ORIGINAL ARTICLE

COMPARISON OF CVD RISK ASSESSMENT VIA QRISK®2 VS REYNOLDS RISK SCORE IN INFLAMMATORY JOINT DISEASES

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Background: The risk of cardiovascular disease in patients with inflammatory joint diseases is very high and rheumatologists need to screen their patients for this risk. A number of screening tools have been used in this patient population. Objective was to compare the cardiovascular risk assessment in patients with inflammatory joint diseases using QRISK®2 and Reynolds Risk Score. **Methods:** Four hundred and one patients with inflammatory joint diseases were enrolled via consecutive non-probability sampling. Their future cardiovascular disease risk was calculated via the QRISK®2 and Reynolds Risk Scores. The resulting scores were analyzed for any correlation. **Results**: There was no significant correlation between the scores obtain via both risk assessment tools (p>0.05).

Keywords: Rheumatoid Arthritis; Cardiovascular risk; QRISK®2; SCORE chart; Statins

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INTRODUCTION

The inflammatory joint diseases are a group of auto-immune diseases of varying aetiology that target the connective tissues, bones & joints of the body.[1] Inflammatory joint diseases are known to be associated with a high risk of cardio vascular disease in an individual.[2] Diagnosis of cardiovascular involvement in this patient population as well as general population is difficult because of the variable spectrum that is characteristic of symptoms of cardiovascular disease.[3] Early detection of cardiovascular involvement in an individual helps in reducing the burden on the individual as well as the health care system in terms of resources required for treatment and the overall financial burden.[4] Therefore, estimating the prevalence of cardiovascular disease is an important first step towards cardiovascular disease risk stratification of an individual.[5] The risk of coronary artery disease in an individual with inflammatory joint diseases such as rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, systemic lupus erythematosus etc., depends on the presence of traditional and non-traditional risk factors of cardio-vascular disease.[6-8] The traditional risk factors include tobacco smoking, sex, age, diabetes mellitus, hypertension, obesity, family history of ischemic heart disease and dyslipidemias[6,7] and the non-traditional risk factors for cardiovascular disease include genetic susceptibility, chronic inflammation and chronic use of medication for disease control.[8]

Among the inflammatory joint diseases, rheumatoid arthritis, ankylosing spondylitis, systemic lupus erythematosus and systemic sclerosis are known to be associated with an accelerated type of atherosclerosis.[9] Major contributors to the cardiovascular disease in this patient population includes arrythmias, cardiac autonomic neuropathy, non-ischemic heart failure and microvascular dysfunction in the light of information that inflammatory cells can directly affect the whole cardiovascular system.[7,10] The increased risk of cardiovascular disease in a patient with rheumatoid arthritis results in a reduced life lifespan of anywhere between 3–18 years.[11] The mortality due to cardiovascular diseases in patients with rheumatoid arthritis is 50% higher than in the general population, and the incidence of ischemic heart disease, myocardial infarction and cerebrovascular accidents is in the range of 41–68%.[12–14] The EULAR recommends cardiovascular risk screening for patients with rheumatic diseases.[15] The assessment of cardiovascular risk is well-established in inflammatory joint diseases such as rheumatoid arthritis and several algorithms such as the Framingham Risk Score, the QRISK®2 & QRISK®3, the SCORE chart and the Reynolds Risk Score have been developed and validated for assessment of cardiovascular risk in patients with inflammatory joint diseases such as rheumatoid arthritis.[5]

The aim of the study was cardiovascular risk stratification in patients with inflammatory joint disease and comparison of QRISK®2 risk score with the Reynolds Risk Score in our population. Considering the paucity of information in literature on this topic, we believe that the results of this study would establish a foundation of future research.

