

**The Trend of Modifiable Risk Factors of Ischemic Heart Disease in  
Pakistan from 2000 To 2022**Huzaifa Saleem<sup>1\*</sup><sup>1</sup>Nowshera Medical College, Khyber Pakhtunkhwa, Pakistan

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**Abstract**

Ischemic Heart Disease is the leading cause of mortality in Pakistan. It is caused by myocardial ischemia. Most cases of myocardial ischemia are as a result of coronary artery atherosclerosis. There are modifiable and nonmodifiable risk factors of atherosclerosis. Here we discuss the trend of modifiable risk factors in Pakistan from 2000 to 2022. A secondary analysis was conducted to find the trend of modifiable risk factors and its relation with ischemic heart disease in Pakistan from 2000 to 2022. For this purpose, literature review was performed using Google Scholar and PubMed. Data on trends of these risk factors was obtained from WHO Pakistan website. The trend of modifiable factors of ischemic heart disease, namely tobacco smoking, obesity, alcohol consumption and hypertension has been increasing in Pakistan, except for tobacco smoking. Proper preventive measures must be taken to counter this specific death rate. This may include mass health education, health promotion, dietary changes, and lifestyle changes.

**Keywords** Risk factors of Atherosclerosis, Ischemic Heart Disease, Tobacco smoking, Alcohol**1. Introduction**

Ischemic Heart Disease is the leading cause of mortality in Pakistan. Ischemic Heart Disease is a broad term encompassing several closely related syndromes caused by myocardial ischemia—an imbalance between cardiac blood perfusion and nutrient requirements. Manifestation of Ischemic heart disease includes Angina pectoris, Myocardial infarction, Progression to Congestive cardiac Failure and Sudden cardiac death.

More than 90% of ischemic heart disease cases are a consequence of occluding atherosclerotic plaques in the coronary arteries. In 40%-50% of Myocardial Infarction cases the Left anterior descending artery is occluded, left circumflex artery is occluded in 15%-20% of cases and in 30%-40% the Right coronary artery is occluded (1).

It is clear that atheromatous plaques of the coronary arteries is the major cause of Ischemic heart disease. Now

there are two types of risk factors for atherosclerosis namely, modifiable and nonmodifiable factors.

Nonmodifiable factors include Genetics, Age and Gender. Modifiable factors include cholesterol intake, Hypertension, Cigarette smoking, Diabetes, Use of statins, Exercise etc. These factors can significantly add to the development or progression of atherosclerosis and hence increasing the chances of ischemic heart disease in these risk groups.

**2. Methodology**

I conducted a Secondary analysis to find the trend of Modifiable risk factors and its relation with ischemic heart disease in Pakistan from 2000 to 2022. For this I searched Google Scholar and PubMed to gather information on the risk factors of ischemic heart disease and then I gathered information on their trend from WHO website (8). An inference was drawn to find if ischemic

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heart disease will continue to be the leading cause of mortality in the future in Pakistan.

### 3. Results

Figure 1 show the trend of Tobacco smoking in age group 15 and above per population of each year. It can be seen that 57.9% of male population and 20.6% of female population smoked tobacco in the year 2000. The rate was 50.3% in males and 16% in females in 2005, 47.6% in males and 14.5% in females in 2007, 43.8% (male) and 12.5% (female) in 2010, 37.3% in males and 9.8% in females in 2015, 32.8% (male) and 7.7% (female) in 2020, 31.7% in males and 7.3% in females in 2021, 30.8% in males and 7% in females in 2022. The trend is clearly decreasing and has been lower in females as compared to males since the year 2000.

