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Occupational allergic contact dermatitis in tannery workers of Peshawar KP Pakistan: an under estimated health issue

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Abstract

Allergic contact dermatitis is one of the important occupational hazards in tannery workers. Workers handle chromate salts which produce corrosive effect and sensitization which leads to allergic contact dermatitis. This study has been done to find out the prevalence of skin problems. The study was conducted among the 120 workers working in tanning industry. Immunoglobulin E levels in serum were determined by Microplate Chemiluminescence Immunoassay. The result showed that chromate is the most frequent allergen among tannery workers. Occupational allergic contact dermatitis is an important and growing health issue. Workers should be provided proper protective equipment to minimise the chromate effect on skin.

Keywords: xxxx

1. Introduction

Allergic ailments also called as allergies are collection of clinical manifestations caused by hyperactivity of immune system^[1]. Allergies are vital health issues distributed throughout the world in human and other animals. It is considered to be a major economic concern as it adversely affects daily life and ability of man power^[2, 3]. There are various types of allergies that include Allergic rhinitis or Hay fever (Inflammation in nasal cavity), atopic eczema (Dermatitis/ inflammation of skin), Anaphylaxis (tongue / Throat swelling) and many more^[4]. Work-related allergies can affect the quality of work and adversely affect the productivity of daily life^[5]. More than 250 allergy causing agents have been spotted which cause serious allergic responses. Most of the professionals are at higher risk of allergic rhinitis and asthma^[6, 7]. Occupational dermatosis is one of the most unadorned skin disorders that are caused with the contact of some allergy causing agents^[8]. This disease is more communal in construction manufacturing. It is estimated that prevalence of occupational dermatosis to chromate is about 10% of the total world population^[9]. Cobalt, epoxy resin, nickel, and rubber is the most prevalent allergens in occupational dermatosis^[10, 12]. Looking to the above facts of allergies and its related adverse effects in different occupational groups and low productivity of work caused by allergies, the current study is designed to investigate the concentration of chromium in blood and its effect on human skin.

2. Materials and Methods

Study area: District Peshawar was selected as target area due to the presence of a numerous amount of tanneries which continuously discharge their harmful waste products directly in environment i.e. land and in open air. Peshawar is a city of KP province, a major industrial zone of KP province.

2.1 Patient selection: About 240 respondents were included in this study along with the prior consent. All respondents were grouped into different age groups ranging from 20 to 50 years old. All of them were exposed to hexavalent chromium (Cr VI), which was considered to be major cause of allergies. About 120 healthy respondents were also included in this study as control group of the experiments.

2.2 Sample Collection: About 5 ml a blood were collected from each respondent by a disposable sterile syringe and was stored in EDTA tube for further experimental analysis in biochemistry lab, university of Peshawar.

2.3 Experiment Design

Samples were further processed by two experimental techniques i.e. spectrophotometers for the detection of concentration of chromium and Microplate Chemiluminescence Immunoassay for Immunoglobulin E levels in serum.

3. Results

About 240 respondents were included in this study along with the prior consent. All respondents were grouped into different age groups ranging from 20 to 50 years old. All of them were exposed to hexavalent chromium (Cr VI), which was considered to be major cause of allergies.



The levels of hexavalent chromium in erythrocytes of the exposed and control groups are shown in table 1.

Table 1: Hexavalent chromium in erythrocytes of controls and tannery workers ($\mu\text{g/l}$)

Age	20-35 years		35-50 years	
	Control	Tanners	Control	Tanners
Group I	0.621 \pm 0.054	3.84 \pm 0.21	0.667 \pm 0.09	3.981 \pm 0.27

Values are presented as mean \pm SD (n = 120 in each group)

The concentration of chromium in control group is 0.621 $\mu\text{g/l}$ and 0.667 $\mu\text{g/l}$ respectively which increased to 3.84 $\mu\text{g/l}$ and 3.981 $\mu\text{g/l}$ in exposed groups I and II respectively. Tannery workers in group I (aged 20-35, 1-10 years exposure) and group II (aged 36-50, 11-20 years exposure) showed significantly higher blood Cr levels than that of controls. Tannery workers in group II with long-term chromium

exposure have significantly higher blood Cr level than that of tannery workers in group I with short term chromium exposure. The exposed group I and II have Ig E levels of the workers are summarized in table 2.

Table 2: IgE levels of the workers

Group	IgE (IU/L)
Group I	97.5 \pm 1.4
Group II	798 \pm 2.1

Tannery workers in group I and group II showed significantly higher Ig E levels than that of controls. Ig E levels in tannery workers in group II with long-term chromium exposure are higher than that of tannery workers in group I with short term chromium exposure. These findings have shown that the duration of exposure has significant effect on blood chromium level and Ig E levels in tannery workers.

4. Discussion

Basic chromium (III) sulphate [$\text{Cr}(\text{H}_2\text{O})_5(\text{OH})\text{SO}_4$] is frequently used in leather industries as a primary tanning agent [12]. Tannery workers are occupationally exposed to hexavalent chromium which has shown adverse effect on health.

The findings of previous studies have shown elevated hexavalent chromium levels in blood of workers. Similar results were documented in our study in tannery workers exposed to hexavalent chromium. We observed that hexavalent chromium levels in blood of exposed group I and II were significantly higher than unexposed population.

Elevated Ig E is an important determinant for any allergic reaction. In leather tanning chromium is used abundantly and capable to bind with skin protein of workers to produce complex antigens which lead to hypersensitivity.

The resulting contact dermatitis can cause preliminary condition of bronchial asthma. Skin ulcer can be developed, if skin is in contact with chromium (VI), with an abrasion [13].

Our data demonstrated the fact that occupational exposure to hexavalent chromium induces allergic contact dermatitis in tannery workers. Hand dermatitis usually predominates among tannery workers. Thus, it is recommended that these workers should be provided some protective equipment. Regular use of gloves are effective means to prevent occupational skin diseases.

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