Original Article

Estimate a patient's 10 years cardiovascular risk using the Arteriosclerotic cardiovascular disease tool in a cross-sectional study in Al-Harja, Asser, Saudi Arabia, 2021

Abdulrhamn Bin Saeed[1], Bahaa A. Abaalkhail[2], Ibrahim Ismail[2], Abdullah Saeed[3], Saad Al-Khammash[3]

[1]Department of Public Health, Khamis Mushayt Hospital, Saudi Arabia, [2]Community Medicine Department, Faculty of Medicine, King Abdelaziz University, Jeddah, Saudi Arabia, [3]Action Research Unit Aseer Health Afference, Abha, Saudi Arabia

Abstract

Introduction: Recently, the cases of arteriosclerotic cardiovascular disease (ASCVD) have been increasing in the rural areas of southwest Saudi Arabia. Therefore, this study sought to consider the relevant contributing factors, such as traditional dietary habits and a diet rich in cholesterol and fat, few opportunities for disease screening, false beliefs about chronic disease management medications, delays in diagnosis, and the great distances required for travel to cardiac specialist centers. **Methods:** A cross-sectional study was conducted at 12 primary health care (PHC) centers, using the ASCVD tool. The total required sample was determined to be 440 participants after calculating based on the total population of Al-Harja. Systematic random sampling was performed using a list of PHC centers and fixed intervals. The study's outcome is ASCVD risk score divided into four categories: low risk <5%, borderline risk 5%–7.5%, intermediate risk >7.5%–20%, and high risk >20%. Data were collected through interview questionnaires, measurements, and laboratory sample investigations. **Result:** It was revealed that 16.59% of the participants were classified in the high-risk category for having ASCVD in the next 10 years. There was a significant association between the ASCVD risk score and obesity ($P = 0.03$). Prior diagnoses for either hypertension or diabetes mellitus ($P = 0.00$) were significantly associated with an increased ASCVD risk score. **Conclusion:** An alarmingly high prevalence of high-risk ASCVD scores was seen among male participants, with 54 (22.78%) in the high-risk category, while 19 female participants (9.36%) were in the same category. Therefore, we can conclude that male participants are two times as likely to have a high ASCVD risk than female participants.

Keywords: Arabia, Arteriosclerotic Cardiovascular Disease (ASCVD), diabetes, dietary habits, hypertension, obesity, Saudi

Address for correspondence:
Abdulrhamn Bin Saeed,
Saudi Arabia-Aseer Region, Abha - 62468-7058, Saudi Arabia.
E-mail: me@aaorg.org

Received: 11-11-2022 **Revised:** 07-12-2022
Accepted: 16-01-2023 **Published:** 30-06-2023

Access this article online

Quick Response Code:

Website: http://journals.lww.com/JFMPC

DOI: 10.4103/jfmpc.jfmpc_2183_22

Introduction

In the Middle East, cardiovascular disease (CVD) is becoming a growing public health concern contributing to a growing proportion of morbidities and deaths particularly in the Gulf Council Countries (GCC). It is estimated that CVD-related

How to cite this article: Saeed AB, Abaalkhail BA, Ismail I, Saeed A, Al-Khammash S. Estimate a patient's 10 years cardiovascular risk using the Arteriosclerotic cardiovascular disease tool in a cross-sectional study in Al-Harja, Asser, Saudi Arabia, 2021. J Family Med Prim Care 2023;12:1106-12.

deaths in the GCCs, such as Saudi Arabia, account for 45% of all deaths.[1] Notably, the prevalence of Arteriosclerotic cardiovascular disease (ASCVD) has been increasing in the rural areas of southwest Saudi Arabia, indicating a significant contribution of the rural population to the Nation's growing burden of CVD.