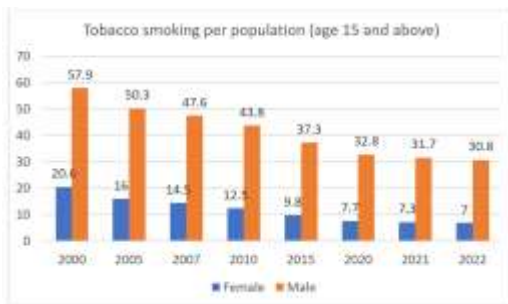


Figure 1: Data obtained from WHO Pakistan

Figure 2 shows the rate of Obesity in every 100 individuals since 2000. Every person (age 18 and above) whose Body mass index was 30Kg/m<sup>2</sup> or above was considered obese. It can be seen that the rate of obesity was 8.25% in females and 3.51% in males in 2000, 10.89% (females) and 5.47% (males) in 2005, 14.25% (females) and 8.3% (males) in 2010, 18.63% (females) and 12.5% (males) in 2015, 23.87% in females and 17.57% in males in 2020, 26.01% in females and 19.94% in males in 2022. It is evident that the trend is increasing with it being more common in females.

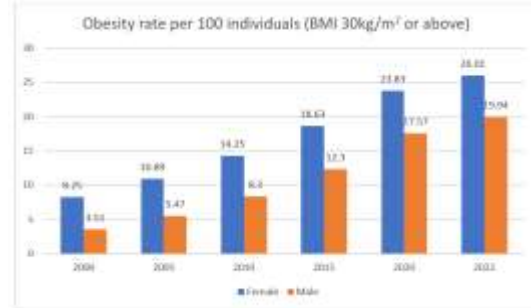


Figure 2: Data obtained from WHO Pakistan

Figure 3 shows the rate of hypertension in every 100 individuals in age group 30-79 years since 2000. According to WHO a person with Blood pressure  $\geq$  140/90 mmHg has a confirmed diagnosis of hypertension. A person with preexisting Cardiac disease or diabetes mellitus or chronic kidney disease and a systolic Blood pressure of 130-139 mmHg is hypertensive (2). Now it is evident from figure 2 that 39.6% of females and 38.2% of males were hypertensive in 2000, 40.9% (females) and 39.6% (females) in 2005, 42.4% (females) and 41.4% (males) in 2010, 43.7% (females) and 41% (males) in 2015, 44.8% (females) and 41.6% (males) in 2019. The trend has clearly been increasing and is more common in females.

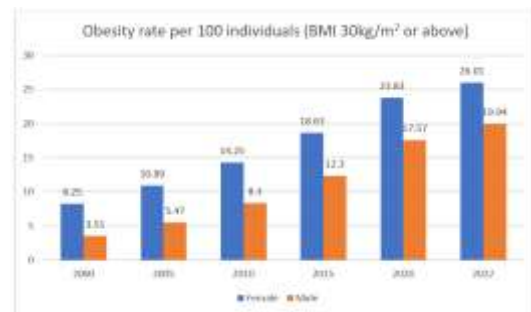
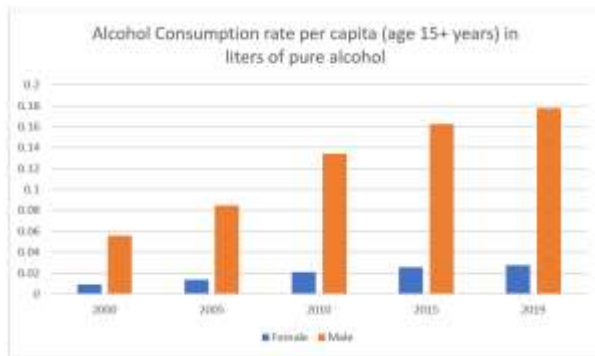


