Section: Physiology

Original Research Article

IMPACT OF SMOKELESS TOBACCO ON RED CELL INDICES IN SOUTHERN RAJASTHAN POPULATION

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Abstract

Background: The purpose of growing tobacco plants is for their leaves, which are fermented and dried before being used in tobacco products. There are two basic ways to consume tobacco: smokeless tobacco and smoked tobacco. Smokeless tobacco (SLT) use is the use of tobacco without burning. In recent years, the SLT products have been the most widely used and readily available tobacco products. They are put under the gums, cheeks, and lips, and can be taken orally or without burning. SLT use has surged globally, particularly among young men and boys in their adolescence who views it as a safer alternative to smoking. Long-term SLT use may impact hematological and biochemical markers and further highlight the negative health impacts of tobacco use. The aim is to study the impact of smokeless tobacco on red cell indices i.e Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC). **Materials and Methods:** A prospective cross -sectional observation study was conducted on southern Rajasthan population aged between eighteen years to fifty-five years. A total of one hundred volunteers were enrolled in this study and it comprises sixty individuals who would have been smokeless tobacco consumers for at least five years and another forty participants were non-tobacco consumers. Recruitment of subjects was carried out randomly and only those who gave their consent were included in this study. The data was compared between study and control groups using appropriate statistical analysis. **Result & Conclusion:** Our study shows highly significant (p-value <0.001) increase in haemoglobin (HGB), red blood cell (RBC) count, haematocrit (HCT) and significant increase (p-value 0.01) in mean corpuscular haemoglobin (MCH) and mean corpuscular volume (MCV) (p-value 0.05). Mean corpuscular haemoglobin (MCHC) showed non-significant higher values (p-value 0.12).

INTRODUCTION

The dried and processed leaves of the Nicotiana tabacum plant, which is widely grown and farmed for commercial purposes in many nations worldwide, are known as tobacco.[1] The purpose of growing tobacco plants is for their leaves, which are fermented and dried before being used in tobacco products. Nicotine can be chewed, sniffed, or smoked. The inception of its use is influenced by curiosity as well as peer pressure from friends and acquaintances.[2] This could be just one of the factors that lead to tobacco consumption. There are two basic ways to consume tobacco: smokeless tobacco and smoked tobacco. Smokeless tobacco (SLT) use is the use of tobacco without burning. In recent years, the SLT products have been the most widely used and readily available tobacco products. They are put under the gums, cheeks, and lips, and can be taken orally or without burning. Nicotiana Tabacum is used to make smoking tobacco products, while Nicotiana Rustica is utilized to make smokeless tobacco products. It has been reported that N. Rustica species has higher amounts of tobacco-specific N-nitrosamines than N. Tabacum species.[3] The principal constituents of smokeless tobacco products consist of nicotine alkaloid, hydrocarbons, formaldehyde, acetaldehyde, tobacco-specific N-nitrosamines (TSNA), N-nitrosamine acids, volatile N-nitrosamines, and heavy metals such as polonium-210.[4] People who smoke tobacco find it difficult to stop because tobacco includes nicotine, an addictive chemical. Due to its addictive properties, using smokeless tobacco can develop into a lifetime habit that has detrimental impacts on one's health over time.[5,6] Since smoking is now illegal in more indoor and public spaces, SLT use and prevalence have significantly expanded as a substitute source of

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nicotine addiction.[7] In India, chewing tobacco is the most popular way to use SLT.[8,9] In India, one of the most popular SLTs is "khaini," tobacco mixed with slaked lime.[10] Chewing tobacco is consumed in India in a variety of forms, including paste (Qiwam, Zarda), dried leaves (Patti), gum (Gutkha), betel quid (Pan), and tobacco with lime (Khaini/Mawa).[11] SLT use has surged globally, particularly among young men and boys in their adolescence who view it as a safer alternative to smoking. Smoking has decreased as a result of strong efforts to raise public awareness of the harmful effects of tobacco use, but SLT usage has paradoxically increased significantly.[12] Similar amounts of nicotine that increase toxicity may be delivered by smoking and smokeless tobacco products.[13] Chewing habits cause the absorption of nicotine to proceed at a reduced pace, but it continues at the mucous membranes.[14] Compared to cigarettes, SLT delivers three to four times as much nicotine and remains in the bloodstream for a longer period of time. The psychotropic component nicotine is converted by the liver to cotinine after being metabolically inactivated by CYP2A6.[15]