CVD has established modifiable and non-modifiable risk factors. The WHO identifies nine major contributing risk factors for CVD: tobacco smoking, saturated lipids, hypertension, diabetes, obesity, diet, physical activity, excessive alcohol consumption, and psychosocial factors such as stress. These risk factors account for 90.4% of the population-attributable risk of cardiac events when taken together.[2] Modifiable risk factors are the target of various public health risk-reduction interventions designed to reduce the population-level CVD risk. However, while the established modifiable and non-modifiable cardiovascular risk factors can predict 80% of future CVD risk, the remaining 20% of risk determinants remain unclear yet it potentially represents a category of factors that enhance the risk of CVD and drive disparities in its prevalence.[3]

Understanding the 10-year cardiovascular risk of individuals is essential for the planning, budgeting, and resource allocations in the design of public health programs that target population-level cardiovascular health needs. The use of a pooled cohort estimate is an essential starting point, but not the final arbiter, for decision-making in the ASCVD primary prevention: The preliminary risk assessment should serve as the starting point for a discussion that includes:

1. The burden and severity of CVD risk factors and the control of these risk factors.
2. The presence of risk-enhancing conditions. It may be difficult to quantify how much a risk-enhancing mechanism alters a patient's 10-year risk prediction. Therefore, clinician judgment is also crucial in examining whether factors are significant enough to reclassify an individual's risk category.
3. The adherence to healthy lifestyle recommendations. For all patients, appropriate lifestyle modifications should be recommended. More intensive lifestyle efforts are recommended to achieve beneficial ASCVD risk-reduction benefits among individuals with a higher 10-year estimated ASCVD risk.

Southwest Saudi Arabia's rural regions represent a particularly underserved population that may be experiencing a greater burden of CVD risk because of potential unusual risk-enhancing factors and barriers to risk reduction. Barriers to risk reduction in rural settings arise from unique social determinants including traditional dietary habits and a diet rich in cholesterol and fat, few opportunities for disease screening, false beliefs about chronic disease management medications, delays in diagnosis, and the great distances required for travel to cardiac specialist centers. However, the prevalence patterns of ASCVD risk in Southwest Saudi Arabia's rural areas remain unelucidated as little research has targeted this population, limiting the potential for tailored interventions, and further research to unravel the region's unique risk-enhancing elements and guide risk reduction efforts. This study aims to estimate the prevalence and patterns of CVD risk factors and their determinants in Al-Harja, a rural area in Southwest Saudi Arabia's Aseer region using ASCVD risk assessment tools approved by the American College of Cardiology.

Materials and Methods

Study setting

The study was conducted in the 12 primary health care (PHC) centers located in the Al-Harja governorate in the Aseer region of the Kingdom of Saudi Arabia, which is one of the area. Al-Harja is one of the historical governorates of the area with a population of approximately 24,000 people as of the 2015 government statistics. Out of this 24,000, there are 1100 aged less than 5 years, 1900 aged from 5 to less than 10 years, 6,000 of the population are young aged from 10 years to 20 years, and most of the population are aged from 20 to 45 years which is around 11,000, the remaining 4,000 are divided into 2300 who aged from 45 to 65 years and 1700 who are above 65 years.

Study design and duration

This was a cross-sectional study conducted from February 2021 to April 2021. The ethical approval was obtained form the Ministry of Health ethics committee, registration number Reg-No:06-B091, and the research committee both granted ethical permission.

Sample size and sampling

The study's source population included all male and female patients between the ages of 20 to 79 years visiting the 12 PHC centers in Al-Harja Governorate. The total required sample was calculated to be 440 people after using 15,000 for the total population aged above 20 years of the Al-Harja governorate with a confidence interval of 95% and adding 10% for the non-response rate. The sample size was estimated using Stovin's formula based on a margin of error of. 05 and a population size of N = 15,000. Stovin's formula = N/(1 + Ne2) which here in our study is $(15{,}000/1 + 15{,}000*0.05^2) = 399 + 10\%$ 440 participants.[4] Systematic random sampling was used with the list of 12 PHC centers along with fixed intervals for the patients aged 20 years and 79 years. The minimum average for visiting health centers is 120 patients per day per health center. Therefore, a list was prepared by dividing 120/40, the daily goal, and the result of division = 3. So, systematic random sampling was done based on patient No. 3 with a fixed interval for each 3rd case.

