TO STUDY THE EFFECT OF FORMALIN EXPOSURE ON PULMONARY FUNCTION TEST OF THE PARAMEDICAL STAFF OF THE MAHATMA GANDHI MEDICAL COLLEGE AND HOSPITAL JAIPUR

Dr. Kritika Sharma[1*], Dr. Aparna Garg[2], Dr. MD Salahuddin[3], Dr. Manu Saini[4], Dr. Ramisa Rahman[5], Mr. Sandeep Garg[6]

Abstract: The present study was conducted in the paramedical staff of Mahatma Gandhi Medical College and Hospital Jaipur. The aim of the study was to study the effect of formalin vapors on pulmonary function test in paramedical staff in Mahatma Gandhi medical college. Pulmonary Function Test was recorded using computerized spirometer RMS Helios 401. Analyzing of the data showed that the mean values of MVV after comparison in exposed and non- exposed group that MVV in exposed group was statistically significant ($p<0.004$) as compared to non-exposed group and other parameters like FVC, FEV1 and TV shows statistically non-significant p value ($p>0.05$).

Key Words: Formalin, Pulmonary Functions, Paramedical staff

[1*]Tutor, Dept. of Physiology, Mahatma Gandhi Medical College & Hospital, Jaipur (Rajasthan) India
[2]Professor & Head, Dept. of Physiology, Mahatma Gandhi Medical College & Hospital, Jaipur (Rajasthan) India
[3]Professor & Head, Dept. of Anatomy, Homeopathy University, Jaipur (Rajasthan) India
[4]Assistant Professor, Dept. of Physiology, Mahatma Gandhi Medical College & Hospital, Jaipur (Rajasthan) India
[5]Tutor, Dept. of Physiology, Mahatma Gandhi Medical College & Hospital, Jaipur (Rajasthan) India
[6]Tutor cum statistician, Dept. of Community Medicine, Mahatma Gandhi Medical College & Hospital, Jaipur (Rajasthan) India

***Corresponding Author:** Dr. Kritika Sharma
*****Tutor, Dept. of Physiology, Mahatma Gandhi Medical College & Hospital, Jaipur (Rajasthan) India
dr.kritikashrotriya@gmail.com

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Introduction

Formalin, an aqueous solution of formaldehyde [HCHO][1] formaldehyde is prepared by mixing the commercially available formalin solution with tap water in the proportion of 3:1[1, 2]. It is colour less, irritant solution, having a strong odour. Due to its solubility, stability, low cost, it is widely used as a disinfectant in hospitals, preserving agent and fixative agent for microscopic and histological studies and also for commercial purposes in industries. It is also utilized by manufacturer of resins, plywood and leather things.[3, 4]

During an Anatomy class, the evaporation of formaldehyde from cadavers, embalming fluid, could negatively affect medical students and instructors health[5]. Formaldehyde is reported to cause acute and chronic health related problems[6]. Vapour of formalin produces toxic, allergenic and carcinogenic effects on respiratory system. The body is exposed to the formalin vapours in three ways; inhalation, oral and dermal.

MATERIAL AND METHODS:

This study was carried out in Physiology Research Laboratory, Department of Physiology at Mahatma Gandhi Medical College and Hospital Jaipur.

Paramedical staff of Anatomy and Pathology Department Lab staff of Mahatma Gandhi Medical College and Hospital Jaipur.

Sample Size: - Paramedical staff (25); and healthy unexposed (25) control group of same age group.

Prior permission was taken from the institutional ethical committee. Informed consent obtained from all the subjects before the study procedure.

Pulmonary Function Test was recorded using computerized spirometer RMS Helios 401, for the study parameters including Forced vital capacity (FVC), Forced expiratory volume in 1 second (FEV1), Tidal volume (TV), maximum ventilation volume or maximum voluntary ventilation (MVV).

INCLUSION CRITERIA

1. Paramedical staff who were exposed to formalin vapors daily.
2. Willingness to Participate.

EXCLUSION CRITERIA

1. Subjects with any history of Cardiovascular, Respiratory illness, Dermatological problems, Smokers and Alcoholic.
2. Systemic illness like Diabetes, Hypertension.
3. Any congenital anomalies of spine and thoracic cage or any connective tissue and musculo skeletal disorders; compromising the pulmonary functions.

Variability in all dynamic pulmonary function test in between the exposed group and non-exposed group were analyzed by the Mann Whitney test and found statistically significant ($p<0.004$) MVV after comparison in exposed and non- exposed group by. The level of significance was set at $P<0.05$.

