

The Effect of Smoking on the Blood Parameters of Young Adults

JAYBALLABH KUMAR, GAURAV KUMAR, ABHISHEK SHARMA, FARHAN AHMAD KHAN, SANJEEV SHARMA

ABSTRACT

Aims and Objectives: To compare the haemoglobin concentration, the Differential Leukocyte Count (DLC) and the Packed Cell Volume (PCV) in the blood of smokers and non-smokers.

Methodology: 150 young adults who were of the age group of 20-30 years were selected for this study. Out of the 150, 75 were smokers and 75 were non-smokers. The subjects who suffered from any diseases were excluded. The methods which were used for this study were- Sahli's method for the estimation of haemoglobin, the Tally Chart Method for the determination of the differential leukocyte count and Wintrobe's method for the determination of the PCV.

Observations: In the present study, the means of the neutrophil counts in the passive smokers, occasional smokers and the active smokers (<10 cig./day) were higher than those in the non-

smokers, whereas it was lesser in the active smokers (>10 cig./day). The eosinophil counts in the passive smokers, occasional smokers and the active smokers (>10 cig./day) were slightly higher than those in the non-smokers, whereas it was lesser in the active smokers (<10 cig./day). But the difference was not significant. The packed cell volume of the active smokers (> 10 cig./day) was significantly higher than that of the non-smokers ($p=0.0033$). In the active smokers (< 10 cig./day), the packed cell volume was quite significant than that in the non-smokers ($p=0.078$).

Conclusion: Our study showed that that smoking had an effect on the blood parameters. A majority of the parameters showed higher values in the smokers than in the non-smokers. These mainly included haemoglobin, packed cell volume (PCV) and the differential leukocyte count (DLC).

Key Words: Smokers, Haemoglobin, Packed Cell Volume (PCV) and Differential Leukocyte Count (DLC)

INTRODUCTION

Smoking is one of the most preventable causes of death in our society. The chemicals in cigarettes and tobacco make the smoke which is emitted from smoking them, harmful.

It had been found in previous studies that the mean haemoglobin (Hb) concentration in men and women was higher in the smokers than in the non-smokers [1]. The mean haemoglobin levels and the carboxyhaemoglobin levels increase progressively with the number of cigarettes which are consumed per day. Cigarette smoking seems to cause a generalized upward shift of the haemoglobin distribution curve, which reduces the utility of the haemoglobin level to detect anaemia.

The neutrophils increased in number disproportionately with the current number of cigarettes which were smoked per day. The increased cigarette smoking decreased the proportions of the white blood cells that were lymphocytes or eosinophils. The other smoking variables had no influence on the per cent counts for the specific white cell types in the peripheral blood. These data suggested that the effect of cigarette smoking on the differential cell counts was not uniform and that it was primarily influenced by the current smoking behaviour, although long-lasting effects of the past smoking are also evident [2].

It had been found in the earlier studies that the smokers had shown significantly high values of the total leukocyte count ($P<0.001$) as compared to those in the non-smokers [3]. Among the smokers, the total leukocyte count was found to be positively associated with the intensity of the smoking, the pack per year and the duration of the smoking ($P<0.001$).

The women smokers had significantly higher Hb values than the non-smokers, while among men, the smokers had a little higher Hb values than the non-smokers. No significant difference was found between the ex-smokers and the never smokers [4]. The leukocyte chemotaxis was found to be depressed in the smoking subjects as compared to that in the same subjects who abstained from cigarettes or to that in the non-smokers [5]. Therefore, we conducted this study in the Teerthanker Mahaveer Medical College and Research Centre, in order to investigate the effect of smoking on the blood parameters and to highlight our findings among the medical students as well as the other staff members for the purpose of awareness. Therefore, this study was different from the other studies which were done on the same context, in a medical college.

AIMS AND OBJECTIVE

The aim of this study was to compare the haemoglobin concentration, the differential leukocyte count and the packed cell volume in the blood of smokers and non-smokers. In this study, we investigated the effect of smoking by citing the blood parameters in the smokers in comparison to those in the non-smokers.

MATERIALS AND METHODS

Subjects

150 young adults from the 20-30 years age group were selected for this study. Out of the 150, 75 were smokers and 75 were non-smokers. The subjects who suffered from any diseases were excluded.

An informed consent was taken from the participants before the study was started and the study was approved by the institutional ethics committee (IEC).