Data collection process

First Stage: Selection of Participant. Every 3rd patient identified through systematic random sampling was selected to participate in the study.

Second Stage: Contact with the health care team in the clinic. Anthropometric and blood pressure measurements were taken by a trained nurse (Ms. Sugna) who was the study assistant in all the 12 PHCCs. Weight and height were determined using an electronic scale (Seca 220, Hamburg, Germany, 2014) and the normal form was determined using a stadiometer. Body mass index (BMI) was computed by dividing weight in kilos by the square of height in meters. In accordance with the system's handbook, two blood pressure measurements were obtained using the oscillometer method with the participant in the correct position. The average of the two measurements was calculated. The nurse was also responsible for the collection, storage, and transfer of blood samples according to Al-Harja General Hospital lab guidelines. A random sample of 10 mL of non-fasting venous blood was taken for the blood collection procedures using a needle of 22 or 23 gauge and a sample adapter to fill the test tube (5 mL in a yellow-capped test tube for basic biochemistry [cholesterol, HDL]). The test tubes were put in a plastic bag labeled with the Patient's name and file number and kept in a cold box with ice packs. The samples were transported to the laboratory of Al-Harjah General Hospital (AGH) after the working day and kept between 2°C and 8°C. The measurement of serum lipid levels for total cholesterol and HDL was done using a fully automated analyzer (Siemens Dimension RxL, Munich, Germany) using enzymatic methods in July 2015 LipidPlus®.

Third Stage: Interviewing. Participants were interviewed in Arabic to collect information on socio-demographic variables, health-related lifestyle habits, behaviors, practices, and medical history.

Fourth Stage: Collection of Results: Participants collected their results from the laboratory 1 week later. Each sample had the file number of the participant.

Fifth Stage: Data entry. Collected data were immediately entered into an Excel Sheet.

Study tool

The instrument that was used to estimate the ASCVD Risk was introduced in 2013 as a tool for assessing the 10-year real risks of atherosclerotic cardiovascular disease (ASCVD) outcomes in a main preventive group. The risk estimates were derived from a combination of well-known cardiovascular risk factors studied prospectively in multiple cohorts for the pooled cohort equation. The cut point of the score is shown as follows: low risk (less than 5%); on the edge of danger (5% to 7.4%); the intermediate risk (7.5% to 19.9%); and high risk (less than 20%).[5]

Data analysis

For Statistical analysis, statistical software for data science (Stata)® version 13 was used: 2013 StataCorp. Release 13 of Stata Statistical Software, College Station, Texas: StataCorp LP. Statistics were computed using mean with standard deviation for continuous data and frequency percentages for categorical variables. Cross-tabulation was used to create descriptive statistics in the form of frequency and percentage. To investigate the ASCVD predictive variables, logistic regression and linear regression were also used. The free online application at https://tools.acc.org/ldl/ascvd_risk_estimator/index.html#!/calulate/estimator/was used to determine the 10-year ASCVD risk scores.

Results

Among the 440 participants enrolled in the study, the majority were male participants (53.86%). The mean age of the sample was 42.28 years. The majority (70.91%) of the participants were married. Most (89.77%) of the participants were found to have a formal education in primary school and above with many of them (37.05%) being graduates. Participants earning less than 10,000 Saudi Riyals (SR) or less per month were the majority (71.82%) [Table 1].

Diabetes mellitus was more prevalent (41.82%) among the participants than hypertension (28.41%) and Dyslipidemia (20.91%). A considerable proportion (21.14%) of the participants had been diagnosed with a psychiatric illness. A significant proportion (24.77%) of the participants had a family history of CVD [Table 2].

As Table 3 shows the Pearson correlation coefficient r, the following variables were positive and the *P* value was significant at <0.05 (BMI, systolic blood pressure, diastolic blood pressure, cholesterol level, and low-density lipoprotein). We can conclude that there is a positive correlation between these variables and increased risk of ASCVD. Only for high-density lipoprotein (HDL), the Pearson correlation coefficient r was negative -0.2410. So, we can conclude that there is a negative correlation between HDL and ASCVD; thus, as HDL increases, the ASCVD decreases.

