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Assessment of Total Cardiovascular Risk Using WHO/ISH Risk Prediction Chart Among Adults in Oman: A Nationally Representative Survey

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ABSTRACT

Objectives: Cardiovascular diseases (CVDs) are the major cause of morbidity and mortality globally and in Oman. Stratifying the population under different risk levels based on the total CVD risk approach using the World Health Organization/International Society of Hypertension (WHO/ISH) risk prediction chart would be more effective in primary prevention of CVD to prioritize and utilize valuable resources. Hence, this study aimed to assess the total 10-year CVD risk among adults in Oman and to ascertain the proportion of the population in need of pharmacotherapy. ***Methods***: We used the data from the 2017 national community-based STEPS survey conducted among men and women in Oman aged 40–80 years. Ten-year total cardiovascular risk was measured using the WHO/ISH risk prediction chart for Eastern Mediterranean Sub-Region B. Independent *t*-test and Chi-square were used to test significance. ***Results:*** There were 2510 participants in the study. Their mean age was 51.5±10.1 years and 51.3% were male. The prevalence of low, moderate, and high CVD risk was 68.0%, 19.1%, and 12.9%, respectively, as benchmarked by the WHO/ISH chart. Immediate pharmacotherapy was needed by 30.3% of participants. Factors significantly associated with elevated CVD risk were the participant's age ($p < 0.001$), education level ($p < 0.001$), and employment status ($p < 0.001$). ***Conclusions:*** A substantial fraction of the population in Oman are at moderate or high CVD risk. Prompt pharmacological interventions are warranted for at least one in every five individuals in conjunction with lifestyle changes.

The developing world is experiencing an ‘epidemiological transition’ where the primary categories of diseases causing death and disability are shifting from communicable to non-communicable diseases (NCDs).[1] Among NCDs, cardiovascular diseases (CVDs) including strokes, heart attacks, and other circulatory diseases are the top cause of premature deaths in the world. In 2015, there were approximately 422.7 million cases of CVD leading to 17.9 million deaths, claiming 31% of worldwide mortality.[2,3] The number of cardiovascular deaths is predicted to escalate to 23.3 million by 2030.[2] An estimated 55% increase in CVD deaths globally can be attributed to aging with population growth contributing to a 25% increase.[3] Besides aging, other major drivers for increasing cardiovascular mortality are smoking, hypertension, diabetes mellitus (DM), and obesity.[2]

The Middle East’s sustained increase in CVD burden is driven to an extent by the advanced ‘epidemiological transition’ secondary to urbanization and lifestyle changes.[4] This has led to an increase in the rates of CVD and associated risk factors.[5] CVD cases in this region are characterized by younger ages, higher prevalence of risk factors, and more severe associated conditions such as DM.[2] It is well-known that persons with DM are prone to more cardiovascular complications and higher mortality risk than those without DM.[6]

In the last five decades, Oman, an Arabian Gulf Cooperation Council (GCC) country, has undergone unprecedented socioeconomic development accompanied by demographic changes due to declining maternal and infant mortality and rising life expectancy. However, these achievements are being threatened by the challenge of NCDs.[7,8] In 2016, NCDs accounted for 72% of all deaths

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in Oman, half of which was attributable to CVDs (second only to Kuwait in GCC).[9,10] In 2015, Oman had 9000 NCD cases per 100 000 persons, and was one of the countries with the highest age-standardized prevalence of NCDs, the others being West Africa, Morocco, Iran, Zambia, Mozambique, and Madagascar.[3] By 2025, Oman's healthcare sector is expected to cater to 210% increase in the demand for healthcare, and 21% of total healthcare expenditure will be devoted to CVD alone.[7]

