



## Angiographic Confirmation of Smokers Paradox in Young Patients with Acute Myocardial Infarction

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### Abstract

**Background:** Smoking is a strong risk factor for premature atherosclerosis and cardiovascular events. Smokers suffer from acute coronary syndrome (ACS) at an earlier age and have a more favourable short-term prognosis when compared to non smokers.

**Aim and Objective:** This study is done to assess smoking as a major risk factor for ACS in young patients, evaluate the angiographic profile of smokers when compared to non-smokers, to assess the outcome in young patients with ACS. **Methods:** This is a cross-sectional prospective analytical study conducted in our institute among 250 consecutive patients less than 40 years of age with ACS between May 2015-April 2016. It includes 183 smokers and 67 non smokers. Clinical examination, ECG, ECHO and coronary angiogram were done. Angiographic profile reviewed in detail to assess the involved vessel and nature of the involvement. **Results:** Anterior wall myocardial infarction was common in smokers than non smokers (60.6% vs 47.7%). Non ST elevation myocardial infarction is common in non smokers (22.4% vs 7.1%,  $p < 0.0006$ ). Left anterior descending artery involvement is common in smokers (59.6% vs 55.2%,  $p < 0.008$ ). Single vessel disease (39.3% vs 26.9%,  $p < 0.04$ ) and recanalised vessels (43.7 vs 28.4%,  $p < 0.02$ ) were more common in smokers. Double vessel (23.9% vs 9.3%,  $p < 0.002$ ) and triple vessel disease (20.9% vs 7.6%,  $p < 0.001$ ) were more common in non smokers. Discrete lesions are more common in smokers (68.1% vs 53.5%,  $p < 0.006$ ). Tubular lesions were more common in non smokers (24.4% vs 12.5%,  $p < 0.003$ ). Co morbidities like DM (40.3% vs 9.8%,  $p < 0.0001$ ), SHT (22.4% vs 9.3%  $p < 0.006$ ) and dyslipidaemia (65.7% vs 7.1%,  $p < 0.001$ ) were more common in non smokers.

**Conclusion:** Anterior wall MI is most common, with LAD being involved in around 2/3 patients. Single vessel disease was predominant with discrete type of lesions among young patients with MI.

**Keywords:** Coronary artery disease, myocardial infarction, angiographic profile

### Introduction

Coronary artery disease (CAD) mostly occurs in persons older than 40 years of age. In India, CAD manifests almost a decade earlier than in Western countries. The term “smoker's paradox” was first introduced into scientific discourse more than 25 years ago following observations that smokers (in comparison to non smokers) experience decreased mortality following an acute myocardial infarction (ACS) [1-4]. This study focuses attention on the interaction between smoking status and outcomes after the so-called smoker's paradox and highlights the challenges of distinguishing residual and unmeasured confounding from true associations in cardiovascular disease epidemiology.

While the smoker's paradox in cardiovascular disease patients has been partly explained by younger age of onset and fewer coexisting high-risk features in patients with ACS who are current smokers, a small number of studies have shown that the residual lower mortality risk despite smoking. Some angiographic studies have demonstrated that coronary artery occlusion in smokers is predominantly caused by thrombosis and thus may have a better response to spontaneous or therapeutic thrombolysis.

This study aims to assess smoking as a major risk factor for MI in young patients, to evaluate the angiographic profile of smokers when compared to non-smokers and the outcome in young patients with MI.

## Materials and Methods

**Setting of the study & Study Design:** This study was conducted in Rajiv Gandhi Govt. General Hospital, Chennai - 3 who presented with ACS (STEMI, NSTEMI, UA). The study duration was year (June 2016 to May 2017). This is a cross-sectional prospective analytical study. A descriptive research design was utilized in the current study. The study design focused on a single group of population (patients less than 40 years smokers Vs non smokers) without trying to make interference.

**Procurement of Permission:** Institutional Ethical Committee approval was obtained prior to the study. Purpose of the study was explained to each participant of study and informed written consent was obtained from them before getting enrolled in this study.

**Selection Criteria:** A preformed questionnaire was used to collect details from those who were enrolled in the study.

**Inclusion criteria:** All adults less than 40 years with ACS were enrolled in the study. Other parameters included diabetes, hypertension, dyslipidemia, family H/O CAD.

**Case definition:** According to CDC- Current smoker refers to an adult who has smoked 100 cigarettes in his or her life-time and who currently smokes cigarettes; Former smoker refers to an adult who has smoked at least 100 cigarettes in his or her life time but who had quit smoking at the time of interview; Non smoker refers to any patient who has never smoked or smoked less than 100 cigarettes in his or her life time[5].

**Methodology:** All young patients admitted for ACS were evaluated ECG, ECHO and Troponin to differentiate unstable angina from NSTEMI. Patients were treated according to the nature of Myocardial Infarction as per the standard guidelines.

**Electrocardiogram:** The parameters like STEMI, NSTEMI, conduction disturbances, IRA localisation if any was noted.

**Echocardiogram:** In ECHO, presence or absence of wall motion abnormalities, LV systolic function, any mechanical complication like MR, VSR or free wall rupture and presence or absence of pericardial effusion was noted.

**Coronary Angiogram:** Coronary angiogram was done after 72 hours of admission. In CAG whether the patient is having normal, recanalised coronaries, single vessel or double or triple vessel disease and involvement of left main vessel was noted. Nature of the lesion- discrete/tubular/diffuse; Presence or absence of thrombus was also noted.

**Confidentiality:** All participants and hospital administration were assured about the confidentiality and anonymity and efforts were made to ensure the privacy of the information.

**Statistics:** Data was analyzed using version 17.0 of the Statistical Package for the Social Sciences (SPSS). Associations between categorical variables were assessed using chi-square tests.

## Results

Variables	Smokers n=183(%)	Non smokers n=67(%)	P value
<b>1. Mean age</b>	<b>33.95</b>	<b>35.4</b>	<b>0.001</b>
<b>1. Regional involvement</b>			
AWMI	111 (60.6)	32 (47.7)	0.06
IWMI	59 (32.2)	20 (29.8)	0.71
NSTEMI	13 (7.1)	15 (22.4)	0.0006
<b>2. Coronary vessel involvement</b>			
LMCA	5 (2.73)	2 (3.0)	0.81
LAD	109 (59.6)	37 (55.2)	0.008
LCx	41 (22.4)	27 (40.3) 34 (50.7)	0.16
RCA	51 (27.9)		0.09
<b>3. Number of vessel involved</b>			
Single vessel disease	72 (39.3)	18 (26.9)	0.04
Double vessel disease	17 (9.3)	16 (23.9)	0.002
Triple vessel disease	14 (7.6)	14 (20.9)	0.001
Recanalised/ Normal	80 (43.7)	19 (28.4)	0.02
<b>4. Type of lesion</b>			
Discrete	158 (68.1)	68 (53.5)	0.006
Tubular	29 (12.5)	31 (24.4)	0.003
Diffuse	45 (19.4)	28 (22.0)	0.55
<b>5. Co-morbid condition</b>			
HT	17 (9.2)	15 (22.4)	0.006
DM	18 (9.8)	27 (40.3)	0.0001
Dyslipidemia	13 (7.1)	44 (65.7)	0.001

## Discussion

The above study taken from 250 patients with acute coronary syndrome smokers vs non smokers.

The mean age among smokers with ACS is 33.95. Smokers were on average approximately 10 years younger than non smokers [6]. Cigarette smoking is an established risk factor for atherosclerotic cardiac disease consistent with this, smokers presenting with ACS in our study were approximately 3 to 4 years younger than non-smokers, and less likely to have other risk factors provides direct evidence for deleterious effect of smoking. This is in concordance with the study done [7]. Nearly 90% of smokers were male from the study, which suggest the fact that there are more male smokers in our country.

Diabetes, hypertension, dyslipidemia were lower among smokers than non smokers. This is similar to the study done in Isreal by Shmuel et al [8] and various other studies.

Most of the smokers present with STEMI than non smokers. Anterior wall MI was more common in the present study which is contrary to the study done by Gupta et al, where he reported inferior wall MI. This finding is similar to previous studies done in Korea and USA [6,9-11]. This might be due to the fact that high thrombus burden may cause total occlusion in smokers whereas in non-smokers sub-total occlusion occurs resulting in NSTEMI. Killip class I and II were more common among smokers when compared to non smokers who were class III and IV due to the above reason.

Left anterior descending (59.6%) was the common vessel involved in the current study which is consistent with the study done in Shimla[9] where the author has reported left anterior descending (LAD) (62.4%) to be the commonest vessel involved.

Angiographic findings are quite different from elders and non-smokers when compared to smokers, accordingly single vessel disease (72%) were predominant than double and triple vessel disease. Normal/ recanalised coronaries were also seen in young MI patients. Xie et al., found SVD in 71.8% in a study of AMI in young Asian women [12]. Increased prevalence of normal coronary arteries (up to 18%) and minor coronary abnormalities were found in Coronary Artery Surgery Study (CASS)[1]. Single vessel disease was found in 38% of subject in a study done in Shimla in 2015.

Smokers have higher fibrinogen, hematocrit and factor VII, impaired endothelial functional and vasospasm, predisposing to thrombus formation and MI. Thus coronary obstruction in smokers might be more thrombogenic and less atherosclerotic in nature, so it is more amenable to vaso-dilatation and thrombolysis. Thereby complete reperfusion occurs commonly in smokers. Smokers more often have discrete type of lesion, where as non smokers have tubular and

diffuse type of lesion because of the diffuse atherosclerosis of the vessel; more over non-smokers have other co-morbid conditions (DM, HT, Dyslipidemia) leading to diffuse nature of the lesion.

## Conclusion

Thus young smokers with myocardial infarction may have less severe form of coronary lesion and respond better to spontaneous or therapeutic thrombolysis probably because of the younger age, better risk profile like DM, HT, Dyslipidemia and high thrombus containing lesion.

**Limitation of the present study:** Study done in single centre with sample size of only 250 patients. Young patients with MI due to atherogenic causes were only included other causes like- inherited thrombophilic disorders- protein C, S deficiency, factor V Leiden mutation, prothrombin gene mutation.

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