Original Research Article

Effect of cigarette smoking on location of infarction in patients presented with ST-segment elevation myocardial infarction

Abstract

Background: An acute ST-elevation myocardial infarction (STEMI) is an event in which transmural myocardial ischemia results in myocardial injury or necrosis. The current 2018 clinical definition of myocardial infarction (MI) requires the confirmation of the myocardial ischemic injury with abnormal cardiac biomarkers. STEMI has more in hospital mortality rate than non-ST segment elevation acute coronary syndromes. The work aimed to study and assess the effect of cigarettes smoking on location of infarction in patients presented with ST-segment elevation myocardial infarction.

Methods: This case control study was carried out on 100 subjects presented with first ST segment elevation acute myocardial infarction then divided into 2 groups according to smoking status; group 1 (50 patients): Smokers and group 2 (50 patients): Nonsmokers

Results: Smokers were significantly younger than non-smokers (53.86±7.77) years vs. (58.20 ± 7.80), P = 0. 006.Gender distribution: Smokers were significantly more likely to be male (82.0 % vs. 58.0 %, P = 0.009)**.** inferior STEMI was statistically significant difference between the two groups (P value =0.045*). Myocardial Infarction Localization by electrocardiogram was statistically significant different between the two groups (P value =0.045*). EF was statistically significant different between the two groups (smoker and nonsmokers respectively 54.86 ± 8.58 % vs. 49.04 ± 6.61 %) (P value =0.001*)

Conclusions: We highlighted that Smoking increases the risk of inferior ST-Elevation Myocardial Infarction (STEMI). Smokers experience coronary artery disease at a younger age than non-smokers.

Keywords: Effect of cigarette smoking, location of infarction, ST-segment elevation myocardial infarction.

Introduction:

Myocardial infarction is an important key component of the burden of cardiovascular system diseases. The evaluation of the incidence and case fatality of myocardial infarction are important determinants of the reduction in coronary disease mortality [1].

An acute ST-elevation myocardial infarction (STEMI) is an event in which transmural myocardial ischemia results in myocardial injury or necrosis [2]. The current 2018 clinical definition of myocardial infarction (MI) requires the confirmation of the myocardial ischemic injury with abnormal cardiac biomarkers [3].

ST-segment elevation myocardial infarction (STEMI) has more in hospital mortality rate than non-ST segment elevation acute coronary syndromes [4].

Atherosclerosis is the disease responsible for most acute coronary syndrome (ACS) cases. About 90% of myocardial infarctions (MIs) result from an acute thrombus which obstructs an atherosclerotic coronary artery. The rupture of plaque and erosion are considered to be the major triggers for coronary thrombosis. Following plaque rupture or erosion, platelet activation and aggregation, coagulation pathway activation, and endothelial vasoconstriction occur which leads to coronary thrombosis and occlusion.

One of the known modifiable risk factors for atherosclerosis is smoking or other tobacco use [5] and it is well known that smokers are at greater risk for diseases that affect the heart and blood vessels (cardiovascular disease) [8] as smoking damages blood vessels and can make them thicken and grow narrower. These changes can lead to tachycardia, hypertension and lastly thrombus formation [5, 6].

Smoking also causes stroke and coronary heart disease, which are among the leading causes of death and even people who smoke fewer than five cigarettes a day can have early signs of cardiac and vascular disease [5, 7].

There are policies for decreasing the number of smokers in societies which have shown promising results indicating a decline in the incidence of acute coronary syndrome [8, 9].

This work aimed to study and assess the effect of cigarettes smoking on location of infarction in patients presented with ST-segment elevation myocardial infarction.

Patients and Methods:

This case control study was carried out on 100 patients presenting by new ST-segment elevation myocardial infarction aged more than 18 years old were recruited from cardiology department in Tanta university hospitals presented

The patients were below 18 years old, presented with Non-ST Elevation myocardial infarction and had prior PCI and CABG were excluded.

Patients were divided into 2 groups according to smoking status: Group 1 (50 patients): Smokers. Group 2 (50 patients): Nonsmokers

Patients were allocated to PCI according to catheterization lab availability after confirming diagnosis.

