

10-Year Atherosclerotic Cardiovascular Disease (ASCVD) Risk Score Calculation in Out-Patient Department

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ABSTRACT

Objective: To calculate 10-year Atherosclerotic Cardiovascular Disease risk score in outdoor department of a tertiary care hospital and identify individuals at high risk of cardiovascular disease.

Study Design: Cross-sectional study.

Place and Duration of Study: Combined Military Hospital, Malir, Pakistan, from Oct 2020 to Mar 2021.

Methodology: 116 patients presenting to Out-Patient Department of General Medicine of CMH, Malir, Pakistan, without previous evidence of cardiovascular disease were included. Previous history of diabetes, smoking, use of anti-hypertensives, Aspirin and statins was recorded. Systolic and diastolic blood pressures, waist circumference, HbA1c, fasting blood sugar, fasting LDL, HDL and total cholesterol were tested for each patient. 10-year ASCVD risk score was calculated using online ASCVD Risk Estimator calculator.

Results: Mean age of the patients was 58.6 ± 9.92 years with 62.1% being males and 37.9% being females. Mean 10-year ASCVD risk score was 13.37 ± 7.1 , of which 21 patients (18.1%) had Very High, 66 (56.9%) had Intermediate and 29 (25%) had Low 10-year ASCVD risk score. Among Very High cases, 80.9% were males, all were in age group 50-79 years, 61.9% were diabetic, 33.3% were smokers and 66.7% were obese.

Conclusion: A very high percentage of study group had Intermediate or Very High 10-year ASCVD risk score. Identifying those individuals at high risk early and controlling the modifiable risk factors can help lessen the morbidity and mortality associated with cardiovascular diseases.

Keywords: Anti-Hypertensives, Cardiovascular disease, Smoking, Statins.

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INTRODUCTION

Cardiovascular diseases (CVD) comprise the most prevalent medical disorders in industrialized nations while also becoming a rapidly growing burden on healthcare system in developing nations. The American Heart Association (AHA) reports that around 50% of people aged ≥ 20 years have CVD.¹ While age-adjusted death rates for CVD have declined by two-thirds in the last four decades in the United States, the increased identification and reduction of risk factors as well as improved treatments and interventions for the management of CVD have played a vital role. Increasing sedentary lifestyle and high caloric dietary intakes are leading to an epidemic of obesity, Type 2 diabetes mellitus and hypertension. If these risk trends continue, age-adjusted CVD mortality rates could increase in the future.² Atherosclerosis develops over many years and is usually advanced by the time symptoms occur in

middle age, where acute coronary and cerebrovascular events occur suddenly, and are often fatal before reaching medical care facility, leading to devastating loss of young and productive life. Therefore, the identification of "at risk" subjects will allow sustainable primary prevention strategies to reduce CVD. As a primary preventive measure, statins have been used successfully for CVD and its acute management.³ Use of Aspirin in primary prevention has led to reduction in non-fatal MI incidents without reduction in all-cause mortality.⁴ Various risk calculators are currently available that help in identification of people who are at high risk of developing CVD like the Framingham Risk Score.⁵ (FRS), QRISK2 Score and Astronaut Cardiovascular Health and Risk Modification (Astro-CHARM). A more recent and comprehensive score formulated by the American Heart Association and American College of Cardiology is the Atherosclerotic Cardiovascular Disease (ASCVD) Risk Score.⁶ Unlike FRS, the ASCVD risk score algorithm can be applied to other races also and predicts both the 10-year and lifetime ASCVD risk of an individual. ASCVD risk score considers modifiable risk factors to calculate the

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risk. In one study, the ASCVD Score stratified 26.1% subjects into Very High 10-year risk group and 59.5% into High lifetime risk.⁷ Zhang *et al.* calculated average 10-year ASCVD risk among adults without previous CVD as 12.5%, 20.6% among them were having Very High 10-year risk and 47.4% were having Intermediate Risk.⁸ Thus, the main aim of our study is to estimate and identify the individuals that are high risk for CVD and plan for controlling the modifiable risk factors by primary prevention to help control the morbidity and mortality associated with CVD.

METHODOLOGY

The cross-sectional study was conducted at the Out-Patient Department (OPD) of General Medicine, Combined Military Hospital (CMH) Malir, from October 2020 to March 2021. Sample size was calculated by using formula ($n = z^2pq/d^2$) where $z = 1.96$, $p = 26.1\%$ (anticipated frequency of individuals with very high risk of CVD).⁷ Non-probability, consecutive sampling technique was utilized. Informed consent was taken from each patient. Ethics permission was taken from Institutional Ethical Review Committee vide letter 47/2021/Trg/ERC.

Inclusion Criteria: Patients of either gender, aged 40 to 79 years reporting to OPD of General Medicine were included.