MATERIAL AND METHODS

This cross-sectional comparative study was conducted in the Outpatient Department (OPD) of Rheumatology in tertiary care hospital of Rawalpindi, Punjab, Pakistan from August to December, 2021 Patients having age range between 30–80 years and suffering from inflammatory joint diseases such as rheumatoid arthritis and ankylosing spondylitis were recruited through consecutive non-probability sampling technique. Prior ethical approval was obtained from the research ethics committee of Pak Emirates Military Hospital, Rawalpindi. Written informed consent and information sheets were collected from the patients. The inflammatory joint diseases were diagnosed according to the internationally accepted criteria such as the ACR (2010) criteria for rheumatoid arthritis and the ASAS (2009) criteria for ankylosing spondylitis. Patients with a prior history of coronary artery disease, cerebrovascular accidents, myocardial infarction, hypothyroidism, arrythmias, peripheral vascular disease and patients already taking statins and / or anti-platelets for any reason were excluded from the study. In addition, patients with moderate to severe activity of rheumatoid arthritis and / or ankylosing spondylitis, patients already on corticosteroids (i.e., prednisolone >5 mg/day), and patients with other connective tissue diseases such as systemic sclerosis, mixed connective tissue disease and systemic lupus erythematosus were also not included in the study. The demographic data including relevant past medical history and tobacco smoking status were recorded in a pro forma. Two readings of resting blood pressure were measured 5 minutes apart and the mean of the two values was taken as the value of systolic blood pressure. Venous fasting blood samples were taken aseptically for complete lipid profile (total cholesterol, triglycerides, low-density lipoproteins, and high-density lipoproteins and sent to the hospital laboratory for measurement. Venous blood was also sent for measurement of C-reactive protein (*hs*CRP). All data was recorded for calculation of QRISK®2 and the Reynolds Risk Score. Data was entered into and analyzed using SPSS v 23. Numerical variables were described as mean and standard deviation. Categorical variables were described as frequencies and percentages. To determine any correlation between the QRISK®2 and the Reynolds Risk Score, Pearson's correlation coefficient was determined and a *p*-value of 0.05 or less was taken as significant. The calculated QRISK®2 and the Reynolds Risk Score were further re-categorized for calculation of spearman's correlation coefficient as follows: The QRISK®2 was further recategorized into three categories of low- (<10%), moderate- (10%-20%) and high-risk (>20%) categories.[16] The Reynolds Risk Score was categorized into three similar categories of no to minimal risk (<10%), moderate risk (10–20%) and high-risk group (> 20%).[17,18]

RESULTS

There were a total of 401 study participants in the age range of 30–80 years. The mean±SD age of study participants was 52.71±12.97 years with a range of 30–80 years.

The mean±SD QRISK®2 score of study participants was 13.46±6.82. Similarly, the mean±SD Reynolds Risk Score was 13.93±6.97. Other numerical parameters are given in Table-1.

There were 206 (51.4%) males and 195 females (48.6%) in the study population. Forty-seven (11.7%) patients were active smokers, 114 (28.4%) had diabetes mellitus, 49 (12.2%) had a history of ischemic heart disease in family, 100 (24.9%) had chronic kidney diseases stage 4 or stage five, 13 (3.2%) had atrial fibrillation, and 136 (33.9%) had hypertension. Rheumatoid arthritis was the most common 347 (86.5%)) inflammatory joint disease in the study population, followed by ankylosing spondylitis 54 (13.5%).

According to the calculated QRISK®2 score, most (175; 43.6%) of the patients were in the moderate risk category where the risk of a cerebrovascular or coronary artery disease in next 10 years was 10–20%. This was followed by the low QRISK®2 category (138; 34.4%) and High QRISK®2 category (88; 21.9%). Similarly, when the Reynolds Risk Score was re-categorized into similar categories, most of the patients were found to have moderate risk of an ischemic or cerebrovascular accident in next 10 years (178; 44.4%), followed by low (134; 33.4%) and high risk (89; 22.2%) Reynolds Risk categories, respectively. To determine a correlation between the two scores, Pearson correlation coefficient was calculated (bivariate correlation); assuming p=0.05. A statistically non-significant correlation emerged (r=-0.15, p=0.758). The test validated the null hypothesis and concluded that there was no correlation between QRISK®2 score and the

Reynolds risk score (Table-5). Spearman's correlation method was also used to confirm these results (table-6). The spearman's correlation value was 0.02 indicating that there was a positive correlation between QRISK®2 and the Reynolds Risk Score, however the results were statistically insignificant (p>0.05) (Table-6, & 7).

