Original Research Article

A study to assess the chronic effects of formalin vapours on lung function parameters (FVC, and FEV1), in first year medical students at RIMS, Raichur

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Abstract

Background: Formalin is a colourless fluid commonly used as a preservative and disinfectant in almost all the Medical colleges. The first year medical students are constantly exposed to these vapours during their classes and practical experiments, due to which they develop a number of acute symptoms. Since the main route of exposure is through inhalation and as it can enter into the lungs easily, there is a possibility that chronic exposure to these vapours could affect the lung functions. Thus the aim of this study was to assess whether chronic exposure to formalin vapours affect pulmonary parameters in medical students. **Aims and Objectives:** The aim of this study was to assess whether long term exposure to formalin vapours has effect on pulmonary parameters namely, FVC(Forced Vital Capacity), FEV1(Forced Expiratory Volume) and FEV1/FVC. **Materials and methods:** The study was conducted on 100 first year medical students of age group,17-20years at Raichur Institute of Medical Sciences, Raichur. The Institutional Ethical Committee clearance was obtained. An Informed consent was taken from all the subjects. The basal values of the parameters that is FVC,FEV1 were FEV1/FVC were recorded using Spiroexcel machine.FEV1/FVC ratio was calculated. The same parameters were recorded on the same subjects after an interval of one month exposure, three months and nine months of exposure to formalin vapours. These values were compared with the basal values. **Results:** In this study it was found that after one month of exposure, there was a significant decrease in FVC and FEV1 values. After three months of exposure, it was found that there was a decrease in FVC,FEV1and also FEV1/FVC ratio. After nine months of exposure, the FVC showed no decrease, where as FEV1and FEV1/FVC ratio decreased significantly. **Conclusion:** The study concludes that chronic or long term exposure to formalin vapours has got a definite effects on lung function parameters.
Key Words: Lung function, formalin, spirometer.

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INTRODUCTION

Formaldehyde is the simplest aldehyde. Formaldehyde based solutions are used as preservative and disinfectants. An aqueous solution of formaldehyde is referred to as formalin. It was discovered by British chemist, August Wilheld Von Hoffman in the year 18561.The first year Medical students, the anatomists and technicians working in these laboratories are constantly exposed to formalin vapours2.The primary route of exposure to formaldehyde is through inhalation, from where it enters and is absorbed by the lungs3. After entering it get quickly dissolved and in the tissues it converted to an non toxic form called

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Formate4.The most common symptoms that are seen after acute exposure to formalin vapours include burning, itching sensation in eyes nose and skin5. Recent studies have shown that the upper respiratory tract is the target for the ill and hazardous effects of exposure to formalin vapours and these studies have also provided the evidence that formaldehyde is an irritant of the respiratory tract and can cause acute as well as chronic health problems7.A few acute controlled exposure studies have showed no significant change in lung parameters after exposure, while some reported a significant decrease in lung function parameter8. Since medical students are exposed to these vapours during their classes there is a possibility that it could have effects in their lung functions. Thus ,the purpose of this study was to assess whether this long term exposure to formalin vapours affects lung function parameters in first year medical students.

MATERIALS AND METHODS

The study was done on 100 first year medical students ,in the Department of Physiology at RIMS, Raichur. A detailed history and clinical examination of all the subjects was done. Informed consent was obtained from all the subjects. Healthy students of age group,17-20 years were taken for the study. Subjects with respiratory illness, or habits of smoking, alcohol intake were excluded from the study. Height(in cm) and weight(in kg) were recorded. Portable computerised Spirometer of Medicaid company was used to record the respiratory parameters. Subjects were explained about the instrument, and the method for recording was demonstrated to them. The parameters recorded were FVC,FEV1 and FEV1/FVC. To perform FVC maneuver, the subject was instructed to breathe in deeply to his full extent and then expel the air as quickly as possible,once all the air in the lungs has been expelled, the subject was instructed to breathe in as quickly as possible. Similarly FEV1 was recorded. The ratio of these two parameters was calculated. These parameters were recorded before the exposure to the formalin vapors, These were considered as Basal values. The same parameters were recorded on the same subject at an interval of one month, three months and after nine months of exposure. The values obtained were compared.

Statistical analysis

Data collected during the study was analysed using appropriate statistical tests and results were analysed using software, SSPS. Paired 't' test was used for comparing the pre and post exercise values. All data is expressed as Mean± Standard Deviation (SD). p value less than 0.05 was considered significant.

DISCUSSION

In this study it was found that the basal values of the parameter FVC (Mean±SD), was 3.011±0.58.After one month of exposure the mean and standard deviation value was 2.81±0.60.This was found to be statistically significant. After three months of exposure, it was2.73±0.57, this was statistically highly significant as p<0.001. After nine months the value was 2.88±0.50, this was statistically not significant. The FEV1 basal value was 2.74±0.60.After one month of exposure it was 2.52±0.69, this was statistically highly significant as p<0.001. After three months the value was 2.39±0.58, this was also so highly significant. After 9 months the value was found to be 2.37±0.76. this was highly significant. The ratio ie FEV1/FVC had a basal value of 91.09 ± 7.77. The value showed a changed to 89.19±13.65. this was found to be not significant statistically. After three months it was 87.73±10.97. This was found to be significant statistically, After nine months the value was 80.94±20.32. This was found to be statistically highly significant.

Table 1: (Mean±SD) of the parameters at duration of exposure

Parameter Basal	Basal	1M	3M	9M
FVC	3.01±0.58	2.81±0.06	2.73±0.51	2.88±0.50
FEV1	2.74±	2.52±0.69	2.39±0.58	2.37±0.76
FEV1/FVC	91.09±7.77	89.19±13.65	87.73±10.97	80.94±20.32

Table 2: p values of the parameters at different duration of exposure

Parameter	p value		
	1M	3M	9M
FVC	0.026 (S)	0.001 (HS)	0.1088
FEV1	<0.0001 (HS)	<0.0001 (HS)	0.0005 (HS)
FEV1/FVC	0.23 (NS)	0.012 (S)	<0.0001 (HS)

A study conducted by Akbar-Khanzandeh *et al.* reported that on exposure to formaldehyde, FEV1/FVC ratio increased during the exposure9.Kilburn K.H *et al.*[10] conducted a similar study on histology technicians, showed that there was a reduction in the pulmonary parameters like FVC, FEV1 and FEF(25%-75%) as compared to the control groups. Another study was conducted by Masoudneghab *et al.*[11] to investigate the respiratory effects of long term occupational exposure to formaldehyde. The findings of this study indicated that in addition to acute partially reversible effects long term occupational exposure to formaldehyde resulted in significant decrements in pulmonary parameters such as FVC, FEV1 and VC. Another study conducted by Main and Hogen12 showed that there was no significant decrease in pulmonary function tests in the subjects on

exposure to formaldehyde. This study showed that after one month of exposure FVC and FEV1 values were decreased with no change in FEV1/FVC ration indicating a restrictive disease lung pattern. After three months there was a decrease in FVC, FEV1 and also the ratio indicating a mixed type of disease. After nine months FVC did not show much change where as FEV1 and FEV1/FVC was reduced which could be due to the adaptations of the respiratory system.

CONCLUSION

This study concludes that chronic exposure to formalin vapours, impairs the pulmonary parameters(FEV1 and FVC). The subjects showed a restrictive, obstructive and a mixed type of pulmonary disease pattern after exposure to the vapours. The periodic checking of lung parameters in subjects who are exposed to such vapours can be done as a preventive measure.

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