The subjects were divided into two major groups-

1. Smokers,
2. Non-smokers

The smokers were further divided into the following sub groups-

1. Occasional Smokers
2. Active Smokers <10 cig. /day
3. Active Smokers >10 cig. /day

The non-smokers were further divided into the following sub groups:

1. Non-Smokers
2. Passive Smokers

Sample

The sample was intravenous blood which was withdrawn from the medial cubital vein. The sample (blood) was taken in a blood container and EDTA (ethylene di amine tetra acetate, an anticoagulant) was added to it to prevent it from clotting.

The following methods were used for this study-

1. Sahli's method for the estimation of haemoglobin.
2. The Tally Chart Method for the determination of the differential laeukocyte count.
3. Wintrobe's method for the determination of the PCV.

Statistical Analysis

The results were analyzed by the Student's unpaired t test to compare each smoking group with the non-smoking group.

The statistical softwares, namely SPSS, version 10.0 and Systat, version 8.0 were used for the analysis of the data. Microsoft Word and Excel were used to generate the graphs, tables, etc.

The p values which were below 0.05 were considered to be statistically significant. The values of all the parameters were presented as geometric means.

GROUP	Neutrophil	Eosinophil	Basophil
Non-Smoker	58.87±5.73	1.80±0.77	0.2±0.414
Passive Smoker	61.87±6.33	2.14±1.23	0.2±0.414
Occasional Smoker	61.53±5.58	1.87±0.92	0.13±0.311
Active Smoker <10	62.87±4.45	1.53±0.64	0.2±0.414
Active Smoker >10	58.60±4.95	2.07±1.03	0.06±0.258

[Table/Fig-1]: Comparison of Neutrophils, Eosinophils & Basophils in non-smokers and smokers

The mean of the neutrophil count was 58.87. It was lesser than the count in the passive smokers ($p=0.1846$), but it was not statistically significant. The count in the occasional smokers was also not significant, but it was slightly higher than that in the non-smokers ($p=0.2071$). In the active smokers (< 10 cig. /day), the neutrophil count was significantly higher than that in the non-smokers ($p=0.0417$), but the count in the active smokers (> 10 cig./day) was lesser than that in the non-smokers. It was not statistically significant [Table/Fig-1].

The eosinophil count in the non-smokers was 1.80, which was lesser than those in the passive smokers ($p=0.3739$) and in the

occasional smokers ($p=1.87$). It was not statistically significant. The eosinophil count in the active smokers (< 10 cig./day) was lower than that in the non-smokers ($p=0.3128$) and it was slightly higher in the active smokers (> 10 cig./day) ($p=0.43$). It was not statistically significant [Table/Fig-1].

The mean of the basophil count in the non-smokers (mean=0.2) was equal to those in the passive smokers and in the active smokers (< 10 cig./day). There was no difference in the counts of the basophils in these three groups ($P=1.0$). In the occasional smokers, the basophil count was lower than that in the non-smokers. In the active smokers (> 10 cig./day) also, it was lower than that in the non-smokers. This difference was statistically not significant [Table/Fig-1].

Group	Lymphocyte	Monocyte
Non-Smoker	37.13±6.71	2.0±1.33
Passive Smoker	33.67±5.81	2.26±1.53
Occasional Smoker	34.27±5.40	2.2±0.94
Active Smoker <10	33.27±4.74	2.13±1.40
Active Smoker >10	37.33±5.12	1.93±1.27

[Table/Fig-2]: Comparison of Lymphocyte & Monocyte in non-smokers and smokers

The mean lymphocyte count in the non-smokers was 37.13, which was higher than that in the passive smokers ($p=0.1416$). The basophil count was lower in the occasional smokers ($p=0.2080$) and in the active smokers < 10 cig./day ($p=0.07$). This was not statistically significant. In the active smokers, the count was 37.33, which was approximately equal to that in the non-smokers ($p=0.9275$). By using the conventional criteria, this difference was found to be statistically insignificant [Table/Fig-2].

The mean of the % of the monocyte count in the non-smokers was 2.0 and it was slightly lower than that in the passive smokers ($p=0.6160$), the occasional smokers ($p=0.6397$) and the active smokers (< 10 cig./day) ($p=0.7974$), but this difference was not statistically significant. The monocyte count in the non-smokers was slightly higher than that in the active smokers (> 10 cig. /day) ($p=0.88$) and it was not statistically significant [Table/Fig-2].

