# Original Article

## Prevalence of Atherosclerotic Plaques in Autopsy Cases with Noncardiac Death

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## ABSTRACT

***Background and Objective:*** **Ischemic heart disease (IHD) following atherosclerosis is the most common cause of cardiac deaths world wide. We aimed to investigate the pathologic features of atherosclerosis in non cardiac death cases to have an estimate of atherosclerosis prevalence in Mashad (North east of Iran).**

***Patients and Methods :*** **This descriptive (cross sectional) study was done, during October 2007 – March 2008, on 80 cadavers from 11 to 50 years old who had died of non cardiac causes and had no history of cardiac disease. After autopsy in forensic medical center, coronary arteries were removed and examined for atherosclerotic plaques. In case of a definite lesion, microscopic slides were also prepared. Otherwise, three random slides from each branch of coronary arteries were studied by a pathologist.**

***Results:*** **We found that 73.1% of men and 61.5% of women had at least one fibrofatty or advanced plaque in major coronary arteries. Atherosclerosis in 41.8% of men and 30.8% of women was in advanced form. Frequency of advanced atherosclerotic plaques progressed with age reaching a maximum of 78.5% by the age of 41-50 years. In addition, prevalence of plaques suddenly increased after second decade of life. Atherosclerotic plaques were most commonly found in left anterior descending artery (60%) followed by right coronary (50%) and left circumflex (42.5%) arteries.**

***Conclusion:*** **This study showed an unexpectedly high prevalence of atherosclerosis in this population. It highlights the importance of cardiovascular risk factor screening from early ages of third decade.**

**Key words: Heart, Autopsy, Atheroma, Iran**

## Introduction

Atherosclerosis is characterized by intimal lesions called atheromas, or atheromatous or fibrofatty plaques, which protrude into and obstruct vascular lumens and weaken the underlying media. Global in distribution, atherosclerosis overwhelmingly contributes to more mortality-approximately half of all deaths-and serious morbidity in the Western world than any other disorder (1).

Although the rate of sudden coronary heart disease (CHD) deaths, with and without CHD history, declined over time, the trend pattern may differ by community and gender (2). In addition, it is a common

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finding in non cardiac deaths, for instance coronary atherosclerosis and MI have been shown to be high prevalent in patients who died from stroke regardless of the etiology (3).

In wealthy countries atherosclerosis peaked in mid twentieth century, and it is now advancing in poor countries and in countries becoming affluent (4). In addition, ethnic differences in prevalence of atherosclerosis have been claimed (5).

Considering the fact that the rate of atherosclerotic coronary artery disease is being increased in developing countries and to reach an estimate of prevalence of atherosclerosis in Mashad (Northeast of Iran) this study was performed on autopsy cases of non cardiac deaths without any history of cardiac disease. Also, we compared the results of our study with other similar studies.

## Materials and Methods

This descriptive, cross sectional, study was done on 80 cadavers with age of 11 to 50 years old whom had died of non-cardiac causes like suicide, trauma and accident during a six month period from October 2007 to March 2008. Those with a history of cardiovascular disease were excluded from the study. A signed letter of consent was taken from the relatives of the dead bodies for legal and ethical purposes. After performing autopsy in Mashad Forensic Medical Center, at first, three main coronary arteries (left anterior descending, right coronary and circumflex) were removed and transferred to Department Of Pathology of Ghaem Hospital in formalin 10% fixative. Then every coronary artery was opened longitudinally and under proper light source was examined for every obvious and possible atherosclerotic plaques then sampling was done. In the absence of any specific macroscopic lesions, 3 random sections were taken from each coronary artery.

After blocking specimen in paraffin, 4 to 5 micron slide sections were prepared, thick slides was stained with hematoxylin and eosin method and was examined for atherosclerotic plaques microscopically.

For better identification of atherosclerotic plaques, plaques morphologically were divided to 2 categories under microscopic examination:

1- Fibrofatty plaques which have intimal thickening, a small lipid core and inconspicuous smooth muscle proliferation and extracellular matrix and a few monocytes and macrophages.

2-Advanced plaques which have large pool of lipid, cell debries, inflammation, well formed plaque wall, sometimes with calcification.

## Results

We examined 67 men and 13 women with no previous history of cardiovascular disease with a mean age of 30±8 years old. Considering both fibrofatty and advanced plaques, we found a high frequency (71.2%) for coronary atherosclerosis in all age groups studied. 73.1%(n=49) of men and 61.5% (n=8)of women had signs of atherosclerosis in forms of fibrofatty or advanced plaques.

Surprisingly, the overall prevalence of coronary advanced plaques was also high as seen in 41.8% (n=28) of men and 30.8% (n=4) of women. Also, they showed at least one involved coronary artery in their heart.

In 67 men, one-vessel involvement was noted in 16.4%, two-vessel and three-vessel involvements were seen in 26.9% and 29.9% of the group studied, respectively. The incidence of atherosclerotic plaques and number of arteries involved became higher as the age increased. Our finding for 13 women was 30.8% with one-vessel, 7.7% with two-vessel and 23.1% with three-vessel involvement.

