Original Article

Plasma Concentration of Ascorbic Acid and Some Hematological Parameters in Tobacco Snuffers Among the Igbos of Southeastern Nigeria

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Abstract

Background: Tobacco snuffing, like cigarette smoking, is known to be a common habit among the adults of Igbo communities in Nigeria. In view of the various pharmacological actions of nicotine and other additive constituents of tobacco snuff, there is growing concern that ascorbic acid, which is a vital antioxidant, and blood cell production or morphology may be affected. **Objective:** To investigate the possible effects of prolonged use of tobacco snuff on plasma ascorbic acid concentrations and some hematological parameters. **Materials and Methods:** Fifty adults of Igbo extraction (35 males and 15 females) residents in and around Enugu metropolis, who have been snuffing tobacco for 6 years and above, were recruited for the study, after they gave informed consent. Also, 50 apparently healthy, age-matched persons (25 males, 25 females), who do not smoke or take tobacco snuff, served as controls. Spectrophotometric method was adopted for ascorbic acid determination while hematological profiles were assessed by Bain method. **Results:** The results showed no significant difference in the measured parameters relative to the controls AA (P=0.08); Hb (P=0.19); PCV (P=0.10); RC (P=0.06); PC (P=0.20); WBC (P=0.09). **Conclusion:** The results of the study suggest that tobacco snuff inhalation may not adversely affect plasma ascorbic acid concentration and hematological parameters in adult humans. The study, however, has not concluded that tobacco snuffing is totally wholesome.

Keywords: Ascorbic acid, Hematological profiles, Igbos, Tobacco

Introduction

Ascorbic acid (vitamin C) is a water-soluble vitamin present in animal and plant tissues, which serve as dietary sources. It functions as an antioxidant[1] and participates in some biochemical pathways and immunological responses.[2,3] Qualitative and/or quantitative deficiency of the vitamin has long been associated with scurvy. Hematological parameters are indicators of blood cells production and quality. They are affected variously in some diseases and consequently are useful diagnostic and prognostic factors of medical and surgical management.[4,5] In the assessment of nutritional status of individuals, hematological parameters are also utilized.

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Tobacco snuff is obtained from the dried leaves of the plant *Nicotiana tobaccum* which is widely cultivated in America and some West African countries. It is yellowish-brown in color with a strong and bitter taste. The principal content of tobacco is nicotine, an alkaloid with diverse pharmacological actions.[6] It has no use in medicine, though it is of value as an insecticide.[7] Tobacco snuff is in powdered form with potash and sweeteners as the main additives. In Igbo communities where it is utilized for cultural and traditional purposes, it is either inhaled through the nose or applied orally. Some addicts also chew the dried leaves. Nicotine intoxication has been associated with tobacco addiction in regular smokers and snuffers. In small doses, it has a stimulatory effect on the autonomic nervous system, which causes raised blood pressure and pulse rate.[8] In view of the various pharmacological actions

of nicotine and additives which are constituents of tobacco snuff and the wide use among the Igbos, it is possible that ascorbic acid, which is a vital antioxidant, and blood cell production or morphology may be affected. This may be enhanced with prolonged and consistent inhalation in addicts. It may even be a risk factor for respiratory diseases. This study was designed to investigate the possible adverse effects of tobacco snuff on plasma ascorbic acid concentrations, hemoglobin, packed cell volume, reticulocyte and platelet count, and total white blood cell count in tobacco snuff addicts.

Materials and Methods

Subjects

Fifty persons (35 males and 15 females) in and around Enugu metropolis, southeastern Nigeria, who have been snuffing tobacco for 6 years and above (addicts), were recruited for the study, after they gave informed consent. All the subjects were Igbos, one of Nigeria's major tribes of the eastern region. Fifty apparently healthy persons (25 males, 25 females), who do not inhale tobacco snuff or smoke cigarette, served as controls. The age range of test and control subjects was 25–65 years. Blood samples were collected from both test and control groups into ethylenediaminetetraacetic acid (EDTA) specimen bottles for laboratory analysis.

Laboratory determinations

Plasma ascorbic acid was determined by spectrophotometric method[9] while whole blood was used for the determination of hematological parameters.[10] The mean results and standard deviations (SDs) of tests and controls were compared using Student's "*t*" test.

Results

There were no significant differences in both ascorbic acid concentration and the hematological parameters of tests and controls AA (P=0.08); Hb (P=0.19); PCV (P=0.10); RC (P=0.06); PC (P=0.20); WBC (P=0.09). When the results were compared on the basis of period for which the subjects have been snuffing and age, there were also no significant differences in the parameters for snuffing period: AA (P=0.25); Hb (P=0.18); PCV (P=0.08); RC (P=0.06); PC (P=0.25) WBC (P=0.08); and For age: AA (P=0.08); Hb (P=0.20); PCV (P=0.09); RC (P=0.07); PC (P=0.24) WBC (P=0.09). The blood film showed normocytic and normochromic blood picture in erythrocytes while white blood cell distribution and morphology were normal. However, a few cases of eosinophilia and neutrophilia were recorded. It was also observed that snuffing was more prevalent in the age range of 41–65 years (72.6%) among the population studied. The summary of the results is presented in Table 1.