Table-1: Descriptive statistics of study population

Variables	Mean	SD	Minimum	Maximum
Age(yrs)	52.71	12.97	30	80
HDL (mmol/l)	1.40	0.32	0.90	1.90
Cholesterol (mmol/l)	3.80	1.31	1.64	6.08
Cholesterol / HDL ratio	2.89	1.29	0.87	6.69
Systolic Blood Pressure (mmHg)	127.99	7.21	115.00	143.00
Height (cm)	160.36	8.06	148.00	175.00
Weight (KG)	58.93	8.97	45.00	75.00
Body Mass Index	22.83	2.35	18.03	29.27
QRISK®2 score	13.46	6.82	1.50	25.00
Reynolds Risk Score	13.93	6.97	1.40	27.00
LDL (mmol/l)	3.99	0.63	3.00	5.10
Triglycerides (mmol/l)	1.63	0.92	0.64	4.63
High Sensitivity CRP (mg/L)	8.65	5.51	1.10	18.00

Table-2: Frequency of different variables in study population

variable	Frequency	Percent
Sex		
Male	206	51.4%
Female	195	48.6%
Total	401	100.0%
Tobacco Smoking		
Yes	47	11.7%
No	354	88.3%
Total	401	100.0%
Diabetes Mellitus		
Yes	114	28.4%
No	287	71.6%
Total	401	100.0%
IHD in Family		
Yes	49	12.2%
No	352	87.8%
Total	401	100.0%
Chronic Kidney Disease		
Yes	100	24.9%
No	301	75.1%
Total	401	100.0%
Atrial Fibrillation		
Yes	13	3.2%
No	388	96.8%
Total	401	100.0%
Hypertension		
Yes	136	33.9%
No	265	66.1%
Total	401	100.0%
Inflammatory Joint Disease		
Rheumatoid Arthritis	347	86.5%
Ankylosing Spondylitis	54	13.5%
Total	401	100.0%

Table-3: QRISK®2 score stratification of study participants

QRISK®2 Score Stratification	Frequency	Percent
Low QRISK®2 category	138	34.4
Moderate QRISK®2 category	175	43.6
High QRISK®2 category	88	21.9
Total	401	100.0

Table-4: Reynolds Risk Score stratification of study participants

Reynolds Risk Score Stratified	Frequency	Percent
Minimal Risk	134	33.4
Moderate Risk	178	44.4
High Risk	89	22.2
Total	401	100.

Table-5: Correlation of the two risk stratification scores

Correlation		QRISK®2 Score	Reynolds Risk Score
QRISK®2 Score	Pearson Correlation	1.000	-.015
	Sig. (2-tailed)		.758
	N	401	401
Reynolds Risk Score	Pearson Correlation	-.015	1.000
	Sig. (2-tailed)	.758	
	N	401	401

Table-6: Stratification of risk categories in both scores

QRISK®2 Score Stratification	Reynolds Risk Score Stratified			Total
	No or minimal risk	Moderate Risk	High Risk	
Low QRISK®2 category	45	66	27	138
Moderate QRISK®2 category	59	77	39	175
High QRISK®2 category	30	35	23	88
Total	134	178	89	401

Table-7: Symmetric measures and correlation scores between QRISK®2 and Reynolds Risk Score

Symmetric Measures		Value	Asymp. Std. Error	Approx. T	*p*-value
Ordinal by Ordinal	Spearman Correlation	.02	.05	.42	**0.674**
Interval by Interval	Pearson's R	.02	.05	.