ORIGINAL ARTICLE

Case – Control study of Haemoglobin Content, Total Erythrocyte count, Total Leucocyte count and Total Platelet Count in Tobacco Factory Workers.

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Abstract:

Background: In humans, tobacco is a risk factor for several diseases including malignancy, usually affecting the GIT and Lungs. In 2008, World Health Organization named tobacco as the world's single greatest explanation for preventable death. Workers within this industry are subjected to environmental hazards of exposure to tobacco leaf dust, pesticide residues and post-harvesting procedures. Workers have respiratory impairments as they are chronically and predominantly exposed to tobacco dust inhaled during tobacco processing.

The primary objectives of this study was to study the blood parameters of Tobacco Factory workers and to match it with age matched controls to determine whether occupational exposure to raw tobacco causes any affect on Haematological parameters.

This study was done at a Tobacco factory in Jaysingpur, Maharashtra on 114 workers of age 20-55 years, with history of exposure to tobacco dust who were exposed to tobacco for a period of more than one year were included in the study. Controls were selected from the office workers within the factory areas not exposed to the tobacco dust at the factory. A well informed written consent was taken from every subject. Screening of subject was done by a well-structured questionnaire. The data was collected and statistically analyzed.

We found statistically significant decrease in haemoglobin concentration and total RBC count in tobacco workers as compared to controls. The total leucocyte count and platelet count was also raised in tobacco workers as compared to controls but was not statistically significant.

Conclusion: Prolonged exposure to tobacco dust leads to anemia in tobacco factory workers. Moreover it may also have an impact on their immune system and platelet counts.

Key Words: Case – Control study, Haemoglobin Content, Total Erythrocyte count, Total Leucocyte count, Tobacco Factory Workers, Total Platelet Count

Introduction:

Tobacco is a product prepared from the leaves of the tobacco plant by crushing them. The plant belongs to the Nicotiana and of the Solanaceae (nightshade) family. Among the known 70 species of tobacco, the chief commercial crop is N.Tabacum. The strong variant N. Rustica is additionally used around the world. [1] Tobacco contains the alkaloid nicotine, which is a stimulant. Cigarettes, cigars, pipe tobacco, and flavored shisha tobacco are prepared from dried tobacco leaves for smoking. It is snuffed or chewed. Tobacco use is a risk factor for several diseases, especially those affecting the guts, lungs, in addition many malignancies. Tobacco use contributes to chronic diseases and health problems including Malignancy, cardiovascular diseases, strokes, tuberculosis, respiratory diseases, gastrointestinal disorders, increased risk of osteoporosis and broken bones, cataracts, blindness, and increased time needed to get over illness. Cigarette smoking and tobacco use also causes the alteration of the lipoprotein levels. [1] This material is extensively used as insulation within the heating plant for drying processes. [2]

In 2008, the World Health Organization named tobacco as the world's single greatest explanation for preventable death. Workers have respiratory impairments as they are chronically and predominantly exposed to tobacco dust inhaled during tobacco processing. [3]

There are many studies emphasizing the role of tobacco dust exposure as a risk factor in respiratory diseases in tobacco factory workers but its effect on hematological parameters has not been studied. The total blood profile gives us a brief look into health status of the subjects ranging from anaemia to immunity and bleeding time of the tobacco factory

workers. Hence the present study was undertaken to assess the effect of tobacco dust on hematological parameters including haemoglobin content, total erythrocyte count, total leucocyte count and total platelet count.

Material and Methods:

The Case Control study was conducted on 114 Tobacco factory workers of age group of 20-55 years at Jaysingpur, Taluka Shirol, Dist. Kolhapur in Maharashtra.

Cases (Group I) - Inclusion criteria -- Both males & females of Age group. 20-55 yrs. who had exposed to tobacco dust more than 1 yrs. Exposure to tobacco less than one year. Smoker's cardiac disease. T.B., Asthma were excluded from the study.

Controls (Group II) - Inclusion criteria -- Both males & females of Age group. 20-55 yrs. who had not exposed to tobacco dust.Smoker's cardiac disease. T.B., Asthma were excluded from the study.

The controls were selected from the office workers within the factory areas and other people who were not exposed to the tobacco in the factory.

Screening of the workers was through a well-structured questionnaire. A well informed written consent was taken from every subject included in the study after explaining the study in detail. The study was done after the approval of Institutional Ethical Committee approval.

The random sample of every subject was collected for CBC (hematological parameters). Under aseptic precaution, exact 2ml blood sample was collected by venipuncture method in an EDTA bulb. After collection, the sample was mixed properly to avoid clotting of blood in the bulb. The CBC samples were run on an auto-analyzer. The observations were subjected to a statistical analysis using SPSS computer software.

