Assessment of the Risk Factors in Clinical Cardiovascular Events using Framingham Risk Score

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Abstract

To explore the role of risk factors and biomarkers, in anticipating the possibility of developing cardiovascular events in a group of patients using the Framingham Risk Score (FRS).Design: Participants Population-based sample of individuals aged between 40 and 75 years old (125 women and 132 men). A Prospective observational study conducted in medicine wards of a tertiary-care hospital for six months. The newly admitted case charts diagnosed with hypertension, diabetes and geriatric patients. We collected the required data in form case sheets, treatment chart, lab master, the physical examination of the medication with the patient is also verified. We used a prepared questionnaire to gather information of patient data collection to collect all the details like inpatient number, age, sex, social status, laboratory data, weight, height, Blood Pressure (BP), family history and therapeutic management, then introduced the data to FRS risk score calculator. FRS is designed to predict the risk of heart problems (including mortality) caused by coronary heart disease and non-fatal myocardial infarction for ten years to come in the life of the individual, considering the risk factors score calculated for each risk factor in the study sample.

Index terms— framingham risk score, risk factors, cardiovascular disease, risk estimation.

Nader Hamoud Khair ? , Kusu Susan Cyriac ? & Nawres Taha Abdullah ? Abstract-Objectives: To explore the role of risk factors and biomarkers, in anticipating the possibility of developing cardiovascular events in a group of patients using the Framingham Risk Score (FRS).

Design: Participants Population-based sample of individuals aged between 40 and 75 years old (125 women and 132 men). A Prospective observational study conducted in medicine wards of a tertiary-care hospital for six months. The newly admitted case charts diagnosed with hypertension, diabetes and geriatric patients. We collected the required data in form case sheets, treatment chart, lab master, the physical examination of the medication with the patient is also verified. We used a prepared questionnaire to gather information of patient data collection to collect all the details like inpatient number, age, sex, social status, laboratory data, weight, height, Blood Pressure (BP), family history and therapeutic management, then introduced the data to FRS risk score calculator. FRS is designed to predict the risk of heart problems (including mortality) caused by coronary heart disease and non-fatal myocardial infarction for ten years to come in the life of the individual, considering the risk factors score calculated for each risk factor in the study sample.

Results: Altogether, 257 cases were analyzed and when compared the Risk Factors (RF) with of the participants using FRS to classify them according to their risk score, the percentage 57 percent (n equals 147) as Low risk, 6 percent (n equals 15) as Moderate-risk, 37 percent (n equals 95). Studying the risk for developing CVD event according to their Blood Pressure, out of 50 patients with Stage 2 BP, 50 percent (n equals 25) of the individuals had high-risk score for developing CVD events. Obese individuals were 13 percent (n equals 33) among sample, and all of them had high-risk according to FRS. Non-Diabetic patients had lower risk according to FRS than Diabetics with 70 percent (n equals 23) out of 33 Non-Diabetic individuals in the sample having lowrisk and

61 percent (n equals 137) out of 224 Diabetics having high-risk. Studying the effect of Lipid profile, results showed the significance of the role of HDL in preventing cardiovascular events, 78 percent (n equals 18) out of 23 individuals with HDL levels lower than 35mg/dL showed higher risk.

1 Conclusion:

The Framingham Risk Score helped in investigating the status of cardiovascular patients and predicting the incidence of CVD events in 10 years by determining risk factors.

The study intended to assess the role of Risk Scores in indication of likely chances of prevention and for patient's education and understanding chances of increased risks for I. Introduction ardiovascular diseases (CVDs) continue to be a leading cause of morbidity and mortality among adults around the world. According to the World Health Organization (WHO), 30% of a total of 58 million deaths worldwide in 2005 were due to cardiovascular diseases, mainly heart disease and stroke. The common modifiable Risk Factors (RF) identified were the unhealthy diet, physical inactivity, tobacco use, High Blood Pressure (BP) and blood glucose, abnormal blood lipids, and being overweight. By a few years, cardiovascular disease will be the leading cause of mortality and morbidity worldwide, and developing countries will be the main contributors to this increase. In general, developing nations with poor literacy rates and a lack of awareness regarding disease-related symptoms and associated risk factors, continue to be relatively ill-equipped to handle this burden, the result is worse disease outcomes. Increased CVD-related hospital admissions and mortality among younger subjects inflate disability-adjusted life-years [1] . Cardiovascular disease is the leading cause of death among high-income countries and is projected to be the leading cause of death worldwide by few years. Much of the current research efforts aimed at the identification, modification, and treatment of individual-level risk factors [2] . Framingham Risk Score is one of the first projects of the National Heart, Lung and Blood Institute (NHLBI), was the Framingham Study in 1948, which enabled us to calculate the risk factor for coronary heart disease for ten years. The study involved close collaboration among professionals from three disciplines: Clinical Pharmacy, Biostatistics, and Epidemiology. One of the study's goals was to understand the causes of heart disease by studying the lifestyles of the people of Framingham, Massachusetts. Their first description of their findings was "risk factors in the development of coronary heart disease," which indicated increases in blood pressure and cholesterol levels, and their association with increased risk of coronary heart disease and acute myocardial infarction. The study also showed that myocardial infarction occur more among women often in later life than in men. This campaign led to the publication of awareness campaigns by the Institute focusing on the importance of high cholesterol and blood pressure as risk factors and lifestyle modification as an essential factor to reduce the risk of heart problems, and introduced the concept of prevention of coronary artery disease and its complications. Clinical trials showed that primary and secondary prevention are possible by lowering blood pressure and total cholesterol [3], [4] . This research focused on the role of Risk Factors in predicting the stage of the CVD and possibility of future cardiovascular events in the patient, and combine the results to come up with a therapeutic regimen that can suit the majority of CVD patients based on a clinical trial.