In the view of the various pharmacological actions of nicotine, chronic consumption of SLT may affect the status of hematological profile. Despite the existence of various published studies, regarding the effects of tobacco on its users, little or no efforts have been made to ascertain its effect on red cell indices. This study, therefore, determines its (tobacco) effect on hemoglobin, hematocrit, red cell count, red cell indices (indices i.e; Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC)) and red cell morphology in the subjects consuming smokeless tobacco regularly at least for five years duration.

Aims and Objectives

To study the impact of smokeless tobacco on red cell indices i.e; Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC).

MATERIALS AND METHODS

A prospective cross-sectional observation study was conducted on southern Rajasthan population aged between eighteen years to fifty-five years. The study was carried out in the Department of Physiology, RNT Medical College, Udaipur (Rajasthan).

Data collection: A total of one hundred volunteers were enrolled in this study and it comprises sixty individuals who would have been smokeless tobacco consumers for at least five years and another forty subjects were those participants who had never consumed tobacco in any form. Recruitment of subjects was carried out randomly and only those who gave their consent were included in this study. Individuals who were on any type of medication and those who did not give their consent were excluded.

Exclusion Criteria

Participants who reported consuming alcohol and or were active smokers were excluded from the study. In the present study, all volunteers were free from any chronic disease, illness, and teetotalers with no smoking habit with free from the use of any tranquilizers, drugs, and anesthetics. After taking informed and written consent, single sample of 2ml blood from volunteers by vein puncture between 7 AM and 10 AM into heparinized test tubes was collected after an overnight fasting by a lab technician under all aseptic precautions for the analysis of hematological parameters in central laboratory of RNT Medical College, Udaipur (Rajasthan) and hematological parameters such as hemoglobin (Hb), hematocrit (Hct), red blood cell (RBC) count, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), were estimated with an automatic electronic blood count analyzer. During this study, there was no financial burden on study participants. The study was carried out after approval from Institutional Ethical Committee. Study participant's identity information will be kept confidential forever.

Data Analysis

Statistical analysis was carried out using SPSS version 25.0. The relationship between the parameters will be determined using the student t-test. A $p < 0.05$ was considered statistically significant.

RESULTS

During this study total hundred participants were included, out of which 68% were male and 32% were females.