Addressing the risk factors for CVD can help moderate this burden. For example, age-related CVD risk can be minimized by early lifestyle changes assisted by prophylactics if called for.[11] A recommended and cost-effective way to prevent CVD is the total-risk approach.[12] The total-risk approach evaluates an individual's overall risk of developing CVD, by considering the co-existence of a range of risk factors. This approach facilitates optimal utilization of healthcare resources by targeting those who are above a pre-defined 'high-risk' threshold for CVD. The total-risk approach postulates that mutual interactions of multiple moderate-level risk factors confer a higher total risk of CVD on an individual than higher level of a single risk factor. This is a shift from the traditional 'vertical' or single risk factor approach. Generally, the logical approach for medical practitioners would be to target solely the high-risk group. However, it has been found that more CVD cases occur among a larger number of individuals who carry multiple lower risk factors for CVDs rather than the smaller numbers of people at higher risk.[13] This population strategy of modestly flattening and extending the risk distribution curve is currently considered to be more effective in reducing mortality and morbidity.

Various tools to assess total CVD risk have been described, such as Framingham, INTERHEART modifiable risk score, SCORE, QRISK, ASSIGN, etc.[14] These were developed based on data from specific population-based cohort studies and need not be valid for other populations. In many developing countries including Oman, no such studies have been conducted, so the information about cardiovascular risk factors is obtained mainly from hospital- and community-based cross-sectional studies. The influence of these risk factors on cardiovascular outcomes in Oman remains largely unknown. In addition, currently there are no national guidelines on risk assessment; therefore, in practice, clinicians in Oman generally depend on risk guidelines developed in Western countries.

However, the World Health Organization/International Society of Hypertension (WHO/ISH) risk prediction charts have been developed utilizing information on the population distribution of risk factors from WHO's different sub-regions, including a chart for the Eastern Mediterranean Region-B (EMR-B) which includes Oman.[15] This prediction chart, which monitors population distribution of total CVD risk, estimates the total 10-year risk of developing fatal and non-fatal major CVDs (heart attack or stroke) according to the interplay of various risk factors such as age, sex, smoking status, systolic blood pressure, total blood cholesterol, and DM. This chart allows for the stratification of individuals into different risk groups, wherein individuals can be identified for management by only lifestyle modification or in conjunction with drug therapy as well. The strength of the chart is its utilitarian simplicity that helps clinicians categorize patients based on their risk profile and then plan their management.[12]

Quantifying and categorizing the population in Oman according to the level of CVD risk score or categories are of crucial importance to guide the preventive strategies conducted in Oman to reduce the mortality due to CVD. However, research activity on CVD is lagging, not only in Oman, but in the entire Middle Eastern region, which together produced only 3% of the absolute number of CVD research articles recorded in PubMed in the last ten years.[2]

This study is leveraging the scientific knowledge on CVDs in the MENA region in general, and Oman specifically. Thus, this study aimed to assess the total 10-year CVD risk among the population in Oman using the WHO/ISH chart. To our knowledge, this is the first and largest community-based study in Oman for the prediction of 10-year CVD risk, as well as the first one that utilized the WHO/ISH chart for EMR-B in GCC that included all surveyed participants.

METHODS

Data were obtained from a large national community-based 2017 STEPS survey conducted in all the governorates (administrative regions) in the Sultanate of Oman. The survey adapted a multistage stratified, geographically clustered sampling approach using the 2010 national census data as the sampling frame. Our potential participants were all men and women residing in Oman (citizens and expatriates) and in the age group 40–80 years. Sample weights were calculated and adjusted according to the primary and secondary sampling units in order to overcome sampling bias. The sample weight was also adjusted for non-response at the household level. The details of the survey methodology are available in the main 2017 STEPS survey article.[16]

Variables were collected through a culturally revised, pre-tested, and validated version of the WHO STEP Surveillance (STEPS) questionnaire (version 3.1).[17] In step 1 of the survey, sociodemographic information of the participants was collected. Step 2 was collecting their blood pressure data. In Step 3, biochemical tests were conducted to measure fasting blood glucose and total blood cholesterol. For blood glucose and total blood cholesterol measurement, blood samples were drawn from the participant after 10–12 h fasting. The collected blood was analyzed with CardioChek© Plus Analyzer. The reference ranges for cut-off points of biomarkers were kept as recommended by WHO, under the heading *Operational Definition*.

