

ORIGINAL RESEARCH**A Pilot Study on the Effects of Chewing Tobacco on Hematological Parameters**

¹Dr Navdeep Singh Kathuria, ²Dr. Gaurav Agrawal, ³Dr. Suyash Gupta, ⁴Dr Narmada Prasad Patel

¹Senior Resident, Department of General Medicine, Dr S.S. Tantia Medical College, Hospital and RC, Sri Ganganagar, Rajasthan, India

²Senior Resident, Department of Neurology, MGM Superspeciality Hospital, Indore, Madhya Pradesh, India

³Senior Resident, ⁴Professor, Department of General Medicine, LN Medical College and JK Hospital, Bhopal, Madhya Pradesh, India

Correspondence:

Dr. Suyash Gupta

Senior Resident, Department of General Medicine, LN Medical College and JK Hospital, Bhopal, Madhya Pradesh, India

Email: drsuyashgupta@gmail.com

Abstract

Background: High school and college students as well as athletes have shown a rise in cigarette use. The aim of this study to evaluate the effects of Chewing Tobacco on Hematological Parameters.

Material and methods: Fifty members of the department of General Medicine, LN Medical College and JK Hospital, Bhopal aged 20-50 participated in a pilot research. Individuals who were 20-50 years old, had a normal body mass index, and used smokeless tobacco exclusively for at least the previous five years were eligible for participation. Active and passive smokers, as well as people with preexisting conditions like lung disease, heart disease, cancer, chronic liver or kidney failure, diabetes mellitus, obesity, or a history of heavy alcohol consumption, were not allowed to participate.

Results: In our study showed the mean value of Hb in chewing tobacco Hb(g/dl) 15.25 ± 0.33 , RBC($10^6/\mu\text{L}$) 5.77 ± 0.87 , TLC($10^3/\text{mm}^3$) 6.57 ± 0.67 , Neutrophil (%) 66.02 ± 2.21 , Eosinophil (%) 1.91 ± 0.61 , Basophil (%) 0.41 ± 0.22 , Lymphocyte (%) 30.15 ± 2.54 , Monocyte (%) 2.21 ± 0.89 , Platelets ($10^3/\text{mm}^3$) 149.25 ± 10.54 . All three measures of haemoglobin, red blood cell count, and total leukocyte count are considerably greater in those who chew tobacco. Their blood also has a much greater neutrophil proportion, as seen by the differential count data. In addition, their blood has a noticeably reduced proportion of lymphocytes and monocytes. Chewing tobacco users also had considerably lower platelet counts.

Conclusion: Chewing tobacco has been shown to have negative effects on a number of haematological parameters in the current investigation, including an increase in Hb level, RBC count, TLC, and neutrophil percentage and a drop in monocyte, lymphocyte, and platelet percentages. According to the results of the current research, care should be used when assessing haematological parameters or doing a screening for anaemia in those who regularly use chewing tobacco.

Keywords: Chewing Tobacco, Hematological Parameters

Introduction

In the Indian subcontinent, oral cancer is one of the top three cancers diagnosed each year, making it a modern pandemic among the continent's noncommunicable illnesses. Oral cancer is the most common kind of cancer in the United States, affecting around 30% of all cases. Cigarette smoking and other tobacco use are major contributors to the rising cancer incidence worldwide.¹ In India, people use several different kinds of smokeless tobacco (SLT), including pan (betel quid) with tobacco, zarda, pan masala, khaini, mawa, snuff, mishri, and gudakhu. Commercially packaged items, in addition to locally made ones, have lately been promoted at low costs, making them accessible to everybody, especially the young and the impoverished.² Pyrimidine-N-glucuronides, nicotine-N-gluc, and cotinine-N Gluc are produced in the liver from the primary tobacco alkaloid nicotine and its chief metabolite cotinine, respectively.³ Chemicals including crotonaldehyde, formaldehyde, and acetaldehyde have also been recorded in SLT, in addition to the more well-known toxins such polycyclic aromatic hydrocarbons, nitrate, nitrite, nicotine, and acrolein.⁴

