group of 332 tannery workers consisted of male and females. Details regarding gender, age, smoking habits are given in Table 1.

While in the age group 36-50, a total of 168 tannery workers were served the questionnaire, out of which 32% were male and 34% female had sterility problems. While the survival rate of children was found to be 67% of male and 65% in female. Moreover, 31% female had an abortion problem and 27% female had still birth problems. In health questionnaire Table 2, cough related problems like upper respiratory tract infection and productive cough were reported by 15.3% in

tannery workers. In addition, 31% tannery workers had phlegm problems while 32% had a stuffy nose problem. Red eye problems were found to be 49% of tannery workers. Skin problems like dermatitis and eczema was observed to be 55% of tannery workers, while intestinal problems like diarrhea and irregular bowel habits were found to be 29% of tannery workers.

Table 1: The demographic information of tannery workers and controls

No of Subjects	Age Groups	Gender	Reproductive Abnormality	Abortions	Sterility	Still Birth	Survival rate of children
112	Exposed group I 20-35 years	Male	Yes	-	22	-	69
52		Female	Yes	22	25	23	67
122	Exposed group II 36-50 years	Male	Yes	-	32	-	67
46		female	Yes	31	34	27	65
62	Controls 20-35 years	Male	Yes	-	3	-	94
43		Female	Yes	2	1	3	92
61	Controls 36-50 years	Male	Yes	-	3	-	93
46		female	Yes	3	2	4	90

Table 2: The health questionnaire for tannery workers at their workplace

Questions asked from the tannery workers	Answers	Frequency	Percent
Do you usually cough on getting up in the morning in winter?	Yes	51	15.3
	No	281	84.6
Do you usually have phlegm on getting up in the morning in winter?	Yes	106	31.9
	No	226	68.9
Do you usually have a stuffy nose or drainage at the back of your nose?	Yes	107	32.3
	No	225	67.7
During the past 12 months, have your eyes been red, itchy or watery more than twice?	Yes	164	49.3
	No	168	50.9
During the last 12 months, have you had a skin rash, dermatitis, hives or eczema?	Yes	183	55.1
	No	149	43.8
During the last 12 months, have you had stomach problem, diarrhea, and irregular bowel habits?	Yes	98	29.5
	No	234	70.4
During the last 12 months, have you had asthma problem?	Yes	135	40.6
	No	197	59.3

n = 240

Table 3: Multiple logistic regression analysis of factors associated with asthma health disorders among leather tannery workers, in Sheikhpura and Peshawar tanneries

Variables	Adjusted R	95% CI	p value	Standard error
Educational status				
Literate	1.30	0.45, 3.23	< 0.001	0.026
Illiterate	2.12	1.17, 3.88	< 0.001	0.177
Ethnicity				
Punjabi	1.20	0.39, 3.12	< 0.001	0.032
Pathan	2.32	1.32, 5.26	< 0.001	0.129
Others	1.67	0.62, 4.56	< 0.001	0.058
Smoking status				
Smokers	2.50	1.25, 4.22	< 0.001	0.122
Non-Smokers	1.01	0.02, 2.98	< 0.001	0.001
Glove use				
User****	1.12	0.29, 2.22	< 0.001	0.023
Non-User††††	3.29	1.72, 6.26	< 0.001	0.169
Allergy†††† and duration of work§§§§				
Non-allergic				
10 years duration of work	1.21	0.40, 3.12	< 0.001	0.021
20 years duration of work	0.99	0.73, 1.33	< 0.001	0.065
Allergic				
10 years duration of work	2.34	1.21, 4.29	< 0.001	0.112
20 years duration of work	3.75	1.99, 6.80	< 0.001	0.189

(n = 120†††)

†††The final model included 120 subjects

†††† All variables are mutually adjusted to each other

§§§ Other ethnicity includes Urdu, Sindhi, Balochi and Brahvi

**** Worker who has at least rarely used gloves during different tanning tasks

†††† Worker who has never used gloves

†††† Perceived allergy to at least one of the following substances: food, metals, chemicals, medicine, dusts or animals

§§§§ The interaction was analyzed by calculating odds ratio relative to a common reference, i.e. the duration of work at a mean duration of 10 years and non-allergic status

In this cross sectional study, reproductive abnormalities, respiratory and stomach problems in tannery workers have been examined. However, skin problems take place first as compared to other health problems, which is due to direct skin contact with chemicals used in tanning processes. Tannery workers were questioned regarding reproductive abnormalities, skin problems and asthma. In addition to that, there were other signs and symptoms of obstruction including wheezing. During the tanning process, occupational exposure to toxic chemicals and microbial agents: mycotoxins and endotoxins are one of the major reasons for these health hazards. These findings suggest that occupational exposure to chromium can cause reproductive abnormalities, skin dermatitis and asthma related problems in tannery workers. Final multivariable logistic model included age, educational status, ethnicity, smoking status, glove use and an interaction between perceived allergy and duration of the work is shown in Table 3. The effect of allergy was evaluated at a mean duration of work (10 years); also the effect of allergy with 10 additional years of work duration (20 years of work duration) was also evaluated. Illiterate were more likely to have asthma compared to those who were literate (adjusted R = 2.12; 95% CI: 1.17-3.88). Pathan workers were more likely to have asthma compared to workers of Punjabi ethnicity (adjusted OR = 2.32; 95% CI: 1.32-5.26). The workers who did not report the use of gloves were more likely to have asthma compared to those who at least rarely used them during different tanning tasks (adjusted OR = 3.29; 95% CI: 1.72-6.26). The smokers were more likely to have asthma compared to those who had never smoked (adjusted OR = 2.50; 95% CI: 1.25-4.22). As noted earlier, final model included a significant interaction ($p = 0.02$) between perceived allergy and duration of work in the tannery. The workers who perceived to have allergy, were more likely to have asthma if their duration of work was 10 years (adjusted OR = 2.21; 95% CI: 0.40 - 3.12) and this relationship was even stronger if duration was 20 years (adjusted OR = 3.75; 95% CI: 1.99 - 6.80). However, there was non-significant relationship between duration of work and asthma for those who did not have perceived allergy.

4. Conclusion

The present study suggests that chronic exposure to solvents and possibly chromium compounds may cause an increase in asthma-related symptoms, skin dermatitis, stomach problems, reproductive abnormalities, abortion and sterility in tannery workers. In order to prevent health issues among tannery workers, we suggest that medical observation, including pre-employment and periodic medical controls, should be performed and must include pulmonary function tests.

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