A smoker was defined as one who smoked tobacco currently or one who quit smoking less than one year before the assessment. Systolic blood pressure was the mean of two assessed readings. A person with DM was defined as one who had a fasting blood sugar level of 7 mmol/L and/or was taking oral hypoglycemic drugs or insulin.[12]

The WHO/ISH chart for EMR-B was used to estimate the total 10-year risk of CVD of all participants. Age, sex, smoking status, systolic blood pressure, total blood cholesterol, and presence or absence of diabetes in mmol/L were used to calculate the total CVD risk. The chart stratifies individuals into low (< 10%), moderate (10% to < 20%), high (20% to < 30%), and very high (>30%) CVD risk groups.[15]

Data were compiled in Microsoft Excel 2019. Data were cleaned and coded before exporting into Stata Software R (StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX:

Table 1: Sociodemographic characteristics of participants (N = 2510).

Variables	Male, n (%)	Female, n (%)	Total, n (%)	*p*-value
Age group, years				
40–49	719 (28.6)	577 (22.0)	1296 (51.6)	< 0.001*
50–59	305 (12.2)	340 (13.5)	645 (25.7)	
60–69	178 (7.1)	204 (8.1)	382 (15.2)	
> 70	86 (3.4)	101 (4.0)	187 (7.5)	
Mean ± SD[b]	50.9 ± 9.8	52.2 ± 10.3	51.5 ± 10.1	< 0.001*
Nationality				
Omani	710 (28.3)	1113 (44.3)	1823 (72.6)	< 0.001*
Non-Omani	578 (23.0)	109 (4.3)	687 (27.4)	
Level of education[a]				
No formal education	427 (17.0)	756 (30.2)	1183 (47.1)	< 0.001*
Preparatory or less	250 (10.0)	137 (5.5)	387 (15.4)	
Secondary completed	317 (12.6)	18 8(7.5)	505 (20.1)	
University and above	292 (11.6)	140 (5.6)	432 (17.2)	
Marital status[a]				
Never married	40 (1.6)	41 (1.6)	81 (3.2)	< 0.001*
Currently married	1201 (47.9)	879 (35.0)	2080 (82.9)	
Divorced/separated	16 (0.6)	54 (2.2)	70 (2.8)	
Widowed	31 (1.2)	248 (9.9)	279 (11.1)	
Employment status[a]				
Working in public sector	357 (14.2)	95 (3.8)	452 (18.0)	< 0.001*
Working in private sector	638 (25.5)	42 (1.7)	680 (27.1)	
Not working	293 (11.7)	1084 (43.2)	1377 (54.9)	

*Chi-square test was done. *significant result; [a]Fischer-exact test; [b]Independent t-test for mean difference.*

StataCorp LLC.) for further analysis. Descriptive statistics were used to measure proportions for different risk categories with a 95% CI. Means along with their SDs were calculated for continuous variables. Independent *t*-test and Chi-square test were conducted to compare continuous and categorical variables, respectively. A *p*-value of < 0.050 was considered statistically significant.

The survey received approval from the Central Research and Ethical Review and Approval Committee of the Ministry of Health, Sultanate of Oman. (Approval No: 26/2015). Informed consent from the individual participants was obtained twice: prior to Step 1 (health history collection) and prior to step 2 (measurement of biophysiological parameters). The confidentiality of the gathered data was maintained.

RESULTS

A total of 2510 participants were included in the analysis. Their mean age was 51.5±10.1 years; 51.3% were male and 48.7% were female. The majority (51.6%) of participants belonged to the youngest (40–49 years) age group. The vast majority (82.9%) were married. Slightly less than half of the participants (47.1%) did not have formal education. More than half of the participants were unemployed (54.9%) [Table 1].

