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PULMONARY FUNCTION TESTS IN PROFESSIONAL WELDERS

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ABSTRACT

The respiratory effects of exposure to welding fumes have been investigated in numerous studies; but the results of these studies have not been consistent. The aim of the present study was to investigate the respiratory effects of welding fumes exposure in a group of manual arc welders exposed primarily to welding processes in confined spaces without respiratory protection. The 25 welders were subjected to spirometry to assess the respiratory functions. Forced expiratory volume at the end of one second i.e. FEV1 and forced vital capacity i.e. FVC were considered. In the present study, the FEV1/FVC ratio less than 0.7 the subjects were 7 and more than 0.7 were 18. This indicates that 7 subjects tend to have obstructive respiratory pathologies and 18 were having either pathologies normal or restrictive respiratory. Welding fumes may impair respiratory function and cause bronchitis. It is concluded that welders are at risk of respiratory dysfunction and should take protective measures such as avoid smoking and use masks.

KEY WORDS: Welding fumes, FEV1, FVC

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INTRODUCTION

Welding refers to any process of joining pieces of metal at joint faces that have been made soft or liquid by heat or pressure. About 800 000 workers are employed full time as welders worldwide; larger numbers are estimated to perform welding intermittently as part of their work duties[1] One of the most common processes, electric arc welding, is performed with hand held electrodes coated with suitable slag forming flux to protect the arc. The high temperature of the process heats both the base metal pieces to be joined and the filler metal from a consumable electrode or wire, which is fed into the weld. Molten fluxes from the consumable electrodes carry away impurities in a liquid form; and when heated consumable electrodes generate a shielding gas to protect the weld from oxidation. Fluxes are commonly a major source of inhalation exposures.[1] The material most commonly welded is mild steel; but stainless steel and aluminium welding are also widely practised[2]. The adverse health effects of welding come from chemical, physical, and radiation hazards. Common chemical hazards include particulates (lead, nickel, zinc, iron oxide, copper, cadmium, fluorides, manganese, chromium) and gases (carbon monoxide, oxides of nitrogen, ozone). Each welding technique and application produce a characteristic range of particulate composition and morphology[1.1] The main object of our study was to detect the chronic effects of welding exposure on pulmonary symptoms and pulmonary function tests.

MATERIALS AND METHODS

The study was approved by IEC (ECR/472/Inst/MH/2013 dated 22/1/2015).The study was conducted on 25 male professional welders. The procedure was explained to subjects and written informed consent was taken.following subjects were included, welders in welding profession for a period of 5 years. All were nonsmokers. The age group was 20-40 years.Subjects having cardiorespiratory problems ,smokers ,those who denied consent were excluded from the study. The pulmonary function tests were performed using Medspiror Electronic Spirometer. The tests were performed in sitting position. The forced expiratory volume at the end of first second (FEV1) and forced vital capacity (FVC) were assessed. The actual values are converted into percentage of predicted values to eliminate the effect of age, height and weight.

RESULTS

Table 1
Showing Spirometry parameters and percentage of predicted values

Sr No	Spirometry parameters	Percentage of predicted values (Mean ±SD)
1	FEV1	64±6.37
2	FVC	65±7.51

Mean± standard deviation of fev1(percentage predicted) was 64±6.37 and mean± standard deviation of fvc(percentage predicted)was 65±7.51

Table 2
Showing FEV1/FVC ratio

Sr no	No of subjects having FEV1/FVC <0.7 (Obstructive pathology)	No of subjects having FEV1/FVC >0.7 (Restrictive pathology)	Total no of subjects
1	7	18	25

The 25 welders were subjected to spirometry to assess the respiratory functions. Forced expiratory volume at the end of one second i.e. FEV1 and forced vital capacity i.e. FVC were considered. In the present study, the FEV1/FVC ratio less than 0.7 the subjects were 7 and more than 0.7 were 18. This indicates that 7 subjects tend to have obstructive respiratory pathologies and 18 were having either pathologies normal or restrictive respiratory.

DISCUSSION

To categorize the pattern and severity of the condition as a 1st step, FEV1/FVC ratio was assessed. If this ratio was less than the lower limit of normal for the patient (included with the test report), obstructive defect is present (i.e. FEV1 has fallen to a greater degree than the FVC). If the ratio is greater than the lower limit of normal then either spirometry test is the normal or restrictive defect is present. In this situation if only spirometry is available, the next step is to look at the FVC. If the FVC is less than the normal, a restrictive defect is suggested. The total lung capacity (TLC) can confirm the restriction if this value is less than the predicted lower limit of normal (if TLC was measured) [4]. In the present study, the FEV1/FVC ratio less than 0.7 the subjects were 7 and more than 0.7 were 18. This indicates that 7 subjects tend to have obstructive respiratory pathologies and 18 were having either pathologies normal or restrictive respiratory.[3] Our study design was cross sectional and all participants were at work. A problem with cross sectional studies is that only

healthy workers who were physically fit tended to remain at work to be surveyed; workers ill due to occupational exposure may have already left the workforce. Chronic bronchitis and impairment of pulmonary function may reduce the working capacity, and welders whose working capacity has been reduced might have already left the workforce. Therefore it can be assumed that there is a healthy worker effect. So we think that the differences found in respiratory symptoms and pulmonary functions in welders are not overestimated. In the study by Azian Hariri et al, a comparison was made between pulmonary function parameters of welders and control groups. Results of PFT reveal that welders in both plants suffered from decrease pulmonary function compared to control group[5].

CONLUSION

We conclude that welders have an increased risk of chronic bronchitis and impairment of pulmonary function. It seems that a strong effort should be made to persuade welders to avoid smoking, better ventilation should be attained, and welders should wear respiratory protective devices.

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