The new criteria for diagnosing myocardial infarction according to ESC guidelines 2017[26] are detection of rise and/or fall of cardiac biomarkers (preferably troponin) with at least one value above the 99th percentile of the upper reference limit, together with evidence of myocardial ischemia with at least one of the following [10]:

1. Symptoms of ischemia (e.g., chest discomfort, angina equivalent and silent ischemia).
2. Electrocardiogram (ECG) changes indicative of new ischemia (new ST-T changes or new left bundle branch block (LBBB).
3. Development of pathological Q-wave changes in the ECG.
4. Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

Studied groups were subjected to the following:

1. An informed consent taken from all patients.

2. Full history taking with emphasis on:

Age, sex, history of risk factors for coronary artery disease (CAD) as: Diabetes Mellitus, hypertension, smoking and past history and family history of CAD.

3. Full clinical examination:

- Vital signs: heart rate, blood pressure and respiratory rate.

- ***General examination***: with attention to height, weight, body mass index (BMI), patient look, decubitus, cyanosis, jaundice, with special attention to signs of heart failure (e.g., congested neck veins and orthopnea)
- ***Local cardiac examination*****:** abnormal pulsation, Heart sounds & murmurs.

4. Resting 12 leads ECG:

Standard 12-lead ECG was obtained within 10 minutes of first medical contact (FMC) according to ESC guidelines 2017 including:

- limb leads I, II, III, aVR, aVL, aVF, and chest leads from V1 to V6 for all patients on admission to the hospital [11].
- Right pericardial leads (V3R, V4R, V5R, V6R) and posterior chest leads (V7 to V9) were done for some patients to detect posterior wall and right ventricular infarction [11].

5. Baseline laboratory tests:

- including serum urea and creatinine, cardiac enzymes include serum troponin and CK-MB and hemoglobin level.

6. Echocardiography:

The study was performed using (a GE vivid seven cardiac ultrasound phased array system with tissue Doppler imaging using M4S transducer 4 MHz)

Two- Dimensional echocardiographic assessment was done during admission after successful PCI in left lateral decubitus position to:

- Assess LV systolic function using Simpson's method in the apical 4 & apical 2 views also left ventricular volumes were assessed (End diastolic volume and end systolic volume) [12].

7. Reperfusion through: percutaneous intervention for Infarct related artery (IRA)

8-Predischarge 12-lead electrocardiograph.

Statistical analysis

Statistical analysis was done by SPSS v26 (IBM Inc., Chicago, IL, USA). Quantitative variables were presented as mean and standard deviation (SD) and compared between the two groups utilizing unpaired Student's t- test. Qualitative variables were presented as frequency and percentage (%) and were analyzed utilizing the Chi-square test or Fisher's exact test when appropriate. A two tailed P value < 0.05 was considered statistically significant.

Results

Smokers were significantly younger than non-smokers (53.86±7.77) years vs. (58.20 ± 7.80), P = 0. 006. Smokers were significantly more likely to be male (82.0 % vs. 58.0 %, P = 0.009).Table 1

Table 1: Demographic data of the study.

Demographics	**Group I Smokers (n = 50)**		**Group II Non-smokers (n = 50)**		**Test of Sig.**	**P. value**
Age (years)					T test	
Min. – Max.	36 – 70		45 – 71		T = 2.788	0. 006*
Mean ± SD.	53.86 ± 7.77		58.20 ± 7.80			
Sex	NO	%	NO	%	X2	
Male	41	82.0%	29	58.0%	6.857	0.009*
Female	9	18.0%	21	42.0%		

χ^2: **Chi square test** t: **Student t-test**
p: p value for comparing between the two groups
Group I: Smoker patients who had acute ST elevation myocardial infarction. **Group II:** Non-Smoker patients who had acute ST elevation myocardial infarction.

Hypertension was statistically significant difference between the studied groups (P value = 0.045*). Diabetes Mellitus and Family history of coronary artery diseases were no statistically significant difference between the two groups (P value =0.059 P value =0.134 Respectively. Table 1

Table 2: Comparison between the two studied groups according to risk factors

			G I smokers	G II non smokers	X^2	P-value
HTN	**No**	**N**	32	22	4.026	0.045*
		%	64.0%	44.0%		
	Yes	**N**	18	28		
		%	36.0%	56.0%		
DM	**No**	**N**	37	28	3.560	0.059
		%	74.0%	56.0%		
	Yes	**N**	13	22		
		%	26.0%	44.0%		
Family Hx	**No**	**N**	43	37	2.250	0.134
		%	86.0%	74.0%		
	Yes	**N**	7	13		
		%	14.0%	26.0%		

