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### RESEARCH ARTICLE

#### PREVALENCE OF ATHEROSCLEROTIC CRDIOVASCULAR DISEASE MODIFIABLE MAJOR RISK FACTORS: A REVIEW.

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#### Abstract

**Introduction:** Globally, Atherosclerotic Cardiovascular disease is responsible for 17.7 million deaths yearly, representing almost one third of deaths globally. Its modifiable risk factors are hypertension, diabetes, overweight or obesity in addition to smoking, and physical inactivity. Saudi economic evolution over the past decades brought up significant increase in life expectancy and substantial modifications in lifestyle as well as it promoted prevalence of such risk factors.

**Objective:** to shed light on the prevalence of ASCVD major modifiable risk factors and their trend if any in Saudi Arabia.

**Methodology:** We searched published literatures that have addressed prevalence of modifiable risk factors of atherosclerotic cardiovascular disease in Saudi Arabia via the internet, using the medical database MEDLINE/PubMed. Retrieved articles were reviewed by authors. We excluded hospital-based studies or none original papers. Selected articles that matched the criteria were included in this review.

**Results:** in this review article we reviewed 21 epidemiological articles that highlighted the prevalence of atherosclerotic cardiovascular disease modifiable risk factors in Saudi Arabia. The real challenges are some risk factors are asymptomatic and underdiagnosed, poorly controlled and they are linked in a way that addition of one risk factor may lead to another one or aggravate it. The trend of such risk factors is growing, and programs should be in place to slow down their growth.

**Conclusion:** There is a need for more comprehensive awareness programs to publics aiming to promote healthy lifestyle and enhance early detection and adherence to treatment.

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#### Introduction:-

Atherosclerotic cardiovascular disease (ASCVD) entails variety of presentations depending on site of atheroma. Coronary atherosclerosis may present in the form of acute coronary syndromes (ACSs), Ischemic heart disease

whether stable or unstable angina. Cerebrovascular atherosclerosis may present as transient ischemic attack, or stroke. Peripheral arterial disease may result from significant atheroma in peripheral arteries. [1]

ASCVD is directly accountable for 17.7 million deaths yearly, representing almost one third of deaths globally. Risk factors for ASCVD, which manifest initially as heart attacks and strokes, are hypertension, diabetes, overweight or obesity in addition to smoking, unhealthy diet, physical inactivity and the harmful use of alcohol. These risk factors are luckily either modifiable or controllable which make them a key to downgrade the risk of ASCVD. [2]

The challenge is that the prevalence of such risk factors in developing countries is increasing because of economic evolution, urbanisation, industrialisation and globalization. Also, sharp increase in life span prolongs the exposure to such risk factors that promote heart disease. [3]

Saudi Arabia witnessed economic evolution over the past decades that brought up significant increase in life expectancy and substantial modifications in lifestyle as well. This review aims to shed light on the prevalence of major modifiable risk factors for ASCVD and their trend if any in Saudi Arabia.

### **Material and Method:-**

A search of published literatures that has addressed individual risk factors in Saudi Arabia was carried out via the internet, using the medical database MEDLINE/PubMed, supported by the US National Library of Medicine. The review was conducted to the time of December 2017. The methodology followed by the researcher for the process of selection of articles is presented in. The researchers conducted a review process and the discordances were resolved by consensus. At a first stage, all published articles containing the words "Prevalence", "Obesity or over weight", "Hypertension", "Diabetes", "Dyslipidemia", "Smoking", "Physical Inactivity" in combination with "Saudi Arabia" as part of their title, as a keyword or as a reference in their abstract have been collected. Initially, retrieved article were filtered confine the search results, excluding hospital based, case reports studies or none original papers. Finally, at the end selection process, we summarized our findings in this review article.

### **Results:-**

#### *Dyslipidemia:*

Three landmark studies evaluated the prevalence of dyslipidemia in Saudi Arabia during the past 25 years. The first report came in 1996 by Al-Nuaim AR where he reported the outcome of community based cross sectional national epidemiological study involving almost 4500 Saudi citizens aging 15 years old or more. The investigators evaluated both the occurrence of hypercholesterolemia (HC) and mean serum total cholesterol (TC) in KSA. Collected data were: height, weight and random sample of blood for total cholesterol assays. The occurrence rate of HC (5.2-6.2 mmol/l) was 9% in men and 11% in women ( $P = 0.74$ ), whereas the occurrence rate of HC ( $> 6.2$  mmol/l) was 7% among men and 8% in women ( $P = 0.52$ ). The prevalence of HC was conversely proportionate to diabetes and smoking as well. The mean serum TC in women was meaningfully higher than for men subjects (4.24 versus 4 mmol/l). A noticeable continuous rise in TC with age, attaining its peak at the 5th and 6th decades in all subjects. Also, there was positive correlation between TCC and increasing BMI values. [4].

In older age group 30-70 years of 16,819 Saudi subjects, Al-Nozha MM, assessed the prevalence of both HC, TC  $> 5.2$  mmol/l, and hypertriglyceridemia (HT), serum triglycerides  $> 1.69$  mmol/l, over 5 years period from 1996-2000. HC occurred in 54% and reported mean cholesterol level was  $5.4 \pm 1.52$  mmol/l. There was no significant variation in the prevalence of HC when gender or place of residence were considered. Hypertriglyceridemia occurrence was 40.3% and reported mean triglycerides level was  $1.8 \pm 1.29$  mmol/l. Men had statistically significant higher HT prevalence of 47.6% compared to 33.7% in females ( $p < 0.0001$ ). He concluded that dyslipidemia is reaching higher prevalence rates in Saudi Arabia and was able to predict that ischemic heart disease will evolve as major health issue soon. [5]

More recently in 2014, Basulaiman M, assessed the prevalence of HC in 2013 spring among 10,735 Saudi subjects who answered a specifically designed survey via face to face interviews and their age was 15 years and above. The overall result, 8.5% of citizens had HC and additional 19.6% were borderline hypercholesteremic. Among hypercholesterolemic Subjects, 65.1% were undiagnosed, 4.3% were untreated, 2.3% were uncontrolled despite being treated. Only 28.3% were controlled by lipid lowering therapy. The risk of HC increased in correlation to aging, margarine consumption, increased BMI and presence of comorbidities like diabetes or hypertension. [6]

*Hypertension:*

In 1997, Al-Nozha MM conducted a cross-sectional community-based survey to investigate prevalence rate of hypertension in 13,700 Saudi subjects regardless of age or gender. Applying the WHO criteria for hypertension, 160/95 mmHg, systolic hypertension prevalence was 9.1% and diastolic hypertension prevalence was 8.7%. Hypertensive patients older than 40 years old had 87.5% systolic and 79.4% diastolic hypertension. However, applying more stringent diagnostic cutoff for hypertension, 140/90 mmHg, subjects more than 40 years old were suffering from either systolic hypertension 20.4% or 25.9% diastolic hypertension. [7]

Ten years later, the same author investigated hypertension prevalence in a community-based study involving 17,230 subjects aging 30-70 years old. The study was conducted over 5 years period from 1995-2000. The crude prevalence of hypertension was 26.1%. Men had significantly higher prevalence of hypertension compared to women (28.6% vs. 23.9%  $p < 0.001$ ) respectively. [8]

Al-Turki KA 2008, reported the outcome of a large screening campaign involving, conducted in the eastern province to evaluate hypertension prevalence during 2004 involving 197,681 subjects. JNC VII criteria for diagnosis of hypertension (140/90 mmHg) was applied to study samples and initially 21% of the subjects were positive for previous history or screening. After the next day confirmation, the prevalence of hypertension dropped to 15.6% and pre-hypertension accounted for 3.7%. The investigators were able to highlight some differences regarding subjects' gender being significantly more prevalent in women than men, despite that, men had significantly higher mean systolic and diastolic blood pressure. [9]

A national health survey was conducted in 2013 involving 10,735 citizens older than 15 years. El Bacheraoui 2014, found that 15.2% were hypertensives and 40.6% were pre-hypertensives. Alarmingly, the diagnosis rate was 42.2% among hypertensive subjects. Among those diagnosed, almost 80% were treated and 45% of them achieved target blood pressure goals. [10]

*Diabetes Mellitus*

The earliest report regarding prevalence of diabetes in Saudi Arabia was reported by Fatani HH, 30 years ago. He and his colleagues screened 5222 subjects living in rural areas in western region. The prevalence rate of diabetes mellitus was 4.3%. Prevalence of diabetes was higher among obese, higher income group and older population. Prevalence in females was double that for males. [11]

3 years later, Anokute CC, screened 3158 subjects from King Saud University Community for diabetes mellitus. The prevalence rate observed for fasting blood glucose  $> 140$  mg/dl was 6.0%. This study involved males only and diagnostic cutoff matched reference value at that period. [12]

In 1996, El-Hazmi, conducted a study to assess the prevalence of diabetes mellitus (DM) in variable areas of Saudi Arabia. A community survey that involved 23,493 Saudi females and males aging 2-70 years. Based on WHO diabetes diagnostic criteria, the overall prevalence of DM was 5.7% men and 4.8% in women. In the 14-70-year age group, the prevalence of DM was 9.7% in the men and 7.1% and in women. In subjects  $> 30$  years, prevalence of T2 DM rose to 17.32% men and 12.18% in women. [13]

Al-Nuaim AR, in 1997 investigated prevalence of diabetes mellitus in Saudi citizens. 13,177 participants older than 15 years geographically distributed all over Saudi Arabia. Prevalence of DM, age adjusted, was among the highest in the world. Urban subjects had significantly higher prevalence (men 12%, 95% CI 11-13 and women 14%, 95% CI 13-15) than rural subjects (men 7%, 95% CI 7-8 and women 7.7%, 95% CI 7-9). [14]

In 2004, Al-Nuzha MM, published the outcome of population-based nationwide epidemiological survey, conducted by assessing Saudi subjects aging 30-70-years over a 5-year period, 1995 to 2000. Utilizing criteria of 1997 American Diabetes Association (ADA) that was endorsed by the WHO in 1998, the prevalence of DM was 23.7% among 16,917 participants. Men had a significantly higher prevalence than women (26.2% vs. 21.5% ( $p < 0.00001$ )) respectively. [15]

Further to this, in 2010 Al-Balghli NA, reported the outcome of DM screening campaign that took place in the eastern region during 2004 in subjects  $> 30$  years old. The confirmed prevalence rate of DM among study population 197,681 participants was 17.2%. [16]

El Bacheraoui 2014, analyzed data of the Saudi Health Interview Survey (SHIS) for diabetes mellitus prevalence estimation and concluded that diabetics represents 13.4% among Saudis > 15 years old. Among those, 57.8% are undiagnosed, 5.4% are untreated, 20.2% uncontrolled despite treatment and only 16.6% are achieving their treatment goals. [17]

### *Obesity and overweight*

The following table summarizes all epidemiological studies conducted in Saudi Arabia (Table 1)

**Table 1:-** Prevalence of obesity (BMI >30 Kg/m<sup>2</sup>) in Saudi Arabia

Study (ref.)	Data collection period	Sample size (No.)			Age groups studied (years)	Obesity prevalence (%)		
		Men	Women	Total		Men	Women	Total
Al-Nuaim et al. (18)	1990–1993	5407	5244	10651	(≥20)	17.8	26.6	22.1
Osman & Al-Nozha (19)	1989-1994	2673	3590	6263	(≥18)	15.6	24.9	20.8
Warsy & El-Hazmi (20)	1992-1995	6646	9064	15710	(>14)	13.1	20.3	15.8
Al-Nuzha et al (21)	1995-2000			17232	(30-70)	26.4	44	35.6
WHO STEPwise (22)	2005	2244	2345	4589	(15-64)	28.3	43.8	36.2
Memish et al (23)	2013			10735	(>15)	24.1	33.5	28.7

Obesity is a public health burden in Saudi Arabia impacting negatively not only the quality of life but also morbidity and even mortality outcomes.

### *Physical Inactivity*

Al-Hazaa HM 2004, reviewed the current literatures discussing physical inactivity in Saudi population. The reported prevalence of physical inactivity ranges from 43.3-99.5% among children and even adults. [24]

### *Smoking*

In 2015, Moradi-Lakeh, published results of a survey on 10735 subjects >15 years old (5253 males and 5482 females) that took place during spring 2013. Current overall smokers were 12.2 %. Men were more likely to smoke than women (21.5 % vs. 1.1 %). [25]

### **Conclusion:-**

ASCVD major modifiable risk factors including dyslipidemia, hypertension, diabetes mellitus, obesity, physical inactivity and smoking are quite prevalent among Saudi population and despite being captured in literatures for almost 30 years still their trend is growing. There is a need for more comprehensive awareness programs to publics aiming to promote healthy lifestyle and enhance early detection and adherence to treatment.

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### **Authors Contribution:-**

All authors contributed to this article including, searching, filtering, manuscript writing, reviewing and editing.

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