ORIGINAL RESEARCH

To compare the clinical and angiographic patterns of coronary artery disease in smokers and users of smokeless tobacco

[1]Dr. Dinesh Choudhary, [2]Dr. Sunil Kumar Budania, [3]Dr. Kriti Soni

[1]MD, DM, Professor, [2]MD, DM, Assistant Professor, Cardiology, S P Medical College, Bikaner, Rajasthan, India
[3]Medical Intern, Dr. D.Y. Patil Medical College, Pimpri, Pune, Maharashtra, India

Corresponding Author
Dr. Sunil Kumar Budania
MD, DM, Assistant Professor, Cardiology, S P Medical College, Bikaner, Rajasthan, India

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ABSTRACT
Aim: The purpose of this study is to compare the clinical and angiographic patterns of coronary artery disease in smokers and users of smokeless tobacco. **Material and methods:** We looked at the patients' routine reports, such as their fasting and postprandial blood sugar levels, lipid profiles, renal function tests, and liver function tests. Final enrollment of research participants consisted of 200 patients out of a total of 400 patients. These patients had a history of tobacco smoking, either in the form of smokeless tobacco or smoked tobacco, but did not have any additional cardiovascular risk factors. CAD in patients is divided into many clinical patterns such as chronic stable angina, unstable angina, non-ST elevated myocardial infarction (NSTEMI), and ST elevated myocardial infarction (STEMI), based on the history, clinical, and laboratory findings (STEMI). **Results:** It was revealed that the prevalence of female users of smokeless tobacco, which was 18%, was considerably greater in comparison to the prevalence of female smokers, which was 6%, and the p value for this comparison was 0.0033. On the other hand, STEMI was the most prevalent pattern seen in smokers, occurring in 31% of patients. This was followed by NSTEMI, which occurred in 30% of patients, unstable angina, which occurred in 20% of patients, and chronic stable angina, which occurred in 19% of cases. **Conclusion:** As compared to smokers, those who use smokeless tobacco had a reduced prevalence of fatal coronary disease as well as multi-vessel disease. More than one third of people who use smokeless tobacco and present to the cardiac catheterization lab with angina or angina equivalent have fatal coronary artery disease, either in the form of STEMI or NSTEMI.
Keywords: STEMI, NSTEMI, smokers, smokeless tobacco

INTRODUCTION

Smoking is a well-known cardiovascular risk factor for coronary artery disease (CAD), the prevalence of which has been steadily declining among the general population over the last several decades as a result of improved public awareness and more stringent legislation. [1-2] whereas the use of smokeless tobacco is an established risk factor for coronary artery disease [3-7], which is on the rise as a result of increased cultural acceptance, easy accessibility, decreased cost, and a lack of awareness about the adverse effects of using smokeless tobacco on the cardiovascular system among individuals with lower socioeconomic status. [Cause and effect] [2] The global prevalence of usage of smokeless tobacco is greater than that of smoking (8.9%) among the population. This figure is at 11.2%. [8] The prevalence of the use of smokeless tobacco among the inhabitants of south-east Asia, and more notably in India, is relatively significant. The use of smokeless tobacco is prevalent among twenty percent of the people in India. [9] The prevalence is much higher (about one third) among the male population of India that is within the age bracket for reproduction (i.e15-54 years). [10] Unfortunately, our understanding of the pattern of coronary artery disease (CAD) among those who use smokeless tobacco is quite poor. Both smokeless tobacco products and smoked tobacco products include nicotine, which is a chemical with a very high potential for addiction. The lungs are responsible for the absorption of nicotine in the case of a smoker, whereas the buccal mucosa is responsible for absorption in the case of a user of smokeless tobacco. When smoked, nicotine is absorbed into the bloodstream at a far higher rate than when taken in via smokeless tobacco. [11-12] Thus, the peak blood

nicotine level is reached far more quickly in smokers as opposed to users of smokeless tobacco. [12] Despite this, the peak serum nicotine concentration does not change in either scenario. [12] As compared to smokers, those who use smokeless tobacco regularly have basal nicotine levels that are often greater than those of smokers. [13] Because the amount of tobacco consumed, the route of administration, the rate of absorption, and the serum level of nicotine are all different depending on how a person chooses to use tobacco, the clinical and angiographic patterns of involvement can also be different depending on how a person chooses to use tobacco. As a result, a case control study was carried out on patients who had coronary artery disease (CAD) in order to compare the clinical and angiographic patterns of people who used smokeless tobacco and those who smoked cigarettes.