χ^2: **Chi square test**
p: p value for comparing between the two groups
*: Statistically significant at $p \leq 0.05$

Pain was no statistically significant difference between the two groups (P value = 0.461). IRA was statistically significant difference between the two groups (P value =0.013). Type of intervention was no statistically significant difference between the two groups (P value = 0.558). TIMI was no statistically significant difference between the two groups (P value = 0.222). Table 1

Table 3: Comparison between the two studied groups according to Clinical Presentation and according to angiographic procedure.

			G I smokers	G II non smokers	X^2	P-value
TCP	**No**	**N**	3	5	0.5643	0.461
		%	6.0%	10.0%		
	Yes	**N**	47	45		
		%	94.0%	90.0%		
ATCP	**No**	**N**	47	45	0.543	0.461
		%	94.0%	90.0%		
	Yes	**N**	3	5		
		%	6.0%	10.0%		
SOB	**No**	**N**	45	42	0.796	0.372
		%	90.0%	84.0%		
	Yes	**N**	5	8		
		%	10.0%	16.0%		
LAD	**No**	**N**	30	20	4.001	0.046*
		%	60.0%	40.0%		
	Yes	**N**	20	30		
		%	40.0%	60.0%		
LCX	**No**	**N**	45	44	0.102	0.749
		%	90.0%	88.0%		
	Yes	**N**	5	6		
		%	10.0%	12.0%		
RCA	**No**	**N**	25	37	6.112	0.013*
		%	50.0%	74.0%		
	Yes	**N**	25	13		
		%	50.0%	26.0%		
PTCA only	**No**	**N**	48	49	0.344	0.558
		%	96.0%	98.0%		
	Yes	**N**	2	1		
		%	4.0%	2.0%		
Stent Implantation	**No**	**N**	2	1	0.344	0.558
		%	4.0%	2.0%		
	Yes	**N**	48	49		
		%	96.0%	98.0%		
Final TIMI Flow	**1**	**N**	0	1	3.010	0.222
		%	.0%	2.0%		
	2	**N**	2	0		
		%	4.0%	.0%		
	3	**N**	48	49		
		%	96.0%	98.0%		

TCP: typical chest pain; ATCP: atypical chest pain; SOB: shortness of breath

χ^2: **Chi square test**

p: p value for comparing between the two groups

*: Statistically significant at $p \leq 0.05$

Heart rate was insignificant difference between the two groups (P value =0.716). The systolic blood pressure was statistically significant difference between the two groups (P value =0.006*). The Diastolic blood pressure was statistically significant difference between the two groups (P value =0.030*). The mean hemoglobin and hematocrit level were significantly higher in smokers than in non-smokers (14.30 ± 1.74mg/dL vs. 13.10 ±

1.71mg/dL, P = 0.001 and 42.50 ± 4.28% vs. 39.50 ± 4.65, P = 0.001, respectively). The Mean platelets level was significantly higher in smokers than non-smokers (290.48± 97.84 109/L vs. 235.28 ± 73.14 109/L, P = 0.002). The Mean creatinine level was significantly lower in smokers than non-smokers (0.98 ± 0.25mg/dL vs. 1.15 ± 0.30mg/ dL, P=0.003). Admission blood glucose was also lower in smokers (136.66 ± 41.45mg/dL vs. 174.28 ± 80.17mg/ dL, P = 0.004) 5- Cardiac Troponin were lower in smokers' group than nonsmokers (0.76 ± 0.90 ng/ml vs. 1.36 ± 0.97 ng/ml, P < 0.002*). Smokers had significantly lower prevalence of hyperlipidemia especially LDL (92.12 ± 16.78 mg/dl vs. 101.98 ± 29.30mg/dl, P < 0.042*). Table 1

Table 4: Comparison between the two studied groups according to vital signs and according to laboratory investigation