Table 1: Sociodemographic characteristics of the participants (*n*=440)

Variable	Sub-variable	Mean±SD or n (%)
Age, Years	Total	42.28±15.23
	20-35	170 (38.63%)
	35>-50	144 (32.72%)
	50>-79	126 (28.63%)
Gender	Female	203 (46.14%)
	Male	237 (53.86%)
Marital status	Single	80 (18.18%)
	Married	312 (70.91%)
	Divorced	22 (5.00%)
	Widow	26 (5.91%)
Education	Illiterate	45 (10.23%)
	Primary	43 (9.77%)
	Secondary	28 (6.36%)
	High school	161 (36.59%)
	Bachelor and above	163 (37.05%)
Income, SR	<5000	165 (37.50%)
	<10000	151 (34.32%)
	>10000	124 (28.18%)

Table 2: Medical history of the participants (n=440)

Variable	Yes	No	Don't Know
Have you been diagnosed with Diabetes Mellitus?	184 (41.82%)	256 (58.18%)	N/A
Have you been diagnosed with Hypertension?	125 (28.41%)	315 (71.59%)	N/A
Have you been diagnosed with Dyslipidemia?	92 (20.91%)	348 (79.09%)	N/A
Have you been diagnosed with a psychiatric condition?	93 (21.14%)	347 (78.86%)	N/A
Family history of CVD	109 (24.77%)	304 (69.09%)	27 (6.14%)

Table 3: Pearson correlation analysis between the explanatory variables

	ASCVD	BMI	SBP	DBP	Cholesterol	HDL	LDL
ASCVD	1.00						
BMI	0.16* 0.00	1.00					
SBP	0.45* 0.00	0.20* 0.00	1.00				
DBP	0.29* 0.00	0.14* 0.00	0.63* 0.00	1.00			
Cholesterol	0.24* 0.00	0.07 0.09	0.20* 0.00	0.14* 0.00	1.00		
HDL	−0.24* 0.00	−0.08 0.06	−0.32* 0.00	−0.15* 0.00	−0.03 0.42	1.00	
LDL	0.24* 0.00	0.08 0.08	0.21* 0.00	0.12* 0.00	0.71* 0.00	−0.22* 0.00	1.00

Table 4: Distribution of cardiovascular risk factors in Al-Harja governate by gender (n=440)

Variable	Male (n=232) Mean±SD	Female (n=200) Mean±SD	*P*
ASCVD risk score	11.83±1.09	6.73±0.97	0.00
Age, years	43.24±0.98	41.17±1.06	0.00
BMI, kg/m^2	27.48±0.34	27.54±0.35	0.00
Diastolic pressure, mmHg	79.41±0.58	78.88±0.60	0.00
Systolic pressure, mmHg	121.61±0.99	121.86±1.24	0.00
Total cholesterol, mmol/L	182.78±2.24	176.50±2.55	0.00
HDL, mmol/L	47.24±0.71	46.31±0.68	0.00
LDL, mmol/L	113.59±2.19	109.50±2.52	0.00

As Table 4 and Figure 1 present the risk factors for ASCVD, adjusted by gender. The mean of the estimated 10-year risk score for ASCVD Age, DBP, and SBP were statically significant with ASCVD sorted by gender. The corresponding *P* value was less than 0.05 for all variables, So we conclude that the difference of means in ASCVD risk, age, BMI, systolic blood pressure, diastolic blood pressure, cholesterol level, LDL, and HDL between male and female participants is different.

Figure 2 illustrates that the majority (63.41%) of the participants belonged to the low ASCVD risk category. However, a significant proportion (16.59) was in the high ASCVD risk category. The proportion of male and female participants in the low-risk category was comparable. Their prevalence of high ASCVD risk was greater among male participants (22.78%) compared to female participants (9.36%) [Table 5].