MATERIAL AND METHODS

The research that is being presented is a retrospective case control study that was carried out at the department of Cardiology. The research included a total of four hundred individuals who presented themselves to a catheterization lab for coronary angiography with the major complaint of angina or angina-like symptoms. All of the patients' concerns were taken into consideration. An exhaustive history of the patients' cardiovascular risk factors for CAD should be elicited, including their family history, history of intake of cigarettes and alcohol, history of diabetes, hypertension, chronic renal disease, and dyslipidemia. We looked at the patients' routine reports, such as their fasting and post-prandial blood sugar levels, lipid profiles, renal function tests, and liver function tests. Final enrollment of research participants consisted of 200 patients out of a total of 400 patients. These patients had a history of tobacco smoking, either in the form of smokeless tobacco or smoked tobacco, but did not have any additional cardiovascular risk factors. Clinical symptoms (such as chest discomfort, dyspnoea, palpitations, fatigability, and syncope), vitals, and clinical signs (such as elevated JVP, oedema, crepitation, rhonchi, S3, S4, or any murmur or abnormal heart sounds) were properly documented for each and every patient who was recruited in the study. Any abnormalities seen on the echocardiography or electrocardiogram, such as ST-T alterations or arrhythmia, as well as any mitral regurgitation, related RV abnormalities, or regional wall motion abnormalities, were noted. The results of treadmill tests were obtained from individuals who were suspected of having chronic stable angina. Data on the quantitative levels of CKMB and Troponin were acquired from patients who were suspected of having ACS. CAD in patients is divided into many clinical patterns such as chronic stable angina, unstable angina, non-ST elevated myocardial infarction (NSTEMI), and ST elevated myocardial infarction (STEMI), based on the history, clinical, and laboratory findings (STEMI). The results of the angiography on the patients, including the location, kind, and severity of the lesion, were reported. Other classifications for the severity of the lesion include occlusive (total or complete occlusion), severe (more than 70 percent), borderline (50 to 70 percent), and moderate (less than 50 percent). All of the patients were divided into two groups, one for those who used smokeless tobacco and another for those who smoked cigarettes or other types of cigarettes. The two groups' illness patterns as well as their angiographic patterns were compared using the data that was collected.

STATISTICAL ANALYSIS

Statistical tests such as proportions, percentages, and the Chi-square test were used to conduct the analysis on the categorical data (X2). In the analysis of the quantitative data, the mean, standard deviation, and an unpaired t-test were used to compare the means of the two groups. A probability level of less than 0.05 was regarded as statistically significant, while a probability level of less than 0.01 was regarded as highly significant (HS). A probability level of higher than 0.05 was deemed to lack statistical significance (NS)

RESULTS

One hundred of the patients used smokeless tobacco, and the same number smoked cigarettes. There were a total of two hundred patients. In each of these groups, men were more dominant than females. Among the population of people who used smokeless tobacco, 82% were male and 18% were female, whereas in the population of people who smoked, 94% were male and 6% were female. It was revealed that the prevalence of female users of smokeless tobacco, which was 18%, was considerably greater in comparison to the prevalence of female smokers, which was 6%, and the p value for this comparison was 0.0033.

Chronic stable angina was the most common coronary artery disease pattern observed in smokeless tobacco users, accounting for forty percent of patients. This was followed by unstable angina, which accounted for twenty-four percent of patients, NSTEMI, which accounted for twenty percent of patients, and STEMI, which accounted for sixteen percent of patients. On the other hand, STEMI was the most prevalent pattern seen in smokers, occurring in 31% of patients. This was followed by NSTEMI, which occurred in 30% of patients, unstable angina, which occurred in 20% of patients, and chronic stable angina, which occurred in 19% of cases (table 1).

Table 1: coronary artery disease among smokers and non smokers

	Smokeless tobacco user	%	Smoker	%	P value
Chronic Stable Angina	40	40	19	19	0.0001
Unstable Angina	24	24	20	20	0.43
NSTEMI	20	20	30	30	0.02
STEMI	16	16	31	31	0.001

Pattern of coronary artery disease among smokers and smokeless tobacco users. [STEMI-ST elevated myocardial infarction, NSTEMI –non ST elevated myocardial infarction

Single valve disease was shown to be much more prevalent in those who used smokeless tobacco, where it was found in 62% of instances, compared to just 48% of cases found in smokers, with a p value of 0.02 indicating statistical significance. In contrast, multi-vessel disease was found in a much higher proportion of smokers (32%) than in users of smokeless tobacco (19%), with a P value of 0.03 indicating a statistically significant difference between the two groups. By comparing the prevalence of double vessel disease between the two groups, however, there was found to be no significant difference between them (table 2).