Nearly one-third of adults worldwide smoke tobacco, according to the World Health Organization. According to the Global Adult Tobacco Survey-2 (GATS-2), 10.7% of adults smoke cigarettes and 21.4% use sublingual nicotine patches or gum.⁵ Males are more likely to utilise SLT than females are, with a 27%-37% prevalence vs 10%-15%.⁶ In India, the incidence of SLT varies widely throughout the country, from 5% in Himachal Pradesh and Goa to approximately 50% in Bihar, Jharkhand, and Chhattisgarh (Global Adult Tally System, 2009-10).⁷ The state of haematological parameters and the impact of tobacco smoking on systemic health may be influenced by the different pharmacological activities of nicotine and additives, as well as their widespread usage in various areas and nations. Although SLT products target keratinocyte stem cells specifically, they are taken systemically and have an effect on a wide variety of other cell types and organs. They contribute to the molecular chain of events that leads to malignant transformation of a cell by producing DNA adducts, primarily O-6-methyl-guanine, which interfere with the accuracy of DNA replication and mutation. The metabolic pattern is strongly modulated by SLT products, increasing the risk of systemic inflammation and conditions such polycythemia vera, cardiovascular disease, and changes in red blood cell (RBC) shape. Indeed, lymphocytes from peripheral blood are most often investigated to examine chromosomal instability due to SLT.^{8,9} Chronic use of SLT may alter the status of haematological parameters and further define the impacts of tobacco use to health, in light of the diverse pharmacological activities of nicotine and additives and the widespread usage in many areas and nations. However, research on the impact of chewing tobacco use on haematological markers in humans and other animals is few. The aim of this study to evaluate the effects of chewing tobacco on hematological parameters.

Material and methods

Fifty members of the department of General Medicine, LN Medical College and JK Hospital, Bhopal aged 20-50 participated in a pilot research. Individuals who were 20-50 years old, had a normal body mass index, and used smokeless tobacco exclusively for at least the previous five years were eligible for participation. Active and passive smokers, as well as people with preexisting conditions like lung disease, heart disease, cancer, chronic liver or kidney failure, diabetes mellitus, obesity, or a history of heavy alcohol consumption, were not allowed to participate.

Statistical Analysis

Data was presented as mean SD. The statistical methods utilised a "intention to treat" approach. The quantitative information was displayed as a mean SD. SPSS version 25.0 was utilised for the analysis.

Results

Table 1 show that most of the participants were 30-40 years of age group 25(50%) followed by 20 to 30 years 15(30%) and 10(20%). In our study showed the mean value of Hb in chewing tobacco Hb(g/dl) 15.25 ± 0.33 , RBC($10^6/\mu\text{L}$) 5.77 ± 0.87 , TLC($10^3/\text{mm}^3$) 6.57 ± 0.67 , Neutrophil (%) 66.02 ± 2.21 , Eosinophil (%) 1.91 ± 0.61 , Basophil (%) 0.41 ± 0.22 , Lymphocyte (%) 30.15 ± 2.54 , Monocyte (%) 2.21 ± 0.89 , Platelets ($10^3/\text{mm}^3$) 149.25 ± 10.54 . All three measures of haemoglobin, red blood cell count, and total leukocyte count are considerably greater in those who chew tobacco. Their blood also has a much greater neutrophil proportion, as seen by the differential count data. In addition, their blood has a noticeably reduced proportion of lymphocytes and monocytes. Chewing tobacco users also had considerably lower platelet counts.

Table 1: Distribution of participants on the basis of age groups

Age group	Number	Percentage
20-30	15	30
30-40	25	50
40-50	10	20

Table 2: Hematological parameters in Participants

Hematological parameters	Value in participants
Hb(g/dl)	15.25 ± 0.33
RBC($10^6/\mu\text{L}$)	5.77 ± 0.87
TLC($10^3/\text{mm}^3$)	6.57 ± 0.67
Neutrophil (%)	66.02 ± 2.21
Eosinophil (%)	1.91 ± 0.61
Basophil (%)	0.41 ± 0.22
Lymphocyte (%)	30.15 ± 2.54
Monocyte (%)	2.21 ± 0.89
Platelets ($10^3/\text{mm}^3$)	149.25 ± 10.54

We found the lower value of MCHC, MCV, and PCV in chewing tobacco participants. MCH level was increased in Chewing tobacco.

Table 3 The effect on MCHC, MCH, MCV, and PCV

Parameter	Value in participants
MCV	84.55 ± 5.54
MCH	30.11 ± 4.67
PCV	41.87 ± 5.22
MCHC	33.66 ± 3.98

Discussion

Fifty smokers, all between the ages of 20 and 50, made up the sample for this research of the..... population. In this study, researchers found that users of chewing tobacco had considerably greater levels of haemoglobin, red blood cell count, and total leukocyte count than non-users. Their blood also has a much greater neutrophil proportion, as seen by the differential count data. In addition, their blood has a noticeably reduced proportion of

lymphocytes and monocytes. Chewing tobacco usage is also associated with a considerable drop in platelet count.