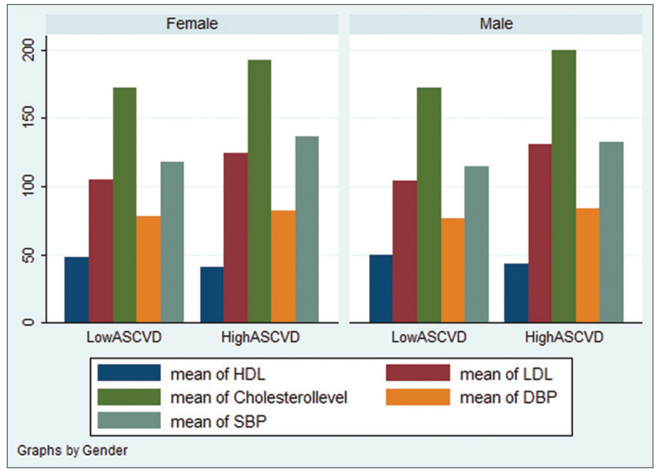

Figure 1 : Means for the risk factors among the participants by gender (n = 440)

In Table 6, we categorize the fourth ASCVD cut points into only two categories; the first category was low and borderline; the second category was the intermediate and high category. Both age and gender were statistically significant. So, for each year increase in age, the odds of having a high ASCVD score increased by 1.3 after controlling for other variables, and in gender, being male, the odds of having a high ASCVD score is 3.5 times higher than female after adjusting to other variables. In tobacco products, only smoking shows a significant relationship with high ASCVD risk with a *P* value of 0.00 with a 2.1 odds ratio in a current smoker and 3.9 in an ex-smoker, so the odds of having a high ASCVD score among smokers is 2.1 times that of non-smokers after adjusting to other variables and the odds of having a high ASCVD score among ex-smokers is 3.9 times that non-smokers after adjusting to other variables. For a co-morbidity, only Diabetes Mellitus was significantly associated with a high ASCVD risk. The odds of having a high ASCVD risk score among those who were diabetic is 5.6 times compared to those who did not have diabetes after adjusting to other variables. Regarding cholesterol, both total cholesterol and HDL were showing a significant relationship with high ASCVD risk, and for each 1 mmol/L increase in cholesterol level, the odds of having a high ASCVD score is increased by 1.03 after controlling for other variables. And for each 1 mmol/L increase in HDL, the odds of having a high ASCVD score is decreased by 0.91 after controlling for other variables, also systolic blood pressure is increasing the odds of having a high ASCDV score. So, for each 1 mmHg increase in SBS, the odds of having a high ASCVD score are increased by 1.06 after controlling for other variables. For dietary habits, the odds of having a high ASCVD risk score among those who ate *Mofatah* is 0.03 times compared to those who did not eat after adjusting to other variables. And the odds of having a high ASCVD risk score among those who eat Fruit is 0.23 times compared to those who did not eat after adjusting to other variables.

Figure 3 displays the ROC curve for the model which is 0.983, so the model can distinguish between positive and negative variables by 98.3%, so this model has good dissemination between the two values of the outcome (low and high ASCVD score) by 98%. And it is considered to be a high percentage.

Discussion

Knowledge of the ASCVD risk prevalence pattern in rural populations is vital for planning and designing tailored and sensitive cardiovascular risk reduction interventions in the effort to lower the nation's burden of CVD. In the present study, high ASCVD risk was significantly more prevalent among male individuals (22.78%) compared to female individuals (9.36%). This finding indicates the role of gender in ASCVD risk, particularly the established role of the male gender as a non-modifiable ASCVD risk factor.[6] Our study also found a high prevalence of Diabetes Mellitus in the sample (41.82%). This finding indicates the large burden of Diabetes Mellitus in the rural population. A 2019 prevalence study conducted by Mohammed Abdullah Al-Mansour using a semi-urban sample population found a diabetes mellitus prevalence of 39.6%, indicating a comparable burden of this ASCVD risk factor among rural and urban populations.[7]

This study found a hypertension prevalence of 28.41% in the study population. A similar previous study conducted by Mansour Al-Nozha found a hypertension prevalence of 26.1% among Saudis.[8] Consistency between the two findings indicates the significant role of the rural population in shaping ASCVD risk prevalence patterns in the general population and the importance of risk-reduction interventions tailored to the rural population in reversing general population prevalence trends.

