MAXIMUM VOLUNTARY VENTILATION IN SMOKERS AND NON-SMOKERS – A COMPARISION

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ABSTRACT

The aim of this study was to compare the maximum voluntary ventilation (MVV) between smokers and non-smokers of 60 male university students (30 each in both groups). The age of the subjects ranged between 21 – 26 years. The subjects were purposely selected from ITM University, Sithaouli Road, Gwalior (M.P), India. Spiro-metric test (A Spiro-meter connected with a computer- Minispir) was conducted on them considering the parameter MVV. It was measured through Spiro-meter in liter per minute. For the data analysis t-test was employed on the data of smokers and non-smoker groups and the level of significance was set at 0.05. Comparative study of maximum voluntary ventilation between smokers and non-smokers concluded that non-smokers have greater maximum voluntary ventilation in comparison with smokers.

Key Words: *Smokers, Non-Smokers, MVV and Electronic Spiro-Meter.*

INTRODUCTION:

Smoking is the most common method of consuming tobacco, and tobacco is the most common substance smoked. Smoking is now recognized as the most important cause of death and disease. Currently, the most of adult population smoke cigarettes. The number of cigarette smokers is slowly declining, but those who do smoke are smoking more. However, now-a-days, the smokers are changing to lower-tar brands. Consumption is rising in developing countries, particularly where tobacco production brings great economic benefits, and it will probably continue to rise for the foreseeable future (Jeffrey S. Wigand). Smoking has significant detrimental effects on various systems on the body. Smoking processes, involve inhalation exposures, which may lead to acute or chronic respiratory diseases. Along with nicotine, smokers also inhale the most damaging compounds in tobacco which include Tar, Carbon monoxide, Hydrogen cyanide, Free radicals, Metals and Radioactive compounds (Ana Pejcic et. al.). It can also cause various patho-physiological effects. It has been identified as the most important risk factor in Chronic Obstructive Pulmonary Disease (COPD). It significantly increases progressive deterioration of

lung function (J.F. Nunn). Amongst the various tests for flows and volumes, maximum voluntary ventilation (MVV) is a parameter that reflects lung volume changes, respiratory muscle functioning, compliance of the thorax lung complex and airway resistance. The MVV was formerly called the maximal breathing capacity (MBC) is the largest volume of gas that can be moved into and out of the lungs in one minute by voluntary effort. The normal MVV is 125-170 litre/min (Ritesh M Karia). MVV, one of the components of Pulmonary Function Testing (PFT), has multiple uses. MVV can be used as a tool for assessment of respiratory muscle weakness which occurs mostly in smokers. The purpose of this study was to compare the MVV between smokers and non-smokers.

METHODS:

ETHICAL APPROVAL-

All the subjects were given a thorough explanation of the procedure and a written informed consent was obtained before participating in the study.

SELECTION OF SUBJECTS-

A total of 60 subjects (30 from each group i.e. smokers and non-smokers) were selected for the purpose of the study. The purposive sampling was used for the selection of the subjects. The age of the subjects ranged between 21 – 26 years. All subjects were almost from the same socio economic group. The subjects who smoke 4-6 cigarettes per day were selected as smokers in this study.

SELECTION OF VARIABLE-

On the basis of literature on physiological variables; finding of the related research studies and keeping in mind the specific purpose of the study to find out the maximum voluntary ventilation between smokers and non-smokers, Maximum voluntary ventilation (MVV) was measured in liter/min by electronic MiniSpir.

PROCEDURE FOR ADMINISTRATION OF THE TEST:

After selecting the subjects, they were measured for their MVV. Maximum voluntary ventilation was measured in liter/min by electronic MiniSpir (MiniSpir User Manual Code 980255).

TEST ADMINISTRATION-

The mouthpiece supplied was inserted into the hollow part of the turbine by at least 0.5 cm. The nose clip was fitted onto the nose of the subject to ensure that air cannot escape through the nostrils. The MiniSpir was hold with both the hands. The side with the MiniSpir label was towards the face of the subject. The subject was asked to insert the mouthpiece well into the mouth beyond the teeth, being carefully to ensure that air cannot escape from the sides of the mouth. The subjects were made standing position so that during expiration they may lean forward, in order to help the expiratory action with a compression of the abdomen. After starting the computer, making the Minispir connected, opening the WinspiroPro Software and clicking on the start option, they were informed to breathe higher and faster with their full capacity for 12 seconds. All data in the MiniSpir was transferred through a USB cable connection. Refer to Paragraph 2.1 of the Manual of Minispir to connect the device to a PC.

SCORING-

The scores of MVV capacity for each subject were recorded in liter/min.

STATISTICAL PROCEDURE:

To compare the means of MVV between smokers and non-smokers, 't-test' as a statistical technique was employed. The level of significance was set at 0.05.

RESULTS:

The group statistics of the subjects is shown in the Table 1 as below.