Exclusion Criteria: All patients with previously established ASCVD, patients with serum creatinine value ≥ 3 mg/dl at time of initial check-up and those failing to give written informed consent were excluded.

Complete history and medical record of the patient was analysed including history of diabetes (presence of any of Random blood sugar >200 mg/dl, Fasting blood sugar >125 mg/dl, glycated haemoglobin (HbA1c) $\geq 6.5\%$ ⁹ in previous records and use of antidiabetic medications) and smoking (regular use of any form of tobacco in last 30 days) by the researcher. Patients were asked regarding regular daily use of statins, Aspirin and anti-hypertensive medications in last three months. Blood pressure was measured with standard android sphygmomanometer with patient sitting and arm supported at the level of the heart, two readings taken five minutes apart and average of these two was considered and hypertension considered as systolic blood pressure ≥ 140 mmHg or Diastolic ≥ 90 mmHg or already taking antihypertensive medications.¹⁰ HbA1c and random blood sugar were measured directly in main laboratory of CMH Malir. Fasting blood sugar, total

cholesterol, LDL-cholesterol and HDL-cholesterol after.⁸⁻¹² hours of fasting were measured in main laboratory of CMH Malir. Diabetes control was described as well controlled if HbA1c was $\leq 7\%$ and poorly controlled if HbA1c was $>7\%$.¹¹ Hypercholesterolemia was defined as presence of fasting total cholesterol >190 mg/dl. ASCVD risk score was calculated by filling the columns online risk assessment tool website.¹² ASCVD risk was classified as Low risk ($<7.5\%$), Intermediate risk (7.5% to 19.9%) and Very High risk ($\geq 20\%$).⁶ The researcher measured waist circumference with measuring tape and patient was diagnosed as having obesity with waist circumference ≥ 40 inches in males and ≥ 35 inches in females.¹³

The data was recorded in a specially designed data collection tool and analysed using Statistical Package for Social Sciences (SPSS) version 23. Quantitative variables with normal distribution were expressed as Mean \pm Sd and qualitative variables were expressed as frequency and percentages.

RESULTS

The study enrolled 116 patients. As shown in Table-I, mean age was 58.6 ± 9.92 years. Mean ASCVD risk score was 13.37 ± 7.1 , mean systolic blood pressure was 132 ± 15 , mean diastolic blood pressure was 81 ± 11 , mean Fasting LDL-Cholesterol was 108 ± 23 and mean HDL-Cholesterol was 51 ± 8 while mean Total Cholesterol was 188 ± 23 . Among total of 116 cases, 72(62.1%) were male and 44(37.9%) were female, 30(24.9%) were in age-group 40-49 years and 86(75.1%) in age-group 50-79 years. 64(55.2%) patients had been diagnosed with diabetes, 48(41.4%) were smokers and 68(58.6%) were non-smokers, 34(29.3%) were obese, 65(56.1%) were using Aspirin, 67(57.7%) were using statins and 64(55.2%) were taking anti-hypertensive medications. Among all patients 21(18.1%) had Very High, 66(56.9%) had Intermediate and 29(25%) had Low 10-year ASCVD risk score. As shown in Table-II, 64 patients with diabetes, 37(57.8%) had well controlled and 27(42.2%) had poorly controlled diabetes. Table-III shows patient categorisation according to ASCVD risk scoring. Among the 21 cases with very high ASCVD risk score, 17(80.9%) were male and 4(19.1%) were female, all (100%) were in age group 50-79 years, 13(61.9%) were diabetic, 7(33.3%) were smoker, 7(33.3%) were using anti-hypertensive medications, 8(38.1%) were using Aspirin while 9(42.8%) were using statins and 14(66.7%) and were obese. Among 13 patients with diabetes having very

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Table-I: Descriptive Statistics Of The Quantitative Parameters (n=116)

Parameters	Mean±SD	Minimum	Maximum
Age (In Years)	58.60±9.92	41	73
10- year ASCVD risk score	13.373±7.19	1.20	29.60
Systolic Blood Pressure (mmHg)	132.10±14.99	105	175
Diastolic Blood Pressure (mmHg)	80.77±11.62	61	109
Fasting LDL Cholesterol (mg/ dL)	108.36±22.62	79	180
Fasting HDL Cholesterol (mg/ dL)	50.81±8.10	32	65
Total Cholesterol (mg/ dL)	188.9052±23.09	136	254

high ASCVD Risk Score, 1(7.7%) had well controlled diabetes and 12(92.3%) had poorly controlled diabetes.