Discussion

Some diseases have long been associated with habits, culture, and environment.[11,12] Tobacco has been linked to cancer of the mouth and alimentary canal.[13] The results of ascorbic acid concentrations obtained did not vary significantly when compared with those of the controls in the study. Comparisons on the basis of age, sex, and snuffing period maintained the same pattern. This implies that ascorbic acid metabolism may not be affected by tobacco snuffing. However, reduced concentration of ascorbic acid has been reported in cigarette smokers.[14] Ascorbic acid acts as a vital antioxidant, which mops up oxygen free radicals and reactive oxygen species generated in the course of intermediary metabolism in the body. The reduced level of ascorbic acid in smokers was attributed to oxidant stress actuated by carbon monoxide produced and inhaled while smoking cigarette. In the case of tobacco snuff, there is no combustion and consequently no threat of carbon monoxide poisoning. Reduced ascorbic acid concentrations have been reported to be one of the markers of oxidative damage and is commonly obtained in some diseases involving free radical route reaction.[15]

Nicotine, an alkaloid which tobacco contains, is absorbed in the oral and nasal cavities of humans. Considering the diverse pharmacological activity of the substance and potash which is added in the process of preparation of tobacco snuff, it is possible that oxygen free radicals and reactive oxygen species are generated in excess. The results recorded in this study suggest that intermediary metabolic pathways may not have generated these highly reactive species to warrant any adverse metabolic effect. Nicotine has been reported in blood of both cigarette smokers and tobacco snuffers, though absorption was shown to be more rapid in snuffers.[16] The author also reported significant concentration of carboxyhemoglobin in smokers and insignificant values in tobacco snuffers. It had earlier been documented that there were no adverse effects on erythropoiesis and hemoglobin metabolism in snuff addicts among Igbos of Nigeria.[17] In this report, the hematological parameters did not vary significantly when compared with those of controls. These imply that the habit of snuffing tobacco may not affect erythropoiesis, myelopoiesis, and thrombopoiesis. In some diseases, one or more parameters may be affected. Carbon monoxide poisoning is common in cigarette smokers, but has not been reported in snuffers. These findings suggest that adverse changes in hematological parameters may not be one of the pharmacological effects of nicotine or any of the additives of tobacco snuff. This is supported by the fact that nicotine is more rapidly absorbed from the nasal than from the oral cavity. Some diseases and xenobiotic intoxication have been associated with altered hematological parameters.[18] The normocytic and normochromic picture of erythrocytes and normal reticulocyte and platelet counts found in this study imply normal erythropoiesis and thrombopoiesis. The differential white blood cell count showed normal distribution and morphology in nearly all subjects. A few cases showed neutrophilia, which may suggest possible pre-existing bacterial infection. Also, the few cases of eosinophilia may be due to nematode infestation.

Table 1: Mean results±SD of ascorbic acid, hemoglobin, packed cell volume, reticulocyte count, platelet count, and total white blood cells

	AA (mg/100 ml)	Hb (g/dl)	PCV (L/L)	RC (%)	PC (×10⁹/l)	WBC (×10⁹/l)
Subjects (*n*=50)	1.7±0.1	12.9±1.5	0.4±0.1	0.5±0.1	300.0±29.6	5.7±0.9
Controls (*n*=50)	1.6±0.1	12.6±1.5	0.4±0.1	0.4±0.1	323.0±29.6	4.4±0.9
P value	0.08	0.19	0.10	0.06	0.20	0.09
Age range						
35–40 years (*n*=14)	1.5±0.1	14.0±1.5	0.4±0.1	0.6±0.2	410.0±30.5	3.1±0.6
41–65 years (*n*=36)	1.4±0.6	13.1±1.8	0.4±0.1	0.6±0.2	380.0±31.2	4.4±0.8
P value	0.08	0.20	0.09	0.07	0.24	0.09
Snuffing period						
6–15 years (*n*=22)	2.0±0.4	13.7±1.5	39.0±4.6	0.40±0.1	225.0±69.1	5.87±0.8
16 years and above (*n*=28)	1.8±0.7	13.7±1.5	39.3±5.9	0.45±0.1	238.3±55.2	4.80±0.9
P value	0.25	0.18	0.08	0.06	0.25	0.08
Sex						
Males (*n*=35)	1.7±0.3	14.1±6.0	39.1±6.0	0.6±0.1	182.0±41.0	3.9±0.4
Females (*n*=15)	1.7±0.2	13.5±3.1	36.5±3.1	0.5±0.1	190.0±53.0	4.8±0.9
P value	0.24	0.19	0.07	0.07	0.24	0.08

AA: Ascorbic acid, Hb: Hemoglobin, PCV: Packed cell volume, RC: Reticulocyte count, PC: Platelet count, WBCs: White blood cells

Conclusion

The results of the study suggest that tobacco snuff inhalation may not adversely affect plasma ascorbic acid concentration, hemoglobin, packed cell volume, reticulocyte and platelet count, and total white blood cell count. However, the study has not concluded that tobacco snuffing is totally wholesome. Low ascorbic acid concentration, which has been reported in chronic cigarette smokers, may not be found in tobacco snuffing.

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