

## RESEARCH ARTICLE

### Assessment of lung functions in hairdressers

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#### ABSTRACT

**Background:** Hairdressers are exposed to various chemicals responsible for health risks. Very few studies are conducted on hairdressers to evaluate the occupational hazards among them. Different hair products such as bleach or sprays contain various chemicals such as ammonia, hydrogen peroxide, or persulfate which may cause respiratory diseases. **Aims and Objectives:** This study was conducted to see the deleterious effect of cosmetic products used in hairdressing on lung functions of hairdressers. **Materials and Methods:** The present study was conducted on 90 hairdressers (study group) from different salons of Azamgarh city. Controls ( $n = 90$ ) were selected randomly from general population. Pulmonary function tests were performed in both the groups; the parameter chosen was forced vital capacity (FVC), forced expiratory volume in 1 s ( $FEV_1$ ),  $FVC/FEV_1$ , and peak expiratory flow rate. **Results:** All the lung functions were significantly lower in hairdressers compare to their counterparts. **Conclusion:** The study group was exposed to various noxious substances which render them to be vulnerable for respiratory disease, for example, occupational asthma and chronic obstructive pulmonary disease.

**KEY WORDS:** Chronic Obstructive Pulmonary Disease; Hairdressers; Occupational Asthma; Pulmonary Function Test


#### INTRODUCTION

Exposure to various chemicals in working atmosphere in salon increases the risks of occupational asthma and other respiratory ailments. Repeated exposure to chemicals and allergens is responsible for the onset of symptoms.<sup>[1,2]</sup> Many studies have been conducted to show the occupational hazards, but very few studies were conducted on hairdressers. Hairdressers are exposed to variety of chemicals, for example, p-benzenediamine, toluene-2,5-diamine, p-aminophenol, alcohols, formaldehyde, methylisothiazolinone, ethanol, isopropanol, ammonia ( $NH_3$ ), persulfates ( $H_2S_2O_8$ ), monoethanolamine, glyceryl monothioglycolate, ammonium

thioglycolate, ammonium phosphate, hydrogen peroxide ( $H_2O_2$ ), carbon dioxide, and carbon monoxide.

Several components of hair products are airway irritants and may produce respiratory symptoms with impairments of lung functions and chronic bronchitis.<sup>[3,4]</sup> Hairdressing is described as an occupation at risk of asthma.<sup>[5]</sup> Some studies showed the presence of the traces of various substances in the hairdressers such as  $NH_3$ ,  $H_2O_2$ , toluene, ethanol, ether, and carbon dioxide.<sup>[6,7]</sup> Some authors also measured the high levels of carbon dioxide, ether, and  $NH_3$  in poor ventilated salons.<sup>[8]</sup> They may suffer from upper and lower respiratory tract infections and occupational asthma.

Different hair products contain various chemical agents, but maximum of these contain  $NH_3$ ,  $H_2O_2$ , and  $H_2S_2O_8$ .  $NH_3$  is used to increase the hair penetration in oxidative dyes as well as in hair bleach.<sup>[9,10]</sup> These substances present in workplace may cause mucosal irritation, leading to inflammation of respiratory tract either by absorption or inhalation.<sup>[11]</sup> Permanent waving solution contains pantethine and thioglycolamide which may

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cause nasal airway obstruction. In pulmonary clinics, the number of such cases is continuously increasing nowadays. The WHO stated that these diseases may be a major cause of mortality unless prevented.

Leino *et al.*<sup>[12]</sup> reported significant increases in number of chronic obstructive pulmonary disease (COPD) in hairdressers as compared to general population.

Various authors as Ronda *et al.*<sup>[13]</sup> reported an increased amount of certain chemicals in the air of poorly ventilated salons which are known carcinogens, for example, dichloromethane and ethylbenzene. Certain other chemicals were also detected, for example, methoxypropanol, toluene, and benzene which may affect respiratory as well as reproductive systems. It has been reported that the inner atmosphere of the salons is not chemically safe.

Hence, the present study was designed to evaluate the pulmonary functions in hairdressers in Azamgarh city.

## MATERIALS AND METHODS

This study was performed in the Department of Physiology, Government Medical College, Azamgarh, to assess respiratory functions in hairdressers. Approval from the ethical committee of the institute was taken.

### Sample and Matching

A total of 90 male hairdressers were chosen randomly in different salons of Azamgarh city and 90 volunteer controls were selected from different areas of city who were office workers and had never been in the business of hair products. Subjects were explained about aims, objectives, and methodology. A detailed history of their physical health and clinical examination was recorded, namely, name, age, height, weight, and lung functions in a predesigned pro forma. Written consent was taken from all the subjects.

### Inclusion Criteria

The following criteria were included in the study:

- Male hairdressers of age between 25 and 45 years.
- At least 3 consecutive years of working in same atmosphere.
- Normal chest roentgenogram.

### Exclusion Criteria

The following criteria were excluded from the study:

- Females.
- Any respiratory or cardiac disease.
- Any hormonal disorder.