2 II. Materials and Methods

A Prospective observational study conducted in ICU, CCU, ICU, Medicine wards of a tertiary-care hospital for six months. Inclusion Criteria: Patients admitted to the ICU, CCU, Medicine wards, and their medications chart contains one or several drugs of anticoagulants, antiplatelets, thrombolytics, antihypertensive, Antihyperlipidemic agents as well as other medications used to prevent or treat the cardiovascular events in patients. Exclusion Criteria: Patients admitted to others wards rather than ICU, CCU, Medicine wards, outpatient department.

3 Method of Collection:

We selected the newly admitted case charts to identified wards on a daily basis, and collected the required data in form case sheets, treatment chart, lab master, the physical examination of the medication with the patient is also verified. A prepared questionnaire to gather information from patients that were used with the Framingham Risk Score to predict the risk factors in patients. Study Procedure: We noted the patient demographics and all medically relevant information in a predefined data collection form. Alternatively, we analyzed these case charts, and followed the changes and the daily notes in the case sheets until the patient is discharged or shift to other wards. Data Analysis: For every participant, we calculated the Framingham risk score, with ten year occurrence of coronary heart disease including the weighted risk factors age, sex, Body Mass Index (BMI), systolic blood pressure, total and high density lipoprotein cholesterol concentrations, smoking, diabetes mellitus, and family history. We assigned the participants to high-risk, moderate-risk, and low-risk groups based on the calculated Framingham risk scores.

4 III. Results

Table 1 summarizes the baseline characteristics and cardiovascular risk factors of the 257 participants; the sample included 132 men and 125 women with a mean age of 63.42 years. Figure **??** shows classification of individuals in the sample them to their risk score as follows; the percentage 57 percent (n equals 147) as Low risk, 6 percent (n equals 15) as Moderate-risk, 37 percent (n equals 95). According to FRS all obese individuals having BMI

more than 30 had the highest risk, the risk of major cardiovascular events with different BMI categories and in normalweight individuals are shown in Figure 4.

By comparing risk between Smoker and Non-Smoker patients, 80% (n = 148) of Non-Smokers had low-risk factors while 71% (n = 51) of Smokers had high-risk. Also when studying the risk according to alcohol consumption in sample 83% (n = 139) of non- Age distribution in sample according to age range was as the following; individuals between 40 and 49 years old were 15% of sample (n = 39), individuals in age range 50-59 years old were 19% (n = 49), individuals with age between 60 and 69 were 35% (n = 90) and individuals who were older than 70 years old made 31% of the study sample (n = 79). Figure **??** shows the risk factor distribution for each age group according to FRS. When compared according to their Blood Pressure, we divided individuals in the sample according to using of Antihypertensive therapy as in Table 2. Figure 8 shows risk factors according to Blood Pressure for all the precipitants regardless of whether they are undergoing antihypertensive drug therapy or not; 38% (n = 37) of individuals with Normal Blood Pressure had High RF when compared to individuals with Stage II 50% (n = 25) of them had High RF. Studying the effect of Lipid profile on developing CVD according to FRS the results of the individuals in the sample showed the protective role of HDL against heart disease, 78% (N = 18) of individuals with HDL levels less than 35 mg/dL had High-risk, while higher levels of HDL showed lower risk [5] . All participants with LDL >160 mg/dL (n = 67) had High RF; that can be explained by the changes in endothelial permeability and the retention of cholesterol-containing LDL particles in the artery wall which leads eventually to Atherosclerosis [6] . 91% (n =26) of patients with TG >250 mg/dL showed higher risk, Hypertriglyceridemia directly influences LDL and HDL, andaccu of atherogenic particles in the circulation explaining the higher risk of CVDs with higher levels of TG [7] . 48% 10% 42% 77% 5% 18% L O W R F M O D E R A T E R F H I G H R