Most individuals had low (< 10%) 10-year CVD risk (64.9%; CI: 64.60–68.33). Moderate (10–< 20%) and high risk (> 20%) were present in 11.8% (CI: 9.43–11.88) and 23.3% (CI: 21.28–24.60), respectively. More Omani women (63.2%) than Omani men (56.3%) had low risk. More Omani men (29.3%) than Omani women (26.0%) were at high CVD risk [Table 2]. Individuals at very high (≥ 30%) CVD risk formed 13.9% of the cohort.

Of the total study participants, 584 (23.3%) were at > 20% CVD risk, with Omani nationals (27.3%) having a higher percentage than non-Omani residents (12.7%) [Table 2]. As expected, total CVD risk was increasing with age. The highest risk was observed among 100% of participants in the age group > 70 years. About 94.0% in their 40s had low risk [Table 2]. One-third (32.9%) participants in the age group 40–60 years who also had diabetes were four-fold likely to have high CVD risk group compared to those without diabetes in the same age group (8.7%) [Table 3]. All individuals with diabetes aged > 60 years were at high CVD risk while those without diabetes were at moderate (45.1%) or high (54.9%) risk of having CVD [Table 3].

Table 2: Distribution of study population into low, moderate, and high cardiovascular risk categories.

Age, years	Participants categorized by CVD risk n (%)		
	Low (< 10%)	Moderate (10–< 20%)	High (≥ 20%)
Male			
Omani			
40–49	316 (94.0)	10 (3.0)	10 (3.0)
50–59	84 (55.6)	48 (31.8)	19 (12.6)
60–69	0 (0.0)	44 (31.2)	97 (68.8)
> 70	0 (0.0)	0 (0.0)	82 (100)
Total	400 (56.3)	102 (14.4)	208 (29.3)
Non-Omani			
40–49	364 (95.0)	10 (2.6)	9 (2.3)
50–59	77 (50.0)	49 (31.8)	28 (18.2)
60–69	0 (0.0)	7 (18.9)	30 (81.1)
> 70	0 (0.0)	0 (0.0)	4 (100)
Total	441 (76.3)	66 (11.4)	71 (12.3)
Female			
Omani			
40–49	470 (93.6)	25 (5.0)	7 (1.4)
50–59	233 (74.0)	41 (13.0)	41 (13.0)
60–69	0 (0.0)	55 (28.2)	140 (71.8)
> 70	0 (0.0)	0 (0.0)	101 (100)
Total	703 (63.2)	121 (10.9)	289 (26.0)
Non-Omani			
40–49	67 (89.3)	6 (8.0)	2 (2.7)
50–59	19 (76.0)	1 (4.0)	5 (20.0)
60–69	0 (0.0)	0 (0.0)	9 (100)
> 70	-	-	-
Total	86 (78.9)	7 (6.4)	16 (14.7)
Total			
Omani			
40–49	786 (93.8)	35 (4.2)	17 (2.0)
50–59	317 (68.0)	89 (19.1)	60 (12.9)
60–69	0 (0.0)	99 (29.5)	237 (70.5)
> 70	0 (0.0)	0 (0.0)	183 (100)
Total	1103 (60.5)	223 (12.2)	497 (27.3)
Non-Omani			
40–49	431 (94.1)	16 (3.5)	11 (2.4)
50–59	96 (53.6)	50 (27.9)	33 (18.4)
60–69	0 (0.0)	7 (15.2)	39 (84.8)
> 70	0 (0.0)	0 (0.0)	4 (100)
Total	527 (76.7)	73 (10.6)	87 (12.7)
Overall total	1630 (64.9)	296 (11.8)	584 (23.3)

CVD: cardiovascular disease.

Table 3: Distribution of study population into low, moderate, and high cardiovascular risk categories grouped by diabetes status.