Table 1

Group Statistics of the smokers and non-smokers on MVV

	Student	N	Mean	Std. Deviation	Std. Error Mean
Maximum Voluntary Ventilation	Non-smokers	30	147.75	11.64	2.12
	Smokers	30	133.21	11.57	2.11

Table 1 shows that the mean of non-smokers (=147.75) is greater than the mean of smokers (=133.21) on MVV. The standard deviation of both the groups is almost equal (=11). The standard error in mean was also found equal in both the cases i.e. 2.1. The standard error is the standard deviation of the sampling distribution of a statistic (here it is means of the samples). The graphical representation of the means of both the group (i.e. Smokers and Non-Smokers) on MVV is given below in figure 1.

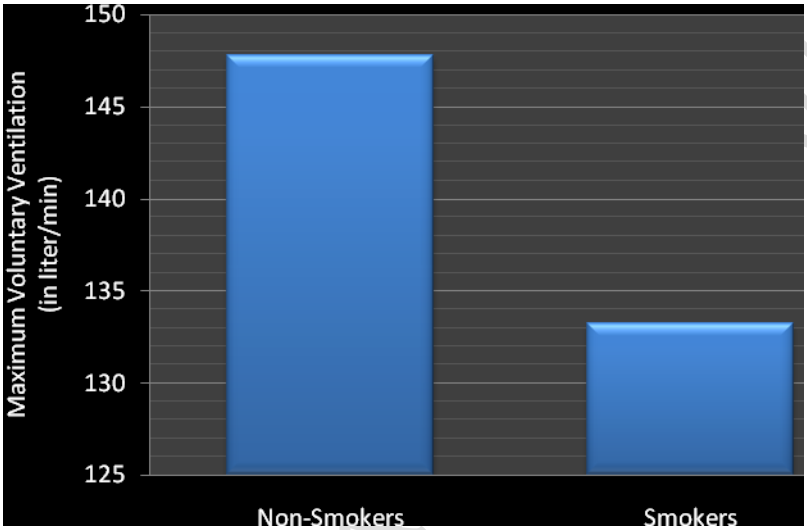

Figure 1

Figure 1 shows that the means of both the groups are unequal.

As the means of both the groups (i.e. smokers and non-smokers) was found to be different, independent 't'- test was employed to compare the mean scores of two groups on MVV. One of the very basic assumption of 't' test is, the two groups have approximately equal variance on the dependent variable. For this purpose Levene's Test for Equality of Variances was employed. The table (Table 2) for the Levene's test is given below.

Table 2

Levene's Test for Equality of Variances

	F	Sig.
Maximum Voluntary Ventilation	.052	.820

Table 2 shows that the F-value (=.052) was not significant, as significance value 0.82>0.05. It means that the two variances are not significantly different; that is, the two variances are approximately equal.

After applying Levene's test, independent 't' test was employed to compare the means of the groups on MVV. The table for the independent 't'-test is shown below.

Table 3

Independent samples t-test between the means of smokers and non-smokers on MVV

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Maximum Voluntary Ventilation	4.85*	58	.000	14.53	2.99	8.54	20.53

*Significant at 0.05 level of significance

Table 3 shows that there was a significant difference in the means of Smokers and Non-Smokers on MVV as p<0.05. So, it may me concluded that the MVV in non-smokers is significantly greater as compared to the smokers.

DISCUSSION:

Respiratory system is one of the important organs of a human body where gaseous exchange take place and diffuses enormous amounts of oxygen into the blood during physical activity of any kind. The responses of respiratory system can be measured by many means. Spirometer is one among them. Spirometry is a painless study of air volume and flow rate within the lungs and can be frequently used to evaluate lung function in an individual in order to find out respiratory adaptation for the training program.

The purpose of the present study was to compare the MVV of two samples i.e. smokers with non-smokers. The Levene's test was employed to test the equality of the variances of both the groups and it was found insignificant. After that independent 't' test was employed to compare the means of both the groups on MVV. The t-value (=4.85) was found to be significant as $p<0.05$. it means there was a significant difference in the mean values of both the groups on MVV. The mean value of non-smokers (=147.75) was found significantly higher than the smokers (=133.21).

Bajentril AL, Veeranna N (2003) studied that 2-5 years of tobacco smoking tends to a definite tendency to narrowing of both the large and small airways and significantly lowering lung function.

Chatterjee S, Nag SK et al. (1988) studied on 334 healthy male non-smokers and 300 healthy male smokers of the age range of 20-60 years and found that value of MVV and PEFR is significantly lower in smokers than non-smokers.

Padmavathy, KM (2008) conducted a study on beedi smokers and non smokers and found that the Forced Vital Capacity (FVC) and Maximal Voluntary Ventilation (MVV) of beedi smokers are lower than those of non-smokers possibly due to reduction in respiratory muscle strength.

CONCLUSION:

So, aggressive tobacco control program aimed to inform the public about the hazards of tobacco use and to provide restriction on the use of or purchase of tobacco must be started. This will be helpful to change policies towards tobacco use; in order to prevent tobacco induced morbidity and mortality. Smoking ban does lead to a reduction in exposure to passive smoking.

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