5 Distribution of BMI values of participants in the

6 50% N O R M A L B P H I G H N O R M A L S T A G E I S T A G E I

7 IV. Discussion

By comparing risk between Smoker and Non-Smoker patients 80% (n = 148) of Non-Smokers had low-risk factors while 71% (n = 51) of Smokers had high-risk, smoking increases the levels of carbon monoxide (CO) in the blood of the smoker, which in turn causes damage to coronary artery lining, Of the thrombocytes adhesion, allowing clotting of the coronary arteries [11] .

83% (n = 183) of non-Alcoholics in the sample had low-risk of developing CHD and 67% (n = 60) of Alcoholics had High-risk, alcohol helps to absorb fat from the intestine, so increase its proportion in blood, especially cholesterol, which helps atherosclerosis and leads to blood clot [12] .

The reason why diabetic patients showed higher risk than non-diabetic patients can be explained by increased thrombocytes adhesion and elevated serum cholesterol levels in diabetics [13] The Framingham risk score is used to predict the ten-year risk of developing coronary heart disease in people with no history of cardiovascular disease [8] . 75% (n = 59) of participants in age range >70 years old had high-risk, Females in sample had less percentage of having High RF 18% (n = 22) comparing to Men 42% (n = 55). Differences in risk factors, particularly in HDL cholesterol and smoking, explained nearly half of the difference in CVD risk between sexes [9] , according to their BMI all Obese individuals (n = 33) having BMI more than 30 had high-risk, the possibility of developing major cardiovascular events is more with higher BMI values than in normal-weight individuals [10] . risk scores according to Blood Pressure, 38% (n=37) of Individuals with Normal Blood Pressure had High-risk when compared to individuals with Stage II 50% (n=25) of them had High-risk. Hypertension predisposes powerfully to all of the major peripheral artery disease. Risk ratios are larger for cardiac failure and stroke, but coronary disease is the most common and most lethal sequela of hypertension equaling in incidence all the other cardiovascular outcomes combined [14] . Diet plays an essential part in the etiology of hypercholesterolemia and hyperlipidemia which eventually lead to atherosclerosis [15] . Several factors such as high intake of saturated fats with diet, age, family history, hypertension, and lifestyle, as well as the high levels of cholesterol TC, TG, and LDL cholesterol play a huge part in causing CHDs [16] . Hypertriglyceridemia directly influences LDL, and HDL composition and metabolism, hypertriglyceridemia leads to atherogenic particles in the circulation explaining the higher risk of CVDs with higher levels of TG [17] . The role of each of TC, HDL, LDL, and TG was evident in the pathology of cardiovascular events studying the effect of Lipid profile on developing CHD according to FRS the results of the individuals of samples showed the significance of high levels of HDL in preventing CVD.

The major challenge in the maintenance of CVD, is to define not only the causes and their relationship between various risk factors and complications, but also to understand the effects of pharmaceutical agents that are beneficial in the management of cardiac complications. Multiple defects in the pathophysiology of CVD are mostly inaccurately understood, and therefore necessitate not isolating a single drug target to the reversal of all or the majority of aspects of the disease. Successful public health efforts can have a substantial effect on the knowledge and behavior of a population.

8 V. Conclusion

Using Framingham Risk Score, we predicted the risk factor for developing CHD; BMI values, tobacco use, alcohol consumption, diabetes, HDL, LDL, and TG values showed a significant effect on predicting the possibility of developing CVD in our sample, showing the importance of monitoring of these risk factors in cardiovascular therapy. The study emphasizes on the clinical importance of monitoring risk factors in cardiovascular patients to predict the outcome and effectiveness of their medication therapy, and to emphasize the necessity to increase their knowledge about the importance of making changes in their lifestyles to lower the risk of having cardiovascular events. [1] [2]