Table 2 .Comparison of numbers of vessels

No of vessels Effected	Smokeless tobacco user	Percentage	Smoker	percentage	P value
DVD	19	19	20	20	0.22
SVD	62	62	48	48	0.02
MVD	19	19	32	32	0.03

In order to conduct an analysis of the severity of lesions, individuals who had lesions affecting a single artery were considered. Among smokers, an occlusive lesion was detected in 58% of patients, but it was observed in 36% of patients who used smokeless tobacco, and the difference was statistically significant with a p value of 0.01. In contrast, non-occlusive lesions with severe stenosis were detected in 57% of patients who used smokeless tobacco, but they were observed in 40% of patients who smoked cigarettes, although there was no statistically significant difference between the two groups in terms of p value (table 3).

Table 3.Comparison of severity of lesions in CAD

Severity of lesion	Smokeless tobacco user		Smoker		P value
Occlusive	36	36	58	58	0.01
Above 70%	57	57	40	40	0.21
50-70%	6	6	2	2	0.36
below 50%	1	1	0	0	-

DISCUSSION

The current research found that among those who used smokeless tobacco, 82% were male and 18% were female, but among people who smoked, 94% were male and 6% were female. It was revealed that the prevalence of female users of smokeless tobacco, which was 18%, was considerably greater in comparison to the prevalence of female smokers, which was 6%, and the p value for this comparison was 0.0033. [14] The data that are mentioned here may provide an explanation for why there is a higher frequency of females among users of smokeless tobacco in comparison to smokers. There is a high level of cultural acceptance for smokeless items in nations such as India, such as the Pan and the Gudakhu. There is a lower literacy rate among the Indian people, which may contribute to a lack of information about the negative effects of smokeless tobacco. This may be another factor that contributes to increasing cultural acceptance. In the current research, the prevalence of fatal myocardial infarctions such as STEMI and NSTEMI were seen in 31% and 30% of cases respectively among smokers. These figures were substantially higher when compared to the 16% and 20% of cases reported among the smokeless tobacco users group. On the other hand, a considerably greater prevalence of chronic stable angina was detected among smokers, which was seen in 40% of instances, compared to just 19% of patients overall. There is some evidence that smokeless tobacco is associated with an increased risk of coronary artery disease (CAD), which may explain why smokeless tobacco users had a lower incidence of nonfatal heart attacks. [15] During the course of an investigation into the angiographic features, it was discovered that people who used smokeless tobacco had a significantly higher incidence of single vessel disease—62 percent of cases, as opposed to 48 percent of cases for smokers, with a statistically significant p value of 0.02. In contrast, multi-vessel disease was found in a

much higher proportion of smokers (32%) than in users of smokeless tobacco (19%), with a P value of 0.03 indicating a statistically significant difference between the two groups. By comparing the frequency of double vessel disease between the two groups, however, researchers found no statistically significant differences between them. Among smokers, an occlusive lesion was found in 58% of patients, but it was seen in 36% of patients who used smokeless tobacco, and the difference was statistically significant with a p value of 0.01. The following list of explanations may help explain the clinical and angiographic pattern of coronary artery disease that was seen to be different in smokers and those who used smokeless tobacco. Tobacco, in all of its forms, has a greater propensity for addiction since it contains nicotine; nevertheless, tobacco-specific chemicals such nitrosamine and aromatic hydrocarbon, rather than nicotine, are the primary ingredient responsible for the pathophysiology of coronary artery disease (CAD).[16,17] By stimulation of the sympathetic nervous system, nicotine may lead to a rise in both heart rate and blood pressure, as well as an abrupt coronary vasospasm. [18] When heated, the aerosol form of nitrosamine and aromatic hydrocarbons produce oxides of nitrogen and carbon monoxide, as well as a large number of free radicals. These free radicals are absorbed more easily and quickly through the alveoli of the lung into the blood vessel, causing endothelial dysfunction and inducing coagulation cascades, which ultimately leads to hypercoagulability and thrombus formation in smokers. [16,17] The atherosclerotic process is prolonged by the inhalation of butadiene, which is also a component of the vapour phase of smoking. [19] As a result of this, the non-heated or non-burnt form of nitrosamine and aromatic hydrocarbons is far less dangerous for the cardiovascular system than the heated or burned form of these substances. Carbon monoxide, which is generated from smoked gas, induces hypoxia in chronic smokers. This, in turn, enhances erythropoietin activation, which results in erythrocytosis and increased blood viscosity, both of which potentiate the processes that lead to thrombosis. [20] Components of smoked tobacco, such as cadmium, nickel, and aluminium, are known to increase microtubule dysfunction in endothelial cells and catalyse the oxidation of proteins in blood vessels, both of which are known to contribute to the progression of atherosclerosis. [21]