Table-II: Descriptive Statistics Of The Qualitative Parameters (n=116)

Parameters	Categories	n (%)
Age Group	40-49 yrs	30(25.9%)
	50-79 yrs	86(74.1%)
Gender	Female	44(37.9%)
	Male	72(62.1%)
ASCVD Risk Score Group	Very High Risk	21(18.1%)
	Intermediate Risk	66(56.9%)
	Low Risk	29(25.0%)
Diabetes	Yes	64(55.2%)
	No	52(44.8%)
Smoker	Yes	48(41.4%)
	No	68(58.6%)
On Anti-hypertensive Treatment	Yes	64(55.2%)
	No	52(44.8%)
Use of Aspirin	Yes	65(56.0%)
	No	51(44.0%)
Use of Statin	Yes	67(57.8%)
	No	49(42.2%)
Obesity	Yes	34(29.3%)
	No	82(70.7%)

DISCUSSION

United Nations (UN) Sustainable Development Goals has set an aim to reduce premature mortality from non-communicable diseases (NCD) by 1/3rd by the end of 2030. CVD account for estimated 17.8 million deaths.¹⁵ Increasing age,¹⁶ and male sex,¹⁷ are independent risk factors for CVD. Lifestyle factors like smoking, obesity,¹⁸ and sedentary living habits,¹⁹ contribute significantly to CVD burden. Risk of CVD can be appreciably reduced by achieving tight control of dyslipidaemia using statins,²⁰ blood pressure and diabetes. Aspirin has been used in primary prevention of CVD and have been found to reduce non-fatal MI incidents.⁸ Even when patients are titrated to evidence-based targets, about 70% of cardiac events remain unaddressed.²¹ Predicting the risk of CVD using various risk prediction models²² has become an important component in efforts of prevention of CVD by helping to identify people who can benefit from preventive interventions.²³ Such models have usually estimated individual ASCVD risk over a 10-year period by measuring conventional risk factors for

Table-III: Atherosclerotic Cardiovascular Disease (ASCVD) Risk Score Groups (n=116)

Parameters		Total (n)	ASCVD-Risk Score Groups		
			Very High Risk n(%)	Intermediate Risk n(%)	Low Risk n(%)
Age Group	40-49 yrs	30	0(0%)	13(43.3%)	17(56.7%)
	50-79 yrs	86	21(24.4%)	53(61.6%)	12(14%)
Gender	Female	44	4(9%)	20(45.5%)	20(45.5%)
	Male	72	17(23.6%)	46(63.89%)	9(12.5%)
Diabetes	Yes	64	13(20.3%)	32(50%)	19(29.7%)
	No	52	8(15.4%)	34(65.4%)	10(19.2%)
Smoker	Yes	48	7(14.5%)	34(70.8%)	7(14.5%)
	No	68	14(20.5%)	32(47.1%)	22(32.4%)
Use of Anti-Hypertensive Medications	Yes	64	7(11%)	35(54.7%)	22(34.3%)
	No	52	14(27%)	31(59.6%)	7(13.4%)
Use of Aspirin	Yes	65	8 (12.3%)	40 (61.5%)	17 (26.15%)
	No	51	13 (25.5%)	26 (51%)	12 (23.5%)
Use of Statin	Yes	67	9 (7.44%)	39 (58.2%)	19 (28.3%)
	No	49	12 (24.5%)	27 (55.1%)	10 (20.4%)
Obesity	Yes	34	14 (41.1%)	16 (47.1%)	4 (11.8%)
	No	82	7 (8.5%)	50 (61%)	25 (30.5%)

CVD.^{5,6} Wang *et al* compared both the FRS and ASCVD Risk Score and found that ASCVD Risk Score is more suitable for Asian population.²⁴ In one study,⁷ which included 60% males and 40% females with median age of 48, dyslipidaemia (30.6%), hypertension (25.5%) and diabetes mellitus (20%) were most frequent. The mean 10-year ASCVD risk among adults aged 40-79 years without previous CVD was 12.6% in another study⁸ with mean of 15.1 in males and 10 in females, 16.3 in smokers and 11.0 in non-smokers. The proportion of adults with $\geq 20\%$ risk significantly increased after 60 years of age. In a similar study by Ashraf *et al.*²⁵ individuals having high ASCVD risk were also predominantly male, among whom 61.9% (n=13) had diabetes and 7(33.3%) were active smokers.

LIMITATION OF STUDY

Our study involved only a small subset of population from a single clinical setting of one hospital. To generalize the results to whole population of the country requires large-scale studies to be carried out with multi-centric approach and to include individuals from all ethnic and regional areas of the country.

CONCLUSION

A very high percentage of our study had Intermediate or Very High 10-year ASCVD risk indicating that they were at significant risk to develop CVD in future. Identifying those individuals that are at high risk, early and then guiding them to change their lifestyles and controlling the modifiable risk factors can go a long way in reducing the ever-increasing burden associated with CVD on our limited health resources and help control the morbidity and mortality associated with CVD.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

HWK & MI: Conception, study design, drafting the manuscript, approval of the final version to be published.

SK & MHA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

HBT & IA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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