Age, years	CVD risk categories, n (%)		
	Low (< 10%)	Moderate (10–< 20%)	High (> 20%)
Individuals with diabetes			
40–49	227 (86.3)	19 (7.2)	17 (6.5)
50–59	122 (51.9)	51 (21.7)	62 (26.4)
60–69	0 (0.0)	0 (0.0)	147 (100)
> 70	0 (0.0)	0 (0.0)	72 (100)
Total	349 (48.8)	70 (9.8)	298 (41.6)
Individuals without diabetes			
40–49	990 (95.8)	32 (3.1)	11 (1.1)
50–59	291 (71.0)	88 (21.5)	31 (7.6)
60–69	0 (0.0)	106 (45.1)	129 (54.9)
> 70	0 (0.0)	0 (0.0)	115 (100)
Total	1281 (71.4)	226 (12.6)	286 (16.0)
Total			
40–49	1217 (93.9)	51 (3.9)	28 (2.2)
50–59	413 (64.0)	139 (21.6)	93(14.4)
60–69	0 (0.0)	106 (27.7)	276 (72.3)
> 70	0 (0.0)	0 (0.0)	187 (100)
Total	1630 (64.9)	296 (11.8)	584 (23.3)

CVD: cardiovascular disease.

Elevated CVD risk had a significant association with the level of education ($p < 0.001$). Elevated CVD risk was present in 52.3% of participants without formal education versus 16.0% of those with higher education. Participants whose partner was not alive (69.5%), separated (37.1%), or never married (33.3%) had higher CVD risk compared to their married (30.4%) counterparts. Employment status was also significantly associated with CVD risk ($p < 0.001$). Workers in the public sector were least likely to have elevated CVD risk (16.4%) compared to private sector employees (24.3%) or unemployed (46.5%) [Table 4]. Sex was not significantly correlated with CVD risk.

Using a threshold of > 30% risk, the estimated proportion of population who needed drug therapy was 22.5%. At a threshold of > 20% risk, the proportion was 30.3%. The estimated proportion was 13.9% and 21.9% using single risk factor approach at risk threshold levels of >30% and >20%, respectively. At a threshold of >30%, the percentage of men who required drug intervention was 11.4% while at threshold of > 20% CVD risk was 14.9%. Similarly, the percentages of women were 11.1% and 15.4% at >30% and >20% threshold level, respectively [Table 5].

Table 4: Socio-demographic factors associated with elevated 10-year cardiovascular disease risk, n (%).

Variables	< 10% risk (low)	> 10% risk (elevated)	*p*-value
Sex			
Male	841 (65.3)	447 (34.7)	0.702
Female	789 (64.6)	433 (35.4)	
Age			
40–49	1217 (93.9)	79 (6.1)	< 0.001*
50–59	413 (64.0)	232 (36.0)	
60–69	0 (0.0)	382 (100)	
> 70	0 (0.0)	187 (100)	
Level of education			
No formal education	564 (47.7)	619 (52.3)	< 0.001*
Preparatory or less	291 (75.2)	96 (24.8)	
Secondary completed	410 (81.2)	95 (18.8)	
University and above	363 (84.0)	69 (16.0)	
Marital status			
Never married	54 (66.7)	27 (33.3)	< 0.001*
Currently married	1447 (69.6)	633 (30.4)	
Divorced/separated	44 (62.9)	26 (37.1)	
Widowed	85 (30.45)	194 (69.5)	
Employment status			
Working in public sector	378 (83.6)	74 (16.4)	< 0.001*
Working in private sector	515 (75.7)	165 (24.3)	
Not working	737 (53.5)	640 (46.5)	

*Chi-square test was done. *Significant result.*

Table 5: Study population who required pharmacotherapy using WHO/ISH chart at different threshold levels and single risk factor approach.

Approach	Variant	Persons requiring drug therapy, n (%)					
		Threshold CVD risk > 30%			Threshold CVD risk > 20%		
		Male	Female	Total	Male	Female	Total
WHO/ISH chart	Chart alone	162 (6.5)	185 (7.4)	348 (13.9)	279 (11.1)	305 (12.2)	584 (23.3)
	Chart normal + BP ≥ 160/100	112 (4.5)	82 (3.3)	194 (7.7)	85 (3.4)	72 (2.9)	157 (6.3)
	Chart normal + TC ≥ 8	12 (0.5)	12 (0.5)	24 (1.0)	10 (0.4)	9 (0.4)	19 (0.8)
	Total	287 (11.4)	279 (11.1)	566 (22.5)[a]	374 (14.9)	386 (15.4)	760 (30.3)[b]
Single risk	BP ≥ 140/90	148 (5.9)	131 (5.2)	279 (11.1)	215 (8.6)	221 (8.8)	436 (17.4)
	TC ≥ 6	27 (1.1)	42 (1.7)	69 (2.7)	43 (1.7)	70 (2.8)	113 (4.5)
	Total	175 (7.0)	173 (6.9)	348 (13.9)	258 (10.3)	291 (11.6)	549 (21.9)