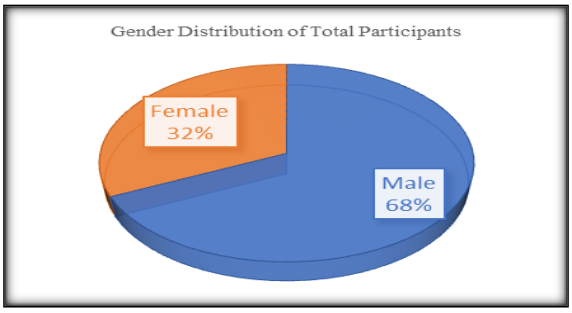

Figure 1: Gender distribution of total participants

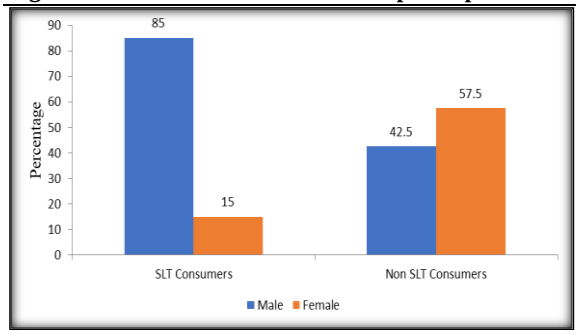

Figure 2: Gender distribution of SLT consumers and SLT non-consumers

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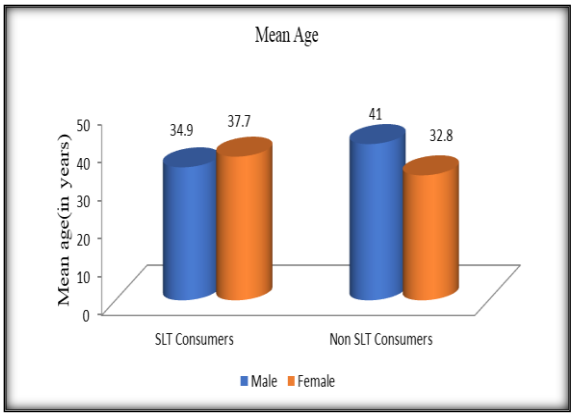

Figure 3: Age distribution of SLT consumers and SLT non-consumers

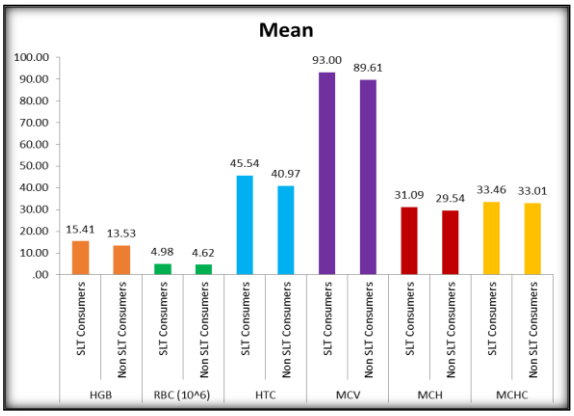

Figure 4: Hematological parameters in SLT consumers and SLT non-consumers

Table 1: Gender distribution of total participants

Gender	No. of Participants	Percentage
Male	68	68
Female	32	32
Total	100	100

Table 2: Gender distribution of SLT consumers and SLT non-consumers

Gender	SLT consumers (% of total participants)	SLT non-consumers (% of total participants)	Total
Male	51(85%)	17(42.5%)	68(68%)
Female	9(15%)	23(57.5%)	32(32%)
Total	60(100)	40(100)	100(100)

Table 3: Age distribution of SLT consumers and SLT non-consumers

Gender	Mean Age ± S.D.	
	SLT consumers	SLT non-consumers
Male	34.9±11.7	41±15.9
Female	37.7±9.8	32.8±9.8

Table 4: Hematological parameters in SLT consumers and SLT non-consumers

	Type	Mean	Std. Deviation	p-value
HGB	SLT consumers	15.41	0.87	<0.001
	SLT non-consumers	13.53	0.35	
RBC (10^6)	SLT consumers	4.98	0.46	<0.001
	SLT non-Consumers	4.62	0.51	
HTC	SLT consumers	45.54	4.55	<0.001
	SLT non-consumers	40.97	2.13	
MCV	SLT consumers	93.00	7.20	0.05
	SLT non-consumers	89.61	9.65	
MCH	SLT consumers	31.09	2.78	0.01
	SLT non-consumers	29.54	3.17	
MCHC	SLT consumers	33.46	1.36	0.12
	SLT non-consumers	33.01	1.47	

DISCUSSION

This study was conducted on the population of southern Rajasthan aged between eighteen years to fifty-five years among them sixty participants were smokeless tobacco consumers and remaining forty were tobacco non-consumers who had not consumed tobacco in any form. All included participants were volunteer and were selected randomly.

Our study shows highly significant (p-value <0.001) increase in haemoglobin (HGB), red blood cell (RBC) count, haematocrit (HCT) and significant increase (p-value 0.01) in mean corpuscular haemoglobin (MCH) and mean corpuscular volume (MCV) (p-value 0.05). Mean corpuscular haemoglobin (MCHC) showed non-significant higher values (p-value 0.12).