RESULTS AND OBSERVATION

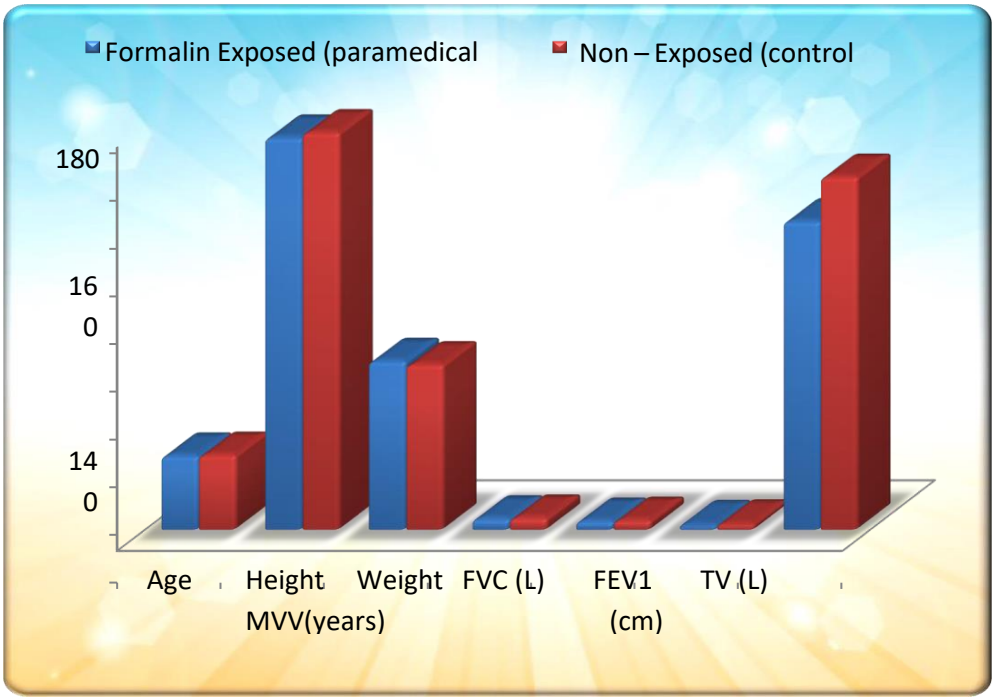
Table 1: Comparison in Formalin exposed (paramedical staff) and Non-Exposed (control group)

	Formalin Exposed (paramedical staff)	Non-Exposed (control group)	P-Value
Age (years)	31.87 ± 6.24	32.25 ± 4.89	0.874 (NS)
Height (cm)	173.87 ± 4.70	176.25 ± 7.146	0.285 (NS)
Weight (kg)	74.125 ± 6.128	72.62 ± 11.211	0.792 (NS)
FVC (L)	3.88 ± 0.338	4.263 ± 0.386	0.103 (NS)
FEV1 (L)	2.87 ± 0.425	3.25 ± 0.397	0.093 (NS)
TV (L)	1.462 ± 0.342	1.785 ± 0.326	0.074 (NS)
MVV(L/S)	136.5 ± 12.03	156.37 ± 9.48	< 0.004*

Values in mean ± Standard Deviation, n= 25, (NS) Nonsignificant, * significant, P value <0.05 is significant.

Table 1 shows comparison of mean values of Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV1), Tidal Volume (TV) and Maximum Voluntary Ventilation (MVV) in Formalin Exposed (paramedical staff) and Non-Exposed group (control group) with their Anthropometric profile.

Table shows the mean values of MVV after comparison in exposed and non- exposed group by Mann Whitney test revealed that MVV in exposed group was statistically significant ($p<0.004$) as compared to non-exposed group and other parameters like FVC, FEV1 and TV shows statistically non-significant p value ($p>0.05$).



Graph 1: Comparison in Formalin exposed (paramedical staff) and Non-Exposed (control group)

Discussion

The present study was a prospective observational study on paramedical staffs with control group of their same age group. The analysis of result after completion of study showed that there was a significant decrease in MVV.

Pulmonary Function Test parameters like FVC (Forced Vital Capacity), FEV1 (Forced Expiratory Volume in one second), and TV (Tidal Volume) remain non- significant ($p>0.05$) in formalin exposed group (paramedical staff) with comparison to non-exposed group (control group). Our study is in accordance with Shital Rameshrao Mankar[7] et al who found significant decrease in MVV but in FVC no significant change was seen in male students. But Schachter EN[8] et al found no significant changes on pulmonary function test after exposure of formalin among healthy individuals either at rest or exercise.

We observed significant symptoms in the exposed group for symptoms of decreased ability to smell, eye irritation, throat irritation, and dry mouth in comparison with the reference group. These symptoms were also significantly related to the time and place of occurrence[9].

Korczynski[10] et al studied the relationship between chronic respiratory symptoms and pulmonary function to formaldehyde concentration and found that chronic short-term exposures to formaldehyde in children can cause bronchial obstructions to occur.

Thus, formaldehyde present in formalin definitely has a toxic effect on various body tissues which can adversely affect the health of medical students and paramedical staff who occupationally exposed to formalin.

In addition to this some simple measures such as increasing airflow in the affected area by opening windows and doors, by using exhaust fans and ventilators in dissection hall, by minimizing direct skin contact with formalin by using rubber gloves, mask & aprons, exposing only the part of the body that is being dissected and periodical removal of fluid dripping collected in the body trays will help in minimizing the toxic effect of formalin.

CONCLUSION

It was concluded from present study that the formalin vapors causes obstructive and restrictive changes as is evidenced by decrease in FVC, FEV1, TV and MVV. It can cause broncho constriction at some extent due to acute exposure. The appropriate use of effective precautionary measurements and ventilation reduces the movement of formaldehyde into the body.[11]

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