Figure 3: Data obtained from WHO Pakistan



**Figure 4:** Data obtained from WHO Pakistan

#### 4. Discussion

Ischemic Heart Disease is the leading cause of mortality in Pakistan and most of ischemic heart disease cases are due to atherosclerosis. Hence a background knowledge of atherosclerosis is required to better understand this article. Atherosclerosis is characterized by vascular intimal lesion called atheroma or atheromatous or atherosclerotic plaques. These plaques consist of inner necrotic center and an outer fibrous cap. The necrotic center is made up of cell debris, cholesterol crystals foam cells and calcium while the outer fibrous cap is made up of smooth muscles cells, macrophages, foam cells lymphocytes, collagen, proteoglycans and neovascularization. The plaque forms mainly secondary to endothelial injury. The atheromatous plaque may progress by growing in size and occlude 70% of the artery, or it may completely occlude the artery secondary to thrombus formation or rupture. If the fibrous cap consists of abundant smooth muscle cells, collagen, few inflammatory cells and the necrotic center contain thin lipid core than the atheromatous plaque is stable otherwise it is a vulnerable plaque. When there is endothelial injury and resultant endothelial dysfunction, there is increased permeability, leukocyte, monocyte adhesion and migration into the vascular intima. Cholesterol also migrate within the intima where they are oxidized by Reactive Oxygen Species and ingested by macrophages through scavenger cells to form foam cells. Platelet Derived Growth Factor produced by macrophages promote smooth muscle cell proliferation. The recruited smooth muscle cells synthesize Extracellular Matrix that stabilize atherosclerotic plaques (3).

Stable atheroma's are protected against extrinsic factors like Hypertension. If the atheroma is unstable than it is at increased risk of undergoing thrombus formation or rupture (acute plaque changes) resulting in coronary artery occlusion. Premenopausal women are protected against atherosclerosis compared with age-matched men. Postmenopausal women are at increased risk of atherosclerosis compare with age-matched men.

Smoking increases the risk for hypertension, coronary plaque rupture resulting in thrombus formation. Reactive oxygen species in cigarette smoke results in endothelial dysfunction. Reactive Oxygen Species like superoxide reduces Nitric Oxide availability and increases Low Density Lipoprotein oxidation (4). Tobacco smoking has been decreasing in Pakistan as seen in Figure 1. It can be seen that Tobacco smoking is more common in men in Pakistan.

In hypertensive patients there is increased formation Reactive Oxygen Species and reduce antioxidant level which promotes endothelial dysfunction (5) From Figure 3 it is evident that rate of hypertension has been increasing in Pakistan. It can be seen that Hypertension is more common in women in Pakistan.

In Obese patient Leptin, resistin, IL-6 and monocyte chemoattractant protein activate macrophage into adipose tissue promoting visceral adipose systematic inflammation, oxidative stress, abnormal lipid metabolism, insulin resistance, hypercoagulability and endothelial dysfunction leading to atherosclerosis (6). According to Figure 2 Obesity has also been increasing in Pakistan, it can be seen that Obesity is more common in women in Pakistan.

The relation between alcohol intake and atherosclerosis is complex. Studies show that people who drink low quantity of alcohol are protected against atherosclerosis compared with those who do not drink alcohol nevertheless, binge drinking increases the risk of atherosclerosis (7). According to Figure 4 Alcohol consumption has also been increasing in Pakistan. It can be seen that Alcohol intake is more common in men in Pakistan.

Since the rate of Hypertension and Obesity is increasing in Pakistan, there is an increased risk of ischemic heart disease. Although tobacco smoking has been declining in Pakistan which will play a protective role against

ischemic heart disease. Alcohol consumption has also been increasing in Pakistan but its role in ischemic heart disease is dependent on quantity, pattern of consumption and the presence of other factors like smoking and Obesity Nevertheless, more research is required to better comprehend its role in atherosclerosis and ischemic heart disease.

## 5. Conclusion

In Pakistan the leading cause of death is ischemic heart disease. The trend of its modifiable factors in Pakistan has been increasing except for Tobacco smoking since the year 2000. Proper preventive measures must be taken to counter this specific death rate. This may include mass Health education, Health promotion, Dietary changes, lifestyle changes.

**Conflict of interest** The author declares no conflict of interest.

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