B. Purushottama Dass, P. Jaganmohan et al,[16] observed that hematological parameters HCT, MCV, MCH were significantly increased while Hb and RBC count were also at higher level but not statistically significant. They also observed that MCHC was significantly at lower levels.

Roan Mukherjee et al,[17] found significant elevation (< 0.001) in total erythrocyte count, total leukocyte count, packed cell volume, haemoglobin level and neutrophil percentage. Significant reduction in the percentage of monocyte (< 0.05) and highly significant reduction in percentage of lymphocyte (<

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0.001). Majority of the variation of these parameters between smokers and gutkha consumers were not significant (> 0.05). Roan Mukherjee et al,[18] suggested that the negative effect of gutkha on blood haematology is no less adverse than smoking.
Sushobhan Biswas, Krishnendu Manna et al,[15] found that, SLT user group had higher levels mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) level compared to the non-user group but the values of hemoglobin, erythrocyte count, lymphocyte count, monocyte count, eosinophil count, packed cell volume (PCV), mean corpuscular volume (MCV) were higher in the non-user group, however the differences were not statistically significant (p> 0.05, from regression analysis) except monocyte count (p< 0.05).
Dorathy C. Okpokam, Euphoria C. Akwiwu et al,[19] found that Hb, Hct, Rbc, TWBC and Neutrophil (141g L^{-1} , 0.43 L L^{-1} , 5.37×10^{9} L^{-1} , 12.7×10^{9} L^{-1} and 73.5%) of snuff users respectively were seen to be significantly raised, while the MCV, MCH, MCHC and lymphocyte count (78 fl, 23 pg, 141g L^{1} and 18.1%) were significantly reduced when compared with non-users. The slight elevation of the Red Blood Cell (RBC) count could be a result of the inflammation caused by snuffing activity. When snuff is consumed, inflammation may occur, which may affect the organs in the body like the lungs leading to hypoxia as a result of the impaired function of the lungs to deliver oxygen. Now when this happens, there is a signal to the kidney to produce erythropoietin to make more red blood cells to compensate for the oxygen loss in the body. This causes a rise in RBC count, since there are more red cells in the system there will be an increase in Hb level.[19]
Anjani Kumar Shukla, Tanya Khaitan et al,[20] observed Significant changes in the complete blood profile in SLT users when compared to nonusers. They found Serum MCH was higher in SLT users (29.65 pg) when compared to nonusers (29.43 pg) which was statistically nonsignificant with a t value of - 0.16 and p value of 0.43, while Hb and MCHC were lower but statistically non-significant and TRBC, PCV, MCV were statistically significantly lowered. Sikander Munir Memon, Naresh Kumar et al,[21] found statistically non-significant higher values of Hb, HCT and MCH in SLT users while reduced level of RBC count, MCV and MCHC but not statistically significant.
Navdeep Singh Kathuria, Gaurav Agrawal et al found all three measures of haemoglobin, red blood cell count, and total leukocyte count considerably greater in those who chew tobacco. The lower value of MCHC, MCV, and PCV in chewing tobacco participants but MCH level was increased in Chewing tobacco users.

Limitations of the Study

A small sample size cross-sectional study was conducted. Looking at the study's various aspects, we can draw the conclusion that it can be further developed as a comparative study with big sample size.

CONCLUSION

In terms of hemoglobin, hematocrit, red blood cell count, and its indices (mean corpuscular hemoglobin, mean corpuscular volume, and mean corpuscular hemoglobin concentration), the current study demonstrates that smokeless tobacco may have a combinatorial effect. When it comes to evaluating hematological parameters or screening for anemia in those who use smokeless tobacco, care should be taken. This is owing to the possibility of inaccurate interpretations resulting from the subject's changed hematological profile as a result of tobacco usage.

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