CVD: cardiovascular disease; WHO/ISH: World Health Organization/International Society of Hypertension; BP: blood pressure; TC: total cholesterol. [a]Chart with BP ≥ 160/100 mmHg and TC ≥ 8 vs. single risk factor, at > 30% threshold, $\chi 2 = 23.2$, $p < 0.001$; [b]Chart with BP ≥ 160/100 mmHg and TC ≥ 8 vs single risk factor, at > 20% threshold, $\chi 2 = 100.2$, $p < 0.001$.

The vast majority (82.4%) of the individuals with > 20% CVD risk were not on regular statins and 86.1% were not on regular aspirin. Following the single risk factor approach, of those having systolic blood pressure ≥ 140/90 mmHg, 89.2% were not on statins and 93.4% were not on aspirin. Among patients with total cholesterol ≥ 6, 93.2% were not on statins and 95.9% were not on aspirin.

DISCUSSION

Total risk assessment is vital to prevention as the classification of individuals at risk of CVD can guide decision-makers in allocating resources and interventions. Ideally, risk prediction tools should be developed from the same population in which it is to be implemented. Without national population-based cohort studies in Oman or the EMR-B region, there will be no tool that can be used consistently. We adopted the WHO/ISH tool which is based on the data available from the 2017 National NCD (STEPS) Risk Factors Survey, and thus ideal for our study purpose. Stratification of individuals into low, moderate, and high CVD risk is a pivotal step in order to minimize negative cardiovascular outcomes. Population-based lifestyle modifications (such as increased physical activity; diet modifications like reduced intake of salt, fat, and/or carbohydrates; exercise; smoking cessation, etc.) as well as awareness strategies can be inculcated at 'macro level' imparting healthy lifestyle information to those with low CVD risk as they form the vast majority of the population. Meanwhile, individualized lifestyle interventions, counseling, and continuous follow-up assessment would be significant for moderate-risk population. Stringent medical interventions may be essential for the minority classified as having high and very high risk for CVD.[12]

Our study estimated the total 10-year CVD risk among the study population which revealed that a substantial proportion of the study population were classified into moderate and high risk (35.1%). A study conducted in southwestern Nigeria yielded similar CVD risk rates as ours.[18] However, studies from the following Asian countries reported much lower risk levels—Nepal (14%), Cambodia (3%), Malaysia (6%), and Mongolia (11%).[19,20] When the population was stratified into high-risk alone (23.3%), our findings were also significantly higher than estimations from Iran, Nigeria, Pakistan, and Nepal which ranged from 2% to 15%.[18,20] Very high-risk (> 30%) rate was 13.9% in our study, which is also higher than the average found in other studies.[18,20]

Amongst our participants with diabetes, 41.6% were classified into high risk whereas another study in Oman conducted by Al-Lawati et al,[21] in 2012 applying the WHO/ISH risk prediction chart had estimated a prevalence of 36% in the same group. Similar differences were found in the comparison of those classified in the low-risk category (48.9%) compared to their results (56%). Moreover, about one-quarter (24.3%) of their cohort were grouped in the 'very high' risk category as per the WHO/ISH chart, which was higher than the present study results (13.9%). The situation was quite different in Qatar which also has an Arab population, where despite a high prevalence of CVD risk factors, application of the WHO/ISH chart classified only around 4% collectively in the high and very high-risk categories.[22] Similarly, contrasting figures were observed in the low-risk category among persons with diabetes which revealed that 82% were classified under low risk compared to 48.9% in our study.[22] Corresponding differences were also observed in other studies where large majorities were classified as low risk groups despite relatively high prevalence of diabetes in these populations.[20,23]