Smokers almost always have an impaired fibrinolytic system in their bodies, which is a mechanism that may fight the coagulation process in the body. Tobacco products that are smoked raise serum levels of fibrinogen or high-sensitivity C-reactive protein while simultaneously lowering plasma levels of tissue plasminogen activators, which results in an impaired fibrinolytic process. [22] while the fibrinolytic system almost often continues to function normally in individuals who use smokeless tobacco, in contrast to those who smoke cigarettes. Acrolein is a reactive aldehyde that is formed by endogenous lipid peroxidation in the case of smokers. It is responsible for modifying the primary protein in HDL, which is known as apo-lipoprotein A-I.

Since HDL is responsible for a crucial function—removing cholesterol from atherosclerotic plaque—a dysfunction in HDL might cause fast progression of arthrosclerosis. [23]

Yet, in the case of smokeless tobacco, the ingredients that were employed in India the most often were betel leaves and areca nuts, both of which have the potential to exhibit antioxidant properties. It has been noted that the antioxidant present in smokeless tobacco may provide some protection against CAD. There is no significant difference in the serum concentrations of antioxidants such as carotenoids and ascorbic acid, alpha-tocopherol and lycopene between those who use smokeless tobacco and those who do not use tobacco, but smokers have significantly lower antioxidant levels. [24] Oral moist snuff is the kind of snuff that is most often used in western nations. It is known to include compounds like fatty acids, flavonoids, and nitrates, all of which have the ability to act as antioxidants and also have a preventive impact against myocardial infarction. [25]

Hence, the cardiovascular consequences of smokeless tobacco use (in terms of coronary artery disease) are less dangerous in users of smokeless tobacco as compared to smokers. This is most likely because of the reasons listed above. In contrast, the same can't be overlooked in those who use smokeless tobacco given the evidence shown above. More than one third of those who used smokeless tobacco and presented themselves to the cardiac catheterization lab complaining of angina or symptoms similar to angina were found to have deadly coronary artery disease in the form of STEMI or NSTEMI. About one fifth of people who use smokeless tobacco and have angina or symptoms similar to angina have been found to have multi vessel disease. Several research have come to the conclusion that smokeless tobacco is to blame for a number of health conditions, including high blood pressure, diabetes, metabolic syndrome, and dyslipidaemia. These conditions, in turn, may put people at risk for coronary artery disease. [26] The pathophysiological process of cardiovascular disease in users of smokeless tobacco is comparable to that of smokers [12], despite the fact that the rates at which the diseases advance might vary. Oxidized vapour forms of nitrosamine and aromatic hydrocarbons, as well as other components like cadmium and nickel, play a significant part in the development of coronary artery disease, which contributes to a greater frequency of fatal coronary events and multi-vessel disease in smokers. While other cardiovascular risk factors, including as hypertension, diabetes, dyslipidaemia, and metabolic syndrome, which might occur owing to the use of smokeless tobacco, play a key part in the aetiology of coronary artery disease

among smokers who also use smokeless tobacco products.

CONCLUSION

As compared to smokers, those who use smokeless tobacco had a reduced prevalence of fatal coronary disease as well as multi-vessel disease. In spite of this, the effects of smokeless tobacco on the cardiovascular system can't be overlooked in light of the information shown above. More than one third of people who use smokeless tobacco and present to the cardiac catheterization lab with angina or angina equivalent have fatal coronary artery disease, either in the form of STEMI or NSTEMI. Additionally, approximately one fifth of people who use smokeless tobacco and have angina or its equivalents have multi vessel coronary artery disease.

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