		Range			Mean	±	S. D	t. test	p. value
SBP	G I	90	–	180	126.40	±	22.88	2.793	0.006*
	G II	100	–	200	139.04	±	22.38		
DBP	G I	60	–	120	82.00	±	15.08	2.201	0.030*
	G II	70	–	115	87.80	±	10.93		
MAP	G I	70	–	140	96.80	±	17.36	2.536	0.013*
	G II	80	–	136.67	104.88	±	14.36		
HR	G I	50	–	115	80.32	±	16.61	0.365	0.716
	G II	48	–	120	79.08	±	17.33		
S Chol.	G I	113	–	267	183.88	±	35.27	1.480	0.142
	G II	120	–	312	196.06	±	46.29		
LDL	G I	60	–	133	92.12	±	16.78	2.065	0.042*
	G II	60	–	183	101.98	±	29.30		
HDL	G I	35	–	73	54.40	±	9.44	3.010	0.003*
	G II	34	–	63	48.92	±	8.76		
S. creat	G I	0.5	–	2	0.98	±	0.25	3.087	0.003*
	G II	0.7	–	2	1.15	±	0.30		
Urea	G I	19	–	50	26.86	±	7.29	2.527	0.013*
	G II	18	–	80	32.84	±	15.06		
RBS	G I	84	–	300	136.66	±	41.45	2.948	0.004*
	G II	99	–	500	174.28	±	80.17		
Hb	G I	10	–	19	14.30	±	1.74	3.482	0.001*
	G II	10	–	17	13.10	±	1.71		
HCT	G I	33	–	50	42.50	±	4.28	3.357	0.001*
	G II	29	–	47	39.50	±	4.65		
PLT	G I	130	–	570	290.48	±	97.84	3.195	0.002*
	G II	90	–	500	235.28	±	73.14		
CKMB	G I	20	–	450	90.18	±	98.91	0.217	0.829
	G II	19	–	1300	96.64	±	186.28		
Tn	G I	0.03	–	5	0.76	±	0.90	3.216	0.002*
	G II	0.1	–	5	1.36	±	0.97		

t: **Student t-test**; p: p value for comparing between the two groups; *: Statistically significant at $p \leq 0.05$

Myocardial Infarction Localization by electrocardiogram was statistically significant difference between the two groups (P value =0.045*). EF assessment by Echocardiography was statistically significant difference between the two groups (smoker and nonsmokers respectively 54.86 ± 8.58 % vs. 49.04 ± 6.61 %) (P value =0.001*). Table 1

Table 5: Comparison between the two studied groups according to Myocardial Infarction Localization by electrocardiogram and EF

			G I Smokers	G II Non smokers	X^2	P-value
Inferior	**No**	**N**	21	31	4.006	0.045*
		%	42.0%	62.0%		
	Yes	**N**	29	19		
		%	58.0%	38.0%		
Anterior	**No**	**N**	29	19	4.006	0.045*
		%	58.0%	38.0%		
	Yes	**N**	21	31		
		%	42.0%	62.0%		
Lateral	**No**	**N**	43	44	0.088	0.766
		%	86.0%	88.0%		
	Yes	**N**	7	6		
		%	14.0%	12.0%		
Posterior	**No**	**N**	45	49	2.837	0.092
		%	90.0%	98.0%		
	Yes	**N**	5	1		
		%	10.0%	2.0%		
ECHO EF (%)	Min. – Max.		35 – 71	35 – 67	t= 3.802	0.001
	Mean ± SD.		± 8.58 54.86	49.04 ± 6.61		

□2: Chi square test ; p: p value for comparing between the two groups; *: Statistically significant at p ≤ 0.05

Discussion

According to the results of our study, smoker patients with STEMI are more likely to experience **inferior** myocardial infarction than anterior myocardial infarction. Tobacco smoking has various effects on cardiovascular system, which predispose smokers to experience coronary artery disease at a **younger** age than non-smokers [13, 14].

Several studies have demonstrated that smoking is strongly associated with premature CAD [15, 16]. Framingham Heart Study has reported that the risk of CAD was approximately three-fold higher in young smokers compared with nonsmokers. It is well known that increased plasma Lp (a) levels is associated with a high risk for premature CAD[17-20] .

Both analyses revealed higher risk of inferior myocardial infarction in smoker patients [21]. In another study by Grines et al in which they have studied the role of smoking status on mortality of patients, the prevalence of inferior STEMI was 60% in smokers and 53% in non-smokers, which was significantly higher in smoker group. Although the overall prevalence of inferior STEMI was higher in their study, the results regarding the association of smoking with inferior STEMI were similar to our finding [22].