The parameters recorded were:

1. Forced vital capacity (FVC)
2. Forced expiratory volume in 1 s ( $FEV_1$ )
3.  $FEV_1/FVC$
4. Peak expiratory flow rate.

All the subjects underwent the extensive clinical examination and investigations, namely, physical examination and blood pressure any anatomical deformity of chest or spine.

Easy on-PC spirometer with flow sensor was used for measuring the lung functions in the Department of Physiology, Government Medical College, Azamgarh. All the parameters were recorded after making subject comfortable in sitting posture. All the precautions were considered while doing the maneuver.

Three readings were taken for each parameter and the best of three was taken as final result. The data were analyzed using Student's *t*-test.

## RESULTS

Table 1 shows the demographic relationship between the study and control groups while Table 2 shows the comparison of lung functions between the study and control groups. All the lung function parameters were significantly decreased in the study group but the most affected parameter was FVC.

## DISCUSSION

Respiratory ailments such as bronchitis or occupational asthma are common in workers exposed to noxious substances present in working place. In our study, a significant fall in lung functions was observed in hairdressers compare to their

**Table 1:** Demographic table of the study and control groups

Features	Study group (n=90)	Control group (n=90)	P-value
Age (years)	36.50±6.54	37.30±7.21	>0.05
Height (cm)	170.32±6.25	172.54±8.32	>0.05
Weight (kg)	65.40±6.67	67.21±6.58	>0.05

**Table 2:** Lung functions in the study and control groups

Parameters	Study group (n=90)	Control group (n=90)	P-value
FVC (L)	3.91±0.07	4.43±0.30	<0.001
$FEV_1$ (L)	1.53±0.77	3.89±0.10	<0.01
$FEV_1/FVC$	0.53±0.23	0.88±0.06	<0.01
PEF (L/min)	352.20±18.09	443.00±18.17	<0.001

FVC: Forced vital capacity,  $FEV_1$ : Forced expiratory volume in 1 s

counterparts, but more significant changes were there in FVC. Hairdressers work in such a noxious atmosphere and are prone to get pulmonary diseases.

Many authors have reported the association between exposure to various chemicals and respiratory ailments. Hence, this study was conducted to evaluate the changes in respiratory functions in hairdressers and significant deterioration was noted in different parameters of lung functions. Three chemicals were mainly found responsible for these changes, namely,  $\text{NH}_3$ ,  $\text{H}_2\text{O}_2$ , and  $\text{H}_2\text{S}_2\text{O}_2$ . These chemicals were used in various hair products as hair dye or bleach. They were used to increase the hair penetration and present in the form of gas or aerosol in the workplace. Hairdressers are continuously exposed to these substances which are either absorbed or inhaled by them. Few subjects were reported an improvement in their symptoms after leaving their job. The worsening of symptoms was directly related to the duration of exposure.

Various authors reported hazardous changes in hairdressers due to their job. Leino *et al.*<sup>[12]</sup> reported significant increases in number of COPD in hairdressers as compared to general population. In a different study by Parra *et al.*,<sup>[14]</sup> they reported that exposure to hair bleach-containing  $\text{H}_2\text{S}_2\text{O}_2$  is mainly responsible for the development of respiratory disorders in hairdressers. Hashemi *et al.*<sup>[15]</sup> also reported a significant fall in pulmonary functions in their study on hairdressers. The French Observatoire National des Asthmes Professionnels<sup>[16]</sup> study reported that hairdressers have a higher risk of occupational asthma.

Mensing *et al.* conducted a study on rabbits with hair bleach and concluded that a 4-h exposure to a hair bleach-induced airway hyperresponsiveness to acetylcholine, but aerosolized  $\text{H}_2\text{O}_2$  did not influence airway responsiveness to acetylcholine.<sup>[17]</sup> Some authors reported that the hairdressers were positive for skin prick test with  $\text{H}_2\text{S}_2\text{O}_2$  while their counterparts were negative. Certain chemicals, for example, pantethine and thioglycolamide present in hair waving cream are responsible for eliciting an immunological reaction by causing irritation and hyperresponsiveness of mucosa of respiratory tracts. Gebber *et al.*<sup>[18]</sup> conducted a clinical and immunological study on hairdresser's and reported that they developed respiratory symptoms about 1 year after being employed in a hairdressing salon, after exposure to  $\text{H}_2\text{S}_2\text{O}_2$  salts, which are common constituent of hair bleach.<sup>[19]</sup>

These changes probably are meant for increasing attention and concentration of the individual to protect oneself from hazardous effects of such noxious substances in the workplace.

## CONCLUSION

Our study shows that hairdressers are at greater risk of occupational asthma and COPD due to exposure to certain

noxious substances present around in the working atmosphere. The symptoms were even more in poorly ventilated salons.

Hence, it is being recommended to provide a healthy atmosphere and protective kits to all the hairdressers to avoid these changes in lung functions.

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