Group	PCV	Hemoglobin
Non-Smoker	42.40±2.38	13.50±0.599
Passive Smoker	43.13±2.75	13.94±0.573
Occasional Smoker	43.87±2.47	14.32±1.084
Active Smoker <10	44.00±2.42	14.34±0.447
Active Smoker >10	45.20±2.40	14.66±0.878

[Table/Fig-3]: Comparison of Packed Cell Volume & Hemoglobin in non-smokers and smokers

The packed cell volumes of the passive smokers and the occasional smokers were not significantly different from that in the non-smokers. The packed cell volume of the active smokers (> 10 cig./day) was statistically very significantly higher than that of the non-smokers ($p=0.0033$). In the active smokers (< 10 cig. /day), the packed cell volume was quite significant than that in the non-smokers ($p=0.078$) [Table/Fig-3].

The mean of the haemoglobin concentration in the non-smokers was 13.50 g/dl and that in the passive smokers was 13.947 g/dl ($p=0.0493$). This difference was statistically significant. The haemoglobin concentration in the occasional smokers was

14.32 g/dl, which was more than the mean in the non-smokers ($p=0.0168$). The value of Hb was significantly higher in the occasional smokers. When the Hb level of the non-smokers was compared with that of the active smokers (< 10 cig./day) (mean=14.34 g/dl), it showed that the Hb level was significantly higher in the active smokers (< 10 cig./day) than in the non-smokers. In the active smokers (> 10 cig./day), the mean of the Hb was 14.66 g/dl. This difference was statistically extremely significant ($p=0.002$) [Table/Fig-3].

DISCUSSION

In the present study, we investigated the changes in the packed cell volume, the haemoglobin concentration, and the differential laeukocyte count in non-smokers and smokers, who were aged 20 -30 years. In the differential laeukocyte count, all the 5 types of laeukocytes of the non-smokers and the smokers were compared. The non-smokers were divided into two groups- the rarely in contact with the smokers (NS) and the passive smokers (PS). The smokers were divided into three groups- the occasional smokers, active smokers (<10 cig./day) (AS <10) and the active smokers (>10 cig./day). The means of the different parameters of the non-smokers were compared with the means of the passive smokers, the occasional smokers, the active smokers (<10 cig./day) and the active smokers (>10 cig./day).

In the present study, the means of the neutrophil counts in the passive smokers, occasional smokers and the active smokers (<10 cig./day) were higher than that in the non-smokers, whereas it was lesser in the active smokers (>10 cig./day). The eosinophil counts in the passive smokers, occasional smokers and the active smokers (>10 cig./day) were slightly higher than that in the non-smokers, whereas it was lesser in the active smokers (<10 cig./day). But the difference was not significant. The differences in the basophil, monocyte, and the lymphocyte counts were also not uniform. Muhammad Jamal Haider and Abdul Rauf (2010) examined the association between the smoking habits and the total laeukocyte count in a group of clinically healthy smokers. As compared to the non-smokers, the current smokers showed significantly high values of the total laeukocyte count ($P<0.001$) [3]. Schwartz J et al., observed in his study, that the neutrophil count had disproportionately increased due to smoking. The increased cigarette smoking had decreased the proportions of the white blood cells that were lymphocytes or eosinophils. The other smoking variables had no influence on the percent counts for the specific white cell types in the peripheral blood. These data suggested that the effect of cigarette smoking on the differential cell counts was not uniform [6].

In our study, the packed cell volume of the active smokers (> 10 cig./day) was significantly higher than that in the non-smokers ($p=0.0033$). In the active smokers (< 10 cig./day), the packed cell volume was quite significant than that in the non-smokers ($p=0.078$). The packed cell volumes of the passive smokers and the occasional smokers were not significantly different from that of the non-smokers. Milton E. Eisen et al., observed that the mean of the packed cell volume in the non-smokers was 52.1 and that in the in smokers, it was 46.3. The packed cell volume was significantly higher in the smokers than in the non-smokers, which is similar to the findings of our study [7].