Total erythrocyte count, total leukocyte count, packed cell volume, haemoglobin level, and neutrophil percentage were all found to be significantly increased ($p < 0.001$) by Roan Mukherjee et al.¹⁰ There was a statistically significant decrease in monocytes ($p < 0.05$) and a very significant decrease in lymphocytes ($p < 0.001$). The majority of these indicators did not differ significantly ($p > 0.05$) between smokers and gutkha drinkers. The higher than expected number of leukocytes suggested that inflammatory reactions had already begun in the sample used for the research. An increase in PCV has also been shown in animal models after treating mice with gutkha. It has been suggested in previous research that Hb levels may rise in those who regularly use gutkha.¹¹ Consumption of gutkha may also induce erythropoiesis, as shown by the increased total erythrocyte count in gutkha users. Total erythrocyte count increased somewhat in a previous investigation on gutkha-treated mice.¹² Some writers claim that gutkha users may have decreased pulmonary function, making it necessary for them to increase erythropoiesis in order to meet their body's oxygen needs.¹²

The nicotine in cigarettes may stimulate the suprarenal glands to produce more catecholamine, which in turn may impact leukocytosis. Inflammation and tissue damage are possible causes. There is some evidence that vitamin B12 is responsible for the increased total leukocyte count seen in the current study's gutkha consumers. The current research suggests that the elevated neutrophil percentage in gutkha eaters may be linked to persistent tissue inflammation. It is well-documented that neutrophils release cytotoxic chemicals that impair lung function.¹³⁻¹⁵ Chewing tobacco users were shown to have less lymphocytes in the current investigation. The sympathetic nervous system becomes more active in conditions of systemic stress. Since increased cortisol output is linked to a lower proportion of lymphocytes in the blood, this may explain why stress tends to lower those cells.^{16,17} The sympathetic nervous system is also known to be stimulated by nicotine.^{18,19} As a consequence, it's reasonable to assume that consuming tobacco products, such as cigarettes, may have the same effect. Smokers may have decreased levels of lymphocytes, particularly cytotoxic T cells or CD8+ T cells, according to a previous research. Smokers may be more prone to infections and tumours due to differences in their T cells, according to a recent study.²⁰⁻²² This research's results on gutkha users' neutrophil and lymphocyte percentages were consistent with those of a previous animal model study, which also found a higher neutrophil proportion and a lower lymphocyte percentage.¹² Evidence of smokeless tobacco's inflammatory effects on the lungs is as extensive as that of cigarette smoking.

A decrease in monocytes in the blood was another finding of this investigation including those who used chewing tobacco. Such changes of monocytes may have a somewhat detrimental influence on lung function. Haematological measures, such as haemoglobin content and leukocyte counts, were found to be greater in gutkha eaters than in controls, but monocyte and basophil counts were found to be lower. This was discovered by Jaganmohan et al.¹¹ who studied smokeless tobacco chewing vehicle drivers. Hemoglobin levels, white blood cell and leukocyte counts, and neutrophil counts were all found to be greater in gutkha users compared to controls, whereas monocyte and basophil counts were found to be lower. Gutkha has been shown by Roan Mukherjee et al.¹⁰ to have an equally bad impact on blood haematology as smoking.

MCV, MCHC, and MCH are blood indices that relate to individual red blood cells and are markers of anaemia. A low MCV level indicates iron deficiency anaemia, whereas a high level indicates vitamin deficiency anaemia. In chewing tobacco, MCHC made no difference. In trials done by Biswas et al.,⁴ the MCHC count was modestly enhanced. Chewing tobacco has a higher MCH content. Similar increases in MCH levels were seen in Biswas et al.'s experiments. In the current investigation, the level of MCV was reduced.⁴ A similar

drop in MCV levels was seen in the research done by Purushottama Dass et al., whereas levels increased in the study conducted by Biswas et al.^{22,4} The changed haematological parameters in SLT users support the notion that SLT and its components are selectively harmful.

Conclusion

Chewing tobacco has been shown to have negative effects on a number of haematological parameters in the current investigation, including an increase in Hb level, RBC count, TLC, and neutrophil percentage and a drop in monocyte, lymphocyte, and platelet percentages. According to the results of the current research, care should be used when assessing haematological parameters or doing a screening for anaemia in those who regularly use chewing tobacco.

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