As shown in our study, smokers have higher rate of inferior STEMI than anterior STEMI. The dominant thrombogenic etiology of STEMI in smokers may explain the higher rate of inferior STEMI, in which right coronary artery (RCA) is the infarct-related artery in majority of cases [23]. RCA is a less branching coronary artery in comparison to left coronary artery, and this may facilitate formation of large clots in this vessel. Also, RCA has less turbulent flow that in conjunction with its larger diameter may predispose it to thrombus formation [24].

However, the exact underlying mechanism by which smoking increases the risk of inferior STEMI needs further investigations. The role of smoking in distribution of coronary lesions has been investigated in different studies with conflicting results [25-28].

Regarding left ventricular involvement and dysfunction in patients with ST elevation myocardial infarction in our study there was significant difference between the two groups as the ejection fraction was significantly higher in the smokers group. This result is supported by Mark E.Hands et al study who demonstrated that anterior infarction compared with inferior infarction of equivalent enzymatic size has a lower global left ventricular ejection

fraction in association with greater left ventricular regional wall abnormality. The latter probably relates to greater amount of necrosis of the left ventricle in the anterior infarct group as indicated by QRS scoring [29].

In the study of FH Zimmerman et al, A history of smoking is especially prevalent and was reported in 73% to 90% of young **patients** with myocardial infarction [16, 30-35]. The present data found that current smoking is associated with myocardial infarction at young age [36]. When young patients with myocardial infarction were compared with older patients, both the present study and previous reports [33, 35-37] ([208],[211] ,[214] ,[215]) found hypertension and diabetes to be more common in older age groups.

Tobacco smoking leads to increased **heart rate and blood pressure** via the activation of sympathetic nervous system [38]. Increased oxygen demand occurs simultaneously with vasoconstriction that leads to decreased oxygen supply [39]. There was no significant difference in admission heart rate between the two groups in our study , but in Grassi, G., et al study and other studies , smoking resulted in increases in plasma norepinephrine levels, consistent with findings of other investigators [40, 41]. This may be explained in part by the direct effects of nicotine on sympathetic nerve endings, increasing catecholamine release.

Also, tobacco smoking increases oxidation **of LDL cholesterol** [42] and interferes with endothelial function [43]. Increase in inflammatory factors and acceleration of atherogenesis in combination with increased **platelet aggregation and hypercoagulable state** contribute to pathogenesis of coronary disease in smokers [44]. Both smokers and non-smokers groups showed increase in LDL but in nonsmokers group the LDL was significantly higher .

However, these effects may also indicate that there are possible differences in mechanisms of developing myocardial infarction in smokers. As mentioned in our study results, The mean hemoglobin and hematocrit level were significantly higher in smokers than in non-smokers and there was statistically significant difference between the two groups and

this can be illustrated by the hypoxemia caused by carbon monoxide in cigarette smoking, and as a result the increase in red blood cell mass occurs. Some scientists suggested that increase in hemoglobin level in blood of smokers could be a compensatory mechanism. Carbon monoxide binds to Hb to form carboxy hemoglobin, an inactive form of hemoglobin having no oxy-gen carrying capacity. Carboxyhemoglobin also shifts the Hb dissociation curve in the left side, resulting in a reduction in ability of Hb to deliver oxygen to the tissue. To compensate the decreased oxygen delivering capacity, smokers maintain a higher hemoglobin level than non-smokers [45].

The result of our study regarding hemoglobin and hematocrit levels is supported by the study of Malenica M, Prnjavorac B, Bego T, et al which showed that the values of hemoglobin were significantly larger in smokers than in non-smokers regardless of the sex [46]. Also , In study made by Lakshmi et al. [47] the hematocrit and Hb level were significantly higher in smokers and among the smokers the RBC count was significantly increased as the intensity of smoking increases.

In an early study, increased platelet count was observed in adolescents who recently started smoking [48]. Many studies have indicated that platelet activity is significantly higher in smokers than in nonsmokers. The study demonstrated a link between cigarette smoking and platelet formation; thus, it is possible that smokers are more susceptible than nonsmokers to develop an acute occlusive platelet thrombus in a diseased and stenotic coronary artery [22]. In our study, the significantly higher levels of red blood cell, and platelets in smokers suggest that smokers may have a hypercoagulable state promoting coronary thrombosis.