In this study, the mean of the haemoglobin concentration was 13.50 g/dl in the non-smokers and it was 14.66 g/dl in the active

smokers (> 10 cig./day). Nordenberg D, Yip R and Binkin NJ. (1990) examined the relationships between cigarette smoking, the haemoglobin concentration, and the carboxy haemoglobin concentration by using the data from the Second National Health and Nutrition Examination Survey. Among the women, the smokers had a mean (\pm SE) haemoglobin level of 137 ± 0.4 g/L, which was significantly higher than the mean haemoglobin level of 133 ± 0.5 g/L in the never-smokers. Among the men, the mean haemoglobin levels for the smokers and the never-smokers were 156 ± 0.4 and 152 ± 0.5 g/L, respectively [1]. The mean of the haemoglobin concentration which was observed by Suleiman Muneizel was 15.13 g/dl in the smokers and it was 14.98 g/dl in the non-smokers. The difference was statistically significant. Milton E. Eisen et al. reported that it was found to be 15.0 g/dl in the non-smokers and 17.2 g/dl in the smokers. The haemoglobin concentration was significantly higher in the smokers than in the non-smokers. The results of the present study were not much different from those of previous studies. [4,7,8]

CONCLUSION

Our study showed that smoking had an effect on the blood parameters. A majority of the parameters showed higher values in the smokers than in the non-smokers. These mainly included haemoglobin, packed cell volume and the DLC.

The findings suggested a marked influence of smoking on the haemoglobin concentration, where the concentrations were higher in the active smokers than in the non-smokers.

The packed cell volume was greater in the active smokers (> 10 cig./day) than in the non-smokers. The packed cell volume was slightly higher in the active smokers (< 10 cig./day). Not much difference was found in the passive and the occasional smokers as compared to the non-smokers.

These data suggested that the effect of cigarette smoking on the differential cell counts was not uniform. The effect of cigarette smoking on the differential laeukocyte counts has been unexplored. Our study has enhanced the awareness on the ill effects of smoking among the medical students, as well as among faculty staff members.

REFERENCES

- [1] Nordenberg D, Yip R, Binkin NJ. The effect of cigarette smoking on the haemoglobin levels and on the anaemia screening. *JAMA*. 1990 Sep 26; 264(12): 1556-9.
- [2] Schwartz J, Weiss ST. Cigarette smoking and the peripheral blood laeukocyte differentials. *Ann Epidemiol*. 1994 May; 4(3): 236-42.
- [3] Haider MJ, Rauf A. The smoking habits and their association with the total laeukocyte count among healthy men in Karachi, Pakistan. *World Appl. Sci. J*. 2010; 11(6): 669-73.
- [4] Suleiman M. The haemoglobin level among the Jordanians at a 600-1025 metres altitude. *RMJ*. 2008; 33(1): 72-4.
- [5] Noble RC, Penny BB. Comparison of the laeukocyte count and its functions in smoking and non-smoking young-men. *Infect Immun*. 1975 Sep; 12(3): 550-5.
- [6] Schwartz J, Weiss ST. The host and the environmental factors influence the peripheral blood laeukocyte counts. *Am J Epidemiol*. 1991 Dec 15; 134(12): 1402-9.
- [7] Eisen ME, Hammond EC. The effect of smoking on the packed cell volume, red blood cell counts, haemoglobin and the platelet counts. *Can Med Assoc J*. 1956 Sep 15; 75(6): 520-3.
- [8] Kampman MT, Hornstra G. There was no acute effect of cigarette smoking on the bleeding time of habitual smokers. *Thromb Res*. 1988 Nov 15; 52(4): 287-94.

AUTHOR(S):

1. Dr. Jayballabh Kumar
2. Dr. Gaurav Kumar
3. Abhishek Sharma
4. Dr. Farhan Ahmad Khan
5. Dr. Sanjeev Sharma

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Physiology, TMMC & RC, Moradabad, UP, India.
2. Assistant Professor, Department of Physiology, TMMC & RC, Moradabad UP, India.
3. MSc Student, Department of Physiology, TMMC & RC, Moradabad UP, India.
4. Assistant Professor, Department of Pharmacology, TMMC & RC, Moradabad UP, India.
5. Associate Professor, Department of Pharmacology, TMMC & RC, Moradabad UP, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Jayballabh Kumar, Assistant Professor,
Department of Physiology, TMMC & RC, TMU,
Delhi Road , Bagarpur, Moradabad, 244001, UP, India.
Phone: 09917653488
E-mail: dr.jbkumar@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS:

None.

Date of Submission: **Jul 06, 2012**
Date of Peer Review: **Jul 28, 2012**
Date of Acceptance: **Aug 16, 2012**
Date of Publishing: **Sep 30, 2012**