The prevalence of dyslipidemia and obesity in the current study was 20.91% and 26.36%, respectively. Previous studies have found similar prevalence rates including an Abha-based dyslipidemia prevalence study that established a hypercholesterolemia prevalence of 17.3% and an obesity prevalence study in the Aseer region that yielded a prevalence rate of 23.2%.[9]

The prevalence of physical inactivity in this study was 35.91%. Compared to the General Authority for Statistics 2019 finding only 17.40% of Saudis were involved in sports activities, our study suggests an improvement in the level of physical activity.[10] However, this finding should be interpreted with caution as research has demonstrated significantly skewed patterns in physical activity levels with variations in prevalence ranging as far apart as 55% and 96%.[11] Similarly, the present study found a prevalence rate of mental illness of 21.14% which is not only lower than the national average but also lower than the

Table 5: ASCVD risk score category among the participants

ASCVD Category	Crude (%)	In male	In female
Low risk	279 (63.41%)	138 (58.23%)	141 (69.46%)
Borderline risk	28 (6.36%)	11 (4.64%)	17 (8.37%)
Intermediate risk	60 (13.64%)	34 (14.35%)	26 (12.81%)
High risk	73 (16.59%)	54 (22.78%)	19 (9.36%)

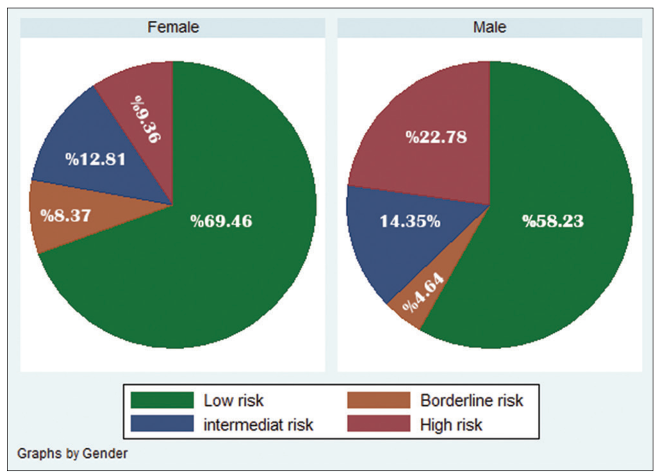

Figure 2: ASCVD risk score categories by gender (n = 440)

Table 6: Logistic regression model of high and low categories of ASCVD risk score among the participant (n=440)

High-lows ASCVD	OR	Std. Err	*z*	*P*>|*t*|	[95% CI]	
Age	1.35664	0.06444	6.42	0.000	1.236041	1.489006
Gender	3.581556	2.164657	2.11	0.035	1.095504	11.70926
Cigarette Smoking			"Ref: to non-smoker"			
Current-Smoking	2.125148	0.4881745	3.28	0.001	1.354743	3.33366
Ex-Smoker	3.974026	1.539304	3.56	0.000	1.860052	8.490556
SBP	1.062823	0.018148	3.57	0.000	1.027842	1.098995
Diagnosed with Diabetes Mellitus	5.698652	3.572913	2.78	0.006	1.667593	19.47396
Cholesterol level	1.030357	0.0066887	4.61	0.000	1.017331	1.04355
HDL	0.9130506	0.0273171	−3.04	0.002	0.8610497	0.9681921
Eating Mofatah "Traditional male:	0.03968	0.045436	−2.82	0.005	0.0042062	0.3743251
Eating Fruit	0.2347982	0.1370413	−2.48	0.013	0.0747973	0.7370611