OBSERVATION AND RESULTS:

The observations in this study shows that the mean hemoglobin concentration of the tobacco workers was decreased than that of control group which is statistically highly significant. Other researchers also found decreased hemoglobin levels in the women beedi rollers.[4, 5,7,8,9]

The Mean Total RBC count of tobacco workers was decreased than the control group .The difference is statistically highly significant. In another researchers study also found decreased RBC count in the women beedi rollers. [4, 5,7,8,9]

Statistical significance was not found in the Total WBC count and the total Platelet counts of the control group

and that of tobacco workers. Other researchers found significant reduction in platelet count. [6]

Table No.1 Shows the general Information regarding age group, working period, work duration, educational qualification and category according to BMI of workers

Characteristics	No. of workers	Percentage %
A. Age group (Years)		
20-30	06	10.5
31-40	15	26.3
41-50	16	28
51-55	20	35
B. Total working period		
1-4 years	08	14
5-10 years	20	35
more than 11 years	29	50.8
C. Work duration		
Annual	57	100
Seasonal	0	0
D. Educational qualification		
Illiterate	36	63.1
Primary	18	31.5
Higher	02	3.5
Graduate	01	1.7
E. Category according to BMI		
Overweight(25-29.9)	09	15.7
Obese (≥30)	01	1.7
Normal (18.5-24.5)	33	57.8
Underweight (<18.5)	14	24.5

Table no.2 Shows the mean value & standard deviation of Hematological parameters in control group and workers

Parameters	Study Groups		Results	
	Control	Workers	Z Test	P value
	Mean ±SD	Mean ±SD		
Hb (gm %)	12.65±1.94	11.25±2.07	-3.71	0.000
RBC (millions/mm3)	4.91±0.59	4.46±0.56	-4.24	0.000
WBC (cells/mm3)	7886.45± 2290.65	7963.16± 2354.60	0.176	0.86
Platelet count (Lakhs/mm3)	3.5±0.79	3.48±1.03	1.137	0.258

Table no. 3. Shows the mean value and standard deviation of Hemoglobin concentration with duration of exposure of tobacco factory workers.

Parameters	Control Group	Workers	Results	
Yrs. of Exp.	Mean ± SD	No. of Workers N=57	F Value	P Value
1-4 yrs.	10.61±2.4	8		
5-10 yrs.	11.47±2.39	20	0.487	0.617
>11 yrs.	11.28±1.77	29		

Table no. 4. Shows the mean value and standard deviation of Red blood cell count with duration of exposure of tobacco factory workers.

Parameters	Control Group	Workers	Results	
Yrs. of exp.	Mean ± SD	No. of workers N=57	F Value	P Value
1-4 yrs.	4.56±0.54	8		
5-10 yrs.	4.6±0.41	20	1.565	0.219
>11 yrs.	4.33±0.62	29		

Table no. 5. Shows the mean value and standard deviation of White blood cell count with duration of exposure of tobacco factory workers.

Parameters	Control Group	Workers	Results	
Yrs. of exp.	Mean ± SD	No. of workers N=57	F Value	P Value
1-4 yrs.	7062.5 ± 1597.26	8		
5-10 yrs.	8331.57 ± 2469.15	20	0.573	0.568
>11 yrs.	7970.0 ± 2448.1	29		

Table no. 06 Shows the mean value and standard deviation of Platelet count with duration of exposure of tobacco factory workers.

Parameters	Control Group		Workers	Results	
Yrs. of exp.	Mean	SD	No. of workers N=57	F Value	P Value
1-4 yrs.	3.89	0.77	8		
5-10 yrs.	3.70	0.80	20	0.137	0.873
>11 yrs.	3.63	1.22	29		

Discussion:

As shown in table no.2, the mean Hemoglobin of the control group was 12.65 gm% and that of tobacco workers was 11.25 gm%. The difference is statistically highly significant (P=0.00). Shahla et al (2010) also found decreased hemoglobin levels in the women beedi rollers. [4]

The Mean Total RBC count of the control group was 4.91 million/mm^3 and that of tobacco workers was 4.46 million/mm^3. The difference is statistically highly significant in this study (P=0.000). In another study, Shahla et al (2010) also found decreased RBC count in the women beedi rollers. [4] Ukoha et al (2012) also found decreased RBC count in Wistar rats. [5]

The mean Total WBC count of the control group was 7886.45 cells/mm3 and that of tobacco workers was 7963.16 cells/mm3. The difference is statistically insignificant (P=0.86). Ukoha et al (2012) also found increased Total WBC count in Wistar rats. [5] Erik J. et al (1998) also observed an increase in Total WBC count in smokers. [6]