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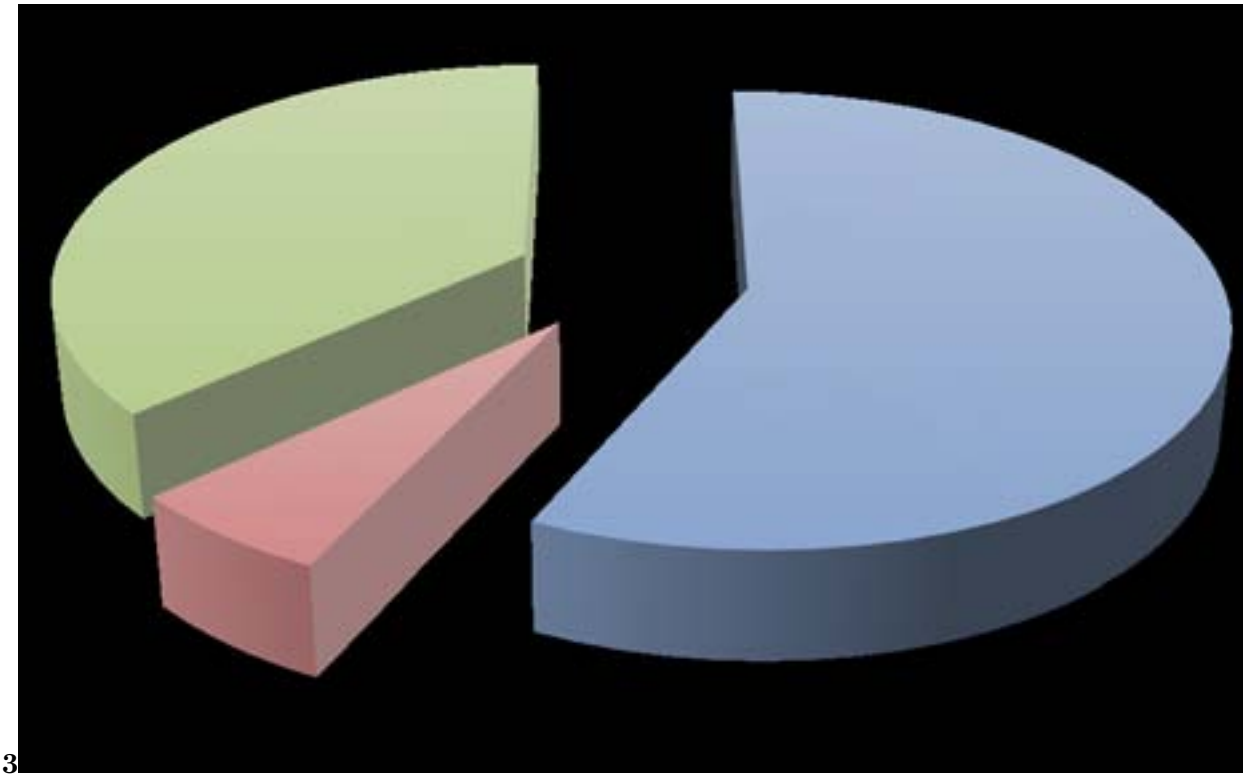

Figure 1: Fig. 1 :Fig. 3 :

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Figure 2: Fig. 4 :

Figure 3:

Figure 4: Fig. 5 :Fig. 6 :F

Figure 5: Fig. 8 :

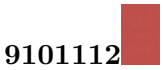

Figure 6: Fig. 9 :Fig. 10 :Fig. 11 :Fig. 12 :

1

	Women	Men	Total
	n=125	n=132	n=257
Average Age	64.8 Years	63.4 Years	63.42
Average BMI	26.9	23.4	24.99
Value	kg\m2	kg\m2	kg\m2
Percentage of Smokers	13%	44%	28%
Percentage of Diabetics	90%	83%	87%
Family History of Disease	36%	25.5%	31%

Figure 7: Table 1 :

Men Females

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100% 80% Low Risk Moderate Risk 100% High Risk 100% Medical Research
0% 0% 6% 14%40% 11%49% 0% 0% 0% 0% Global Journal of
Underweight Normal Overweight Obese I Obese II

Figure 8:

2

Blood Pressure (mmHg)		
Normal	34% (n = 20)	40% (n = 78)
High >130/90	30% (n = 19)	20% (n = 40)
Stage I	17% (n = 10)	20% (n = 40)
Stage II ?160/110	17% (n = 10)	20% (n = 40)

Figure 9: Table 2 :

3

	9.00%	0.00%
38.00%	13.00%	19.00%
5.00%		
		0%
	78.00%	81.00%
57.00%		50%

Figure 10: Table 3 :

					Desirabl	Borderline	Hi
				TC mg/dL	<200	200-239	>
				HDL mg/dL	60	35-45	<
Undergoing Antihypertensive (n = 59) Therapy 23%			Not Undergoing Antihy-pertensive (n = 198) Therapy 77%	LDL mg/dL	60-130	130-159 150-199	>
				TG mg/dL	<150		
80/120 - 100/140 109/159	Low RF	Moderate RF	High RF				15 Vo Ve
			I				D (M GI ©

Figure 11:

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