Note: Age and Gender were forced in the model above

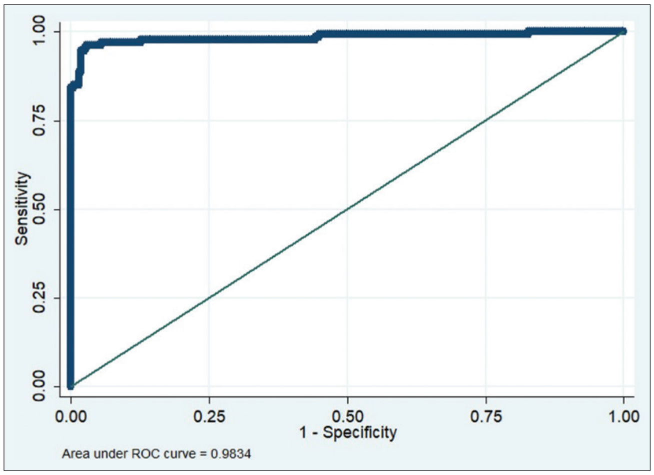

Figure 3: Receiver operating characteristic or (ROC) curve for the Logistic Regression Model above (*n* = 440)

prevalence rate (28.5%) obtained in a Riyadh-based multi-PHC center prevalence study.[12] Overall, the prevalence and severity of ASCVD risk in this rural study population is at least comparable to or higher than that of the general Saudi population or urban populations, a reality that suggests an important role of the rural CVD disease burden in the national cardiovascular health status.

Conclusion

An alarmingly high prevalence of high-risk ASCVD scores was found among the participants from the Al-Harja governorate, with 73 (16.59%) having high-risk scores. Among the participants with a high-risk ASCVD score, the number of male participants was 54, comprising 22.78%, while the number of female participants was 19, comprising 9.36%. Therefore, we can conclude that male participants have a greater than double risk of getting ASCVD than female participants. The 10-year ASCVD risk was positively associated with some of the participants' social demographic factors, including age, gender, and education level. Furthermore, the 10-year ASCVD risk was also positively associated with ASCVD risk factors, including having been diagnosed with diabetes mellitus and hypertension and smoking cigarettes. There was also an apparent impact of BMI on 10-year ASCVD risk. As the BMI of the participants increased, so did the ASCVD risk scores. According to the Centers for Disease Control and Prevention (CDC), the high-fat and high-cholesterol levels may increase the risk of CVD, including atherosclerosis. Therefore, we conclude that high cholesterol was increasing the odds of having high risk 10-years by 1.03, Also, CDC recommends to maintaining an appropriate level of HDL to prevent ASCVD events. In our result, we found that HDL is negatively associated with ASCVD; thus, as HDL increases, the ASCVD risk score decreases.

Limitations

This research has several drawbacks. A critical component of the ASCVD Risk Estimator is the ethnic definition for the 10-year risk estimate. This tool examines two possible ethnicities to get an accurate estimate: These estimates may underestimate the 10-year and lifetime risk for some race/ethnic groups, including American Indians, some Asian Americans (e.g., of south Asian ancestry), and some Hispanics (e.g., Puerto Ricans), while overestimating the risk for others, including some Asian Americans (e.g., of east Asian ancestry) and some Hispanics (e.g., Mexicans and Mexican Americans). Because the major aim of these estimates is to allow the essential conversation about risk reduction by lifestyle change, the imprecision generated by these risk estimates is minimal enough to justify continuing with lifestyle change counseling recommended by these outcomes. Furthermore, since the research is limited to Saudi patients who are Arab and do not belong to the white or black races, we picked other in all participants to address this problem. Furthermore, in our study, we did not assess the food frequency by validated questionnaires which were used as a dietary assessment tool in nutrition.

Strengths

This was the first study to estimate 10 years of cardiovascular risk using the ASCVD risk score tool among Al-Harja people in the Asser region. Furthermore, this was the first study to determine the risk factors of CVD among Al-Harja people. Also, this was the first effect of a traditional high-cholesterol and high-fat diet in a rural area of Saudi Arabia on predicting cardiovascular risk.