While other studies reported differences in risk between males and females,[22,24] our study found no significant differences. Further research is warranted to explore this finding; however, it could be attributed to the small sample size of our cohort and more than half (51.6%) of the respondents being in the youngest age group of 40–49 years. Furthermore, as Oman is undergoing a demographic transition with about a quarter of the study population in the older age group (≥ 60 years), this could explain the high estimated total CVD risk among this age group, as all of them were stratified into the elevated (> 10%) risk category. This trend of estimated CVD risk increasing with age is corroborated by the Framingham Heart Study as well as other studies using the WHO/ISH risk chart.[12,25] Our data found that total CVD risk was significantly associated with education level in line with other studies.[22,26] This disparity suggests that increasing knowledge and awareness of risk factors can mitigate behavioral risk to prevent and reduce CVD risk.[27] Employment status was also a significant predictor of elevated risk which is seen in the higher proportion of unemployed categorized under elevated risk. These findings are relevant for early CVD prevention measures as it was shown that being unemployed was independently associated with increased mortality and recurrent hospitalization for a CVD event.[28]

Presently in Oman, individuals are generally administered drug therapy depending on the presence or absence of a single CVD risk factor, such as raised blood pressure or raised blood lipids. As per the WHO guideline for the assessment and management of individuals with CVD, individuals with a blood pressure of ≥ 160/100 mm Hg or total cholesterol ≥ 8 mmol/L are recommended drug therapy regardless of the CVD risk category.[15] Although this approach appears straightforward, it can confer an individual with low CVD risk to prolonged commitment to drug therapy or overlooking those with higher CVD risk. Interestingly, in our findings, about the same proportion of individuals would require pharmacotherapy if single risk factors like raised blood pressure and raised cholesterol were targeted at > 30% risk threshold. In contrast, other studies in Nepal, Cuba, and Seychelles reported about three-fold greater differences when comparing the WHO/ISH chart and the single risk factor approaches.[19,29,30] Nonetheless, at > 20% risk threshold, there was a significant difference between the WHO/ISH chart risk determination approach and the single risk factor approach. Some newer recommendations now state that individualized decisions should be made for those between the ages of 40 and 59 years with CVD risk; further research will have to be done to ascertain if these decisions and scores can be advocated for appropriate drug therapy.[31]

Furthermore, there is still no accepted consensus for the appropriate CVD risk threshold (30% vs. 20%) at which drug therapy should commence,[20] generally depending on the available resources and its mobility to efficiently target individuals as well as the utility of specific interventions. Current literature shows that substantial numbers of individuals with ischemic heart disease and stroke risk would be eligible for drug therapy if the threshold was lowered from > 30 to > 20% risk.[12] Our results determined that about 23.3% would be treated by drug therapy if the threshold of > 20% risk was taken as compared to 13.9% at > 30% risk. This suggests that a reduction of the CVD risk threshold would enhance diagnosis of patients. This estimated proportion of the population requiring pharmacotherapy was much higher than that of Nepal and Bangladesh at the same threshold level (11% and 9%, 8% and 4%, respectively).[19] Therefore, in Oman, although the total CVD risk approach applied to prevent CVD provides a slightly better prediction at a lower threshold of CVD risk (20%), longitudinal studies are needed to initiate a more reliable evidence-based threshold cut-off determination.

CONCLUSION

A large proportion of the adult population in Oman are at moderate-to-high CVD risk and their numbers are increasing. Pharmacotherapy interventions in conjunction with behavioral modifications are warranted for at least one in every five adults. These findings highlight the importance of designing and implementing local guidelines to categorize the population to low and high risk to guide the decision-making process in the preventive services to minimize CVD burden. More efficient utilization of resources for preventive drug therapy will be achievable through the total CVD risk approach compared to the single risk factor approach.

Disclosure
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