The mean Total Platelet count in the control group was 3.50 L/mm3 and that of the tobacco workers was 3.48 L/mm3. The reduction in Total Platelet count found which is statistically insignificant (P=0.258). Shahla et al (2010) also found decreased Platelet count in the women beedi rollers. [4] Ukoha et al (2012) also studied the effects of sub lethal doses of smokeless tobacco on Wistar rats and found significant reduction in platelet count. [5]

As seen in table no.3, after 5 to 11 years of exposure to tobacco, the Hemoglobin concentration was reduced in subjects. It is statistically insignificant. Our findings are in correlation with other studies, who found positive correlation between Hemoglobin and tobacco exposure. [4, 5, 7, 8, 9]

As seen in table no.4, after 5 to 11 years of exposure, the Total RBC count of the subjects was decreased. It is statistically not significant. Our findings are in correlation with other studies, who found positive correlation between RBC count and the exposure. [4, 5, 7, 8, 9]

As seen in table no.5, after 5 to 11 years of exposure the Total WBC count was increased in the subjects. It is not statistically significant. Our findings are in correlation with

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other studies. [5]

As seen in table no.6, after 5 to 11 years of exposure the Total Platelet count of the subjects was slightly decreased. It is not statistically significant. Our findings are in correlation with other studies.4, 5

Invasion of the RBC membrane by peroxidant which occurs after consumption of oxidative drugs can lead to RBC hemolysis is also reported by many researchers. Cotinine, a peroxidant and a metabolite of nicotine found in tobacco products has also been shown to extend RBC hemolysis in tobacco users at the highest concentration used. This might explain the reduced RBC count observed in the study. The high dose of tobacco consumption may lead to anemia.5

Stimulation of lung macrophages produces neutrophil chemotactic factors and enhancement of neutrophil chemotactic responsiveness. These are proposed as responsible factors for the increased leukocyte counts in smokers. Plasma nicotine levels correlate directly with the leukocyte blood counts in smokers but a direct stimulation of the bone marrow by tobacco smoke has not been shown.6

Conclusion:

In conclusion, prolonged exposure to tobacco dust leads to anemia in tobacco factory workers. Moreover it may also have an impact on their immune system and platelet counts. Thus the observation seen in this study suggests that Factory owners should play an active role to maintain minimal health hazards in their tobacco factory workers by strictly following the rules for factory management and conducting annual health check-up.

Conflict of Interest - Nil
Sources of Support - Nil

References

1. Fahmida Khatun, M. Kamruzzaman, Mominul Islam, Shofikul Islam, Hafizur Rahman, Rezaul Karim Health hazards and the socioeconomic status of female labour of tobacco processing mills in Kushtia, Bangladesh. Science Journal of Public Health 2013 Vol. 1(1) 1-8.
2. L.Settimi, L.Costellati, M.Naldi,G.Bersani, S.Olandasand P.Maiozzi Mortality among workers in an Italian cigarette factory. Occupational Medicine1999 vol. 49(6).361-364.
3. Dr. Nasrin Sultana Dr. Md. AbulKhair Basher Occupational Hazards in Tobacco Factory workers experience from Rangpur- Banglavision research journal 2015 vol.15 (1).81-90.
4. Erik Juel Jensen, Bente Pedersen, Ruben Frederiksen, Ronald Dahl. Prospective study on the effect of smoking and nicotine substitution on leukocyte blood counts and relation between blood leucocytes and lung function Thorax.1998 Vol.53.784-789.
5. Shahla Yasmin Basri Afroz Bushra Hyat Doris D'Souza Occupational Health Hazards in Women Beedi Rollers in Bihar, India. Bull Environ common Toxicol 2010 vol.85.87-91.
6. Ukoha Ukoha1, Uchechukwu Dimkpa2, Stephen Maduka.The effect of sub-lethal doses of smokeless tobacco (snuff) on certain hematological and hemostatic parameters in Wistar rats. Journal of Experimental and Integrative Medicine 2012 Vol.2 (3).225-230.
7. Devendra kumar, b.k.binawara,poona ram beniwal,mrs pooja Sharma Effect of chewing Tobacco on Hematological Parameters in Bikaner City Population Journal Of Medical Science and Clinical Research 2017 Vol.5 (2).17721-17727.
8. Maja Malenica,Besim Prnjavorac,Tamer Bego,Tanja Dujic,Sabina Semiz,SelmaSkrbo, Amar Gusic,Ajla Hadzic,Adlija Causevic.Effect of Cigarette Smoking on Haematological Parameters in Healthy Population Medical Archieves 2017 Vol.71.132-136.
9. Anjani kumar Shukla, Tanya Khaitan, Prashant Gupta, and Shantala r. Naik smokeless tobacco and its adverse effects on hematological parameters: a cross-sectional study. Advances in preventive medicine. 2019. Open access id.no. 3182946.

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