Recommendations

It is strongly recommended that all 12 of Al-Harja's PHC centers conduct multi-factorial ASCVD risk screenings and establish intervention plans for those who are at higher risk. Screening interventions should be directed toward early identification of Diabetes Mellitus as it is the single most prevalent contributor to ASCVD risk in this rural population. Obesity prevention and the promotion of a safe, active lifestyle should be a top health priority. In addition, it is recommended that decentralized specialized cardiovascular services including cardiology services be established in all the 12 PHC centers to increase access to cardiovascular health care and risk reduction services, as the majority (71.82%) of Aseer's rural population earns less than 10,000 SR per month as suggested by the study findings. We recommend conducting further studies to identify and characterize the specific risk-enhancing characteristics of this rural population including dietary practices utilizing reliable and valid measurement instruments. Furthermore, establishing intensive awareness campaigns about the management of the risks of type 2 diabetes and hypertension, as they contribute to increasing the risk of having high ASCVD 10 years risks.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Boumedjout H. Cardiovascular Diseases on the Increase in Arab States. Nature Middle East, 2012. Available from: https://doi.org/10.1038/nmiddleeast. 2012.36. [Last accessed 2022 Dec 04].
2. Ghamri RA, Alzahrani NS, Alharthi AM, Gadah HJ, Badoghaish BG, Alzahrani AA. Cardiovascular risk factors among high-risk individuals attending the general practice at king Abdulaziz University hospital: A cross-sectional study. BMC Cardiovasc Disord 2019;19:268.
3. Einarson TR, Acs A, Ludwig C, Panton UH. Prevalence of cardiovascular disease in type 2 diabetes: A systematic literature review of scientific evidence from across the world in 2007-2017. Cardiovasc Diabetol 2018;17:83.
4. Statistics How To. Slovin's Formula: What Is It and When Do I Use It, 2022. Available from: https://www.statisticshowto.com/probability-and-statistics/how-to-use-slovins-formula. [Last accessed 2022 Dec 04].
5. Muntner P, Colantonio LD, Cushman M, Goff DC Jr, Howard G, Howard VJ, *et al*. Validation of the atherosclerotic cardiovascular disease pooled cohort risk equations. JAMA 2014;311:1406-15.
6. AlQuaiz AM, Kazi A, Alodhayani AA, Almeneessier A, AlHabeeb KM, Siddiqui AR. Age and gender differences in the prevalence of chronic diseases and atherosclerotic cardiovascular disease risk scores in Adults in Riyadh City, Saudi Arabia. Saudi Med J 2021;42:526–36.
7. Al Mansour MA. The prevalence and risk factors of type 2 diabetes mellitus (DMT2) in a semi-urban Saudi Population. Int J Environ Res Public Health 2019;17:7.
8. Al-Nozha MM, Abdullah M, Arafah MR, Khalil MZ, Khan NB, Al-Mazrou YY, *et al*. Hypertension in Saudi Arabia. Saudi Med J 2007;*28*:77–84.
9. Al-Musa Hassan M. Screening for dyslipdemia among Saudi adults attending a primary health care in Saudi Arabia. King Khalid Univ J Health Sci 2016;1:12-9.
10. Alzahrani AA, Al-Khaldi YM, Alsamghan AS. Prevalence of obesity among Saudi board residents in ASEER region, Saudi Arabia. Saudi J Obesity 2016;4:13-9.
11. Alasqah I, Mahmud I, East L, Usher K. Patterns of physical activity and dietary habits among adolescents in Saudi Arabia: A systematic review. Int J Health Sci 2021;15:39–48.
12. Alghadeer SM, Alhossan AM, Al-Arifi MN, Alrabiah ZS, Ali SW, Babelghaith SD, *et al*. Prevalence of mental disorders among patients attending primary health care centers in the Capital of Saudi Arabia. Neurosciences (Riyadh) 2018;23:238-43.