In some studies, therapeutic response after fibrinolysis was greater in smokers [49, 50]. The observed effect is contributed to the higher levels of serum fibrinogen in smokers, which leads to increased fibrin content of thrombosis in smokers.[226] Increased serum fibrinogen,

platelet activity and red blood cell mass also suggest a hypercoagulable state in these patients [44, 51].

The hypercoagulable state may promote coronary thrombosis in smokers [22, 51]. In TEAM-2 study and some other reports, smokers had greater thrombus burden than plaque burden. Also, they were more likely to have TIMI grade flow 3 after thrombolytic therapy [52, 53].These findings support the dominance of **thrombogenic mechanism** in pathogenesis of STEMI in smoking patients [44, 54, 55].

Our findings regarding the effects of smoking on location of myocardial infarction, is consistent with the results of a study by Alemu et al. They investigated the association of smoking status with the location of myocardial infarction in a pooled data from five different cohorts as well as their cohort [21].

Both analyses revealed higher risk of inferior myocardial infarction in smoker patients.[230] In another study by Grines et al in which they have studied the role of smoking status on mortality of patients , the prevalence of inferior STEMI was 60% in smokers and 53% in non-smokers, which was significantly higher in smoker group. Although the overall prevalence of inferior STEMI was higher in their study, the results regarding the association of smoking with inferior STEMI were similar to our finding [22].

As shown in our study, smokers have higher rate of inferior STEMI than anterior STEMI. The dominant thrombogenic etiology of STEMI in smokers may explain the higher rate of inferior STEMI, in which right coronary artery (RCA) is the infarct-related artery in majority of cases [21]. RCA is a less branching coronary artery in comparison to left coronary artery, and this may facilitate formation of large clots in this vessel. Also, RCA has less turbulent flow that in conjunction with its larger diameter may predispose it to thrombus formation [24].

However, the exact underlying mechanism by which smoking increases the risk of inferior STEMI needs further investigations. The role of smoking in distribution of coronary lesions has been investigated in different studies with conflicting results [25, 27, 28, 56, 57].

According to a paper published by Zwaag et al, the most interesting, the augmented risk of coronary disease followed a characteristic *anatomic distribution as* patients who smoked had a strong tendency to have right coronary obstruction. The percentage of smoking patients with single-vessel disease who had right coronary obstruction was significantly higher than in the nonsmoker population. Similarly, among two-vessel patterns, the combination of anterior descending and circumflex lesions, *ie,* the one pattern without right coronary involvement, was less common in smokers than in nonsmokers. So , smoking increases the risk of RCA lesions more than other vessels [25].

The previous study also mentioned that patients with single-vessel disease, the right coronary lesions was significantly higher than for the other lesions. After adjustment for other risk factors, the risk imposed by smoking was also greatest for the right coronary artery; although overlap with the confidence interval of the circumflex artery did appear. Similarly; in the subset with two-vessel disease, the relative risk of anterior descending plus circumflex lesions was significantly lower than for the two patterns with right coronary artery involvement. Thus, *if you* smoke *and have* one or two-vessel disease, the right coronary artery is more likely (and the anterior descending artery is correspondingly less likely) to be involved than if you do not smoke.

Koliaki et al [27] reported a positive correlation between smoking and presence of a lesion in RCA, left circumflex artery and left anterior descending artery (LAD) but not left main coronary artery (LMCA).

As a result , that may have an impact on disease progression and this is also suggested by studies documenting higher vascular resistances and reduced autoregulatory capacity in the right than that in the left coronary artery system [58, 59].

Regarding left ventricular involvement and dysfunction in patients with ST elevation myocardial infarction in our study there was significant difference between the two groups as the ejection fraction was significantly higher in the smokers group. This result is supported by Mark E.Hands et al study who demonstrated that anterior infarction compared with inferior infarction of equivalent enzymatic size has a lower global left ventricular ejection fraction in association with greater left ventricular regional wall abnormality. The latter probably relates to greater amount of necrosis of the left ventricle in the anterior infarct group as indicated by QRS scoring [29].

Conclusions:

We highlighted that Smoking increases the risk of inferior ST-Elevation Myocardial Infarction (STEMI). Smokers experience coronary artery disease at a younger age than non-smokers.

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Conflict of Interest: Nil

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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