Analysis in different age groups revealed that advanced atherosclerotic plaques progressed with age reaching a maximum of 78.5% by the age of 41-50 years (Figure1). In addition, prevalence of plaques was suddenly increased after second decade since atherosclerotic plaques were seen in 63.7% by the age of 31-40 years and 25.8% by the age of 21-30 years. Under 20 years old, only in 1 autopsy advanced plaques was seen (18.7%) and most of the atherosclerotic lesions in this group were fibrofatty plaques and fatty streaks (Table 1).

**Table1:** Comparison of advanced atherosclerosis in different age groups

| Group age(year) | With plaque | Without plaque | Total |
|---|---|---|---|
| 11-20 | 1 | 15 | 16 |
| 21-30 | 8 | 23 | 31 |
| 31-40 | 12 | 7 | 19 |
| 41-50 | 11 | 3 | 14 |

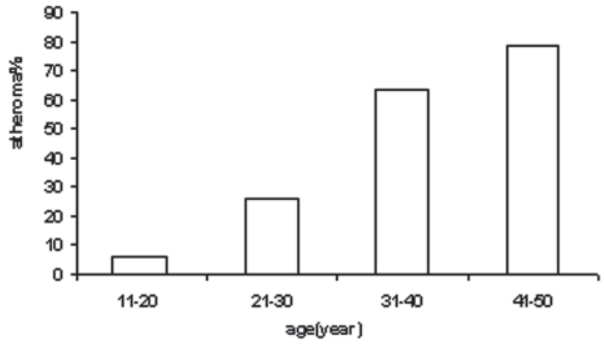


**Fig.1:** Frequency distribution of advanced atherosclerosis in the studied samples according to age.

The most commonly involved coronary artery was left anterior descending (60%) and the most frequently observed was advanced plaques despite right coronary and circumflex that fibrofatty plaques rates exceeded advanced plaques. Right coronary and circumflex were second (50%) and third (42.5%), respectively (Table2).

**Table 2:** Frequency distribution of atheroma in LAD, RCA, LCX.

| | LCX | LAD | RCA |
|---|---|---|---|
| **No atheroma** | 46 (57/5%) | 32 (40%) | 40 (50%) |
| **Fibrofatty plaque** | 19 (23/8%) | 21 (26/3%) | 26 (32/5%) |
| **Advanced plaque** | 15 (18/8%) | 27 (33/8%) | 14 (17/5%) |

LAD: left anterior descending, RCA: right coronary artery, LCX: left circumflex

## Discussion

Atherosclerosis is a common phenomenon, which is seen with different prevalence in different races (1,5). It begins in childhood and progress through young adulthood to form the lesion that causes coronary heart disease. These preclinical lesion are associated with coronary heart disease risk factors in young persons (6).

In our study the frequency of atherosclerotic lesions was 40% which was higher than Golshahi *et al*. study in Esfehan, central part of Iran in which they found atheromas in 28.9% of their 204 subjects (7).The other findings were nearly similar. The prevalence of coronary atherosclerosis in our study was higher that what found in other similar studies as well. Catellier *et al*. (8) evaluated 470 consecutive forensic autopsies for cardiac anomalies and found that atherosclerotic coronary heart disease was the most common major acquired finding, observed in 16% of cases. Of the 470 hearts, only 8% were considered normal. Joseph *et al*. (9) studied 111 young trauma victims with a mean age of 26 years and found signs of coronary atherosclerosis in 78.3% of total study group. Left main or significant two- and three-vessel involvement was noted in 20% of the group comparable with our finding, but he did not classify atherosclerotic lesions. In our study three-vessel involvement was the most common and then two and one vessel disease but Virmani *et al*. (10) studied 48 autopsy patients younger than 30 years who had severe coronary atherosclerosis and showed that single-vessel disease (44%) was greater than the others. Also they noted that left anterior descending was the most common involved artery like our findings. We observed that after the second decade, atherosclerosis suddenly increased and under 20 years rarely advanced plaque existed, resembling Berenson *et al*. (11) who studied 150 persons aged 6 to 30 years and showed that fibrous plaque lesions were present but not extensive in the coronary artery (0 to 24%) specimens. Although we cannot explain, why this sudden increase in atherosclerosis happens after the second decade but it deserves to attract enough attention.

Another similar study in Ethiopia (12) revealed that coronary lesions were seen in 26 ( 21%) of 124 autopsies and the highest incidence of atherosclerosis was in the age of 60-69 years (44%) but our incidence for the lower age group (41-50 years) was higher and equal to 87.3% .Waller *et al*. (13) studied cardiac pathology in 2007 consecutive forensic autopsies and emphasize that cardiovascular deaths accounted for 22.8% of the study patients and atherosclerotic coronary heart disease was the most common type of cardiac disease (18%). After all we emphasize that many of these studies have been done on cases who had died for unknown or cardiac causes but in our study we wanted to estimate frequency of atherosclerosis in our society and so we selected persons that had died from non cardiac causes like suicide trauma and violence and this factor makes our study different form others.

Heterogeneous sex distribution and the higher number of autopsied men were the problems in this

study and other similar studies as well (6).

## Conclusion

This study showed an unexpectedly high prevalence of atherosclerosis in Iran. This study highlights the importance of cardiovascular risk factor screening from early ages of third decade

## Acknowledgment

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