



Original article

Hypercholesterolemia and its associated risk factors—Kingdom of Saudi Arabia, 2013



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ABSTRACT

Purpose: To assess the prevalence of hypercholesterolemia and its associated factors in the Kingdom of Saudi Arabia.

Methods: A national multistage representative sample of Saudis aged 15 years or older was surveyed through face-to-face interviews. Data on sociodemographics, risk factors, and health information were collected, and blood sample analysis was performed. Data were analyzed using SAS 9.3 to account for the sample weights and complex survey design.

Results: Between April and June 2013, a total of 10,735 participants completed the survey. Overall, 8.5% of Saudis had hypercholesterolemia. Another 19.6% had borderline hypercholesterolemia. Among hypercholesterolemic Saudis, 65.1% were undiagnosed, 2.3% were treated uncontrolled, 28.3% were treated controlled, and 4.3% were untreated. The risk of being hypercholesterolemic increased with age and among individuals who reported consuming margarine, obese individuals, and those who have been previously diagnosed with hypertension or diabetes.

Conclusions: More than a million Saudis have hypercholesterolemia, and 700,000 of them are unaware of their condition which can be controlled through early detection campaigns and lifestyle change and medication. An urgent awareness and screening campaign is needed in Kingdom of Saudi Arabia to prevent and avoid disease progression toward more serious stages.

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Introduction

Cholesterol is essential for the body, specifically for hormone synthesis, fat digestion, and formation of cell membranes [1]. However, large amounts of cholesterol in the bloodstream lead to myocardial infarction, stroke, ischemic injury, and organ failure [2]. Hypercholesterolemia can be prevented, and measures such as dietary changes and clinical follow-up must be taken for high-risk individuals to reduce adverse events [3–7].

The Global Burden of Disease 2010 study estimated that high cholesterol is a leading risk factor for death from cardiovascular diseases in the Kingdom of Saudi Arabia (KSA). It accounted for

about 5.14% of total deaths, 3.96% of years of life lost, and 1.99% of disability-adjusted life years. From 1990 to 2010, the burden of hypercholesterolemia remained very high in KSA as it ranked eighth among the risk factors for total deaths [8].

Previous studies reported on prevalence of hypercholesterolemia in KSA. In the early 80s, prevalence of hypercholesterolemia was 7% for males and 8% for females and increased with age and body mass index (BMI) [9,10]. Since the late 90s, data on hypercholesterolemia are limited [11]. However, prevalence of hypercholesterolemia was reported as 18.6% for males and 19.7% for females in 2005 [12].

To assess the current status of hypercholesterolemia in KSA, we analyzed the 2013 Saudi Health Interview Survey (SHIS) to describe the magnitude of hypercholesterolemia in KSA by different socio-demographic groups and risk factors.

Materials and methods

SHIS is a national multistage survey of individuals aged 15 years or older. Households were randomly selected from a national sampling

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frame maintained and updated by the Census Bureau. KSA was divided into 13 regions. Each region was divided into subregions and blocks. All regions were included, and a probability proportional to size was used to randomly select subregions and blocks. Households were randomly selected from each block. A roster of household members was collected, and an adult aged 15 years or older was randomly selected to be surveyed. Weight, height, and blood pressure were measured at the household by a trained professional. An Omron HN286 scale (SN: 201207-03163F) and Omron M6 Comfort monitor (HEM-7223-E) were used to measure weight and blood pressure.

The survey included questions on sociodemographic characteristics, including age, sex, education, and marital status, tobacco consumption, diet, physical activity, health care utilization, different health-related behaviors, and self-reported chronic conditions.

We used measured weight and height to calculate BMI as weight (kilogram)/height² (square meter). Participants were classified into four groups: (1) underweight, BMI less than 18.5; (2) normal weight, BMI 18.5 to 24.9; (3) overweight, BMI 25.0 to 29.9; or (4) obese, BMI greater than or equal to 30.0. Respondents were considered to be current smokers if they reported ever smoking any tobacco products and still currently smoking tobacco, and were considered past smokers if they reported smoking in the past but not anymore. We assessed the type of fat most consumed by asking respondents: "What type of oil or fat is most often used for meal preparation in your household?" Respondents could choose between vegetable oils, olive oil, butter or ghee, margarine, or none in particular. Vegetable and olive oil were combined into one category of vegetable oil, and butter and ghee were considered animal fat.

We computed the servings of fruits and vegetables and red meats and chicken consumed per day from the detailed dietary questionnaire as the sum of the average daily consumption of fruits, fruit juices, and vegetables, and red meats and chicken. We used the International Physical Activity questionnaire [13] to classify respondents into four groups of physical activity: (1) met vigorous physical activity level, (2) met moderate physical activity level, (3) insufficient physical activity to meet vigorous or moderate levels, and (4) no physical activity.

To calculate the time spent on watching television, respondents were asked: "In a typical week, how much time do you usually spend in front of the television or on the computer?" Time was recorded in minutes or hours and then computed to create four categories in hours.

To assess diagnosed hypertension, prediabetes, diabetes, and hypercholesterolemia status, respondents were asked four separate questions: "Have you ever been told by a doctor, nurse, or other

health professional that you had: (1) high blood pressure, otherwise known as hypertension; (2) prediabetes mellitus, otherwise known as prediabetes, borderline diabetes, impaired fasting glucose, impaired glucose tolerance, or impaired sugar tolerance; (3) diabetes mellitus, otherwise known as diabetes, sugar diabetes, high blood glucose, or high blood sugar; (4) hypercholesterolemia, otherwise known as high or abnormal blood cholesterol?" Women diagnosed with diabetes or hypertension only during pregnancy were counted as not having these conditions. Those who were diagnosed with either of these conditions were further asked if they are currently receiving any treatment for their condition. Similarly, the same types of questions were used to determine previous diagnosis of stroke, myocardial infarction, atrial fibrillation, cardiac arrest, congestive heart failure, chronic obstructive pulmonary disease, asthma, renal failure, and cancer. We considered a person to be diagnosed with a chronic condition if they reported being diagnosed with any of the conditions cited earlier.

Respondents who reported being diagnosed with hypercholesterolemia were asked: "During the past 30 days, or since your diagnosis, have you ever taken medication for this condition?" Those who reported being on treatment were asked to provide the name of the drugs they are using.

Respondents who completed the questionnaire were invited to local primary health care clinics to provide a blood sample for laboratory analysis. A Roche Hitachi COBAS 8000 system was used to measure cholesterol. Respondents were considered to be hypercholesterolemic if they met any of the following criteria: (1) measured cholesterol equal to or exceeding 6.2 mmol/L or (2) measured cholesterol not exceeding 6.2 mmol/L, but the respondent reported taking medications for hypercholesterolemia. Respondents were considered to have borderline hypercholesterolemia if (1) they did not report taking drugs for hypercholesterolemia and (2) their measured blood cholesterol level was between 5.18 and 6.2 mmol/L. Respondents under treatment for hypercholesterolemia were considered controlled if their measured cholesterol levels were below 6.2 mmol/L.

Levels of high-density lipoproteins (HDL), low-density lipoproteins (LDL), and triglycerides were also measured. Respondents were considered to have low HDL if their measured HDL was below 1.0 mmol/L or 1.3 mol/L for males and females, respectively. Respondents were considered to have high LDL if their measured LDL was greater or equal to 4.13 mmol/L. They were considered to have hypertriglyceridemia if their measured triglycerides level was greater or equal to 2.3 mmol/L.

Table 1
Sociodemographic characteristics of Saudis aged 15 years or older, 2013

Sociodemographic and risk factors	Categories	Complete sample			Clinical examination sample		
		N	Weighted %	SE	N	Weighted %	SE
Sex	Males	5253	50.64	0.69	2576	52.86	1.08
	Females	5482	49.36	0.69	3014	47.14	1.08
Age (y)	15–24	2382	40.31	0.73	1163	42.32	1.14
	25–34	2757	21.50	0.52	1299	22.05	0.84
	35–44	2339	15.18	0.41	1241	14.35	0.58
	45–54	1520	12.38	0.40	860	11.51	0.55
	55–64	862	6.47	0.29	485	6.03	0.40
Marital status	65+	875	4.17	0.20	542	3.74	0.24
	Currently married	3286	26.32	0.58	2024	28.39	0.91
	Never married	4872	52.83	0.68	2325	51.92	1.07
	Separated, divorced, or widowed	2557	20.85	0.53	1236	19.69	0.82
Education	Primary school* or less	6976	49.35	0.69	3657	46.52	1.05
	Elementary† or high school completed	2829	45.87	0.71	1423	49.74	1.08
	College degree or higher education	897	4.78	0.23	492	3.75	0.27

SE = Standard error.

* Six years of schooling after kindergarten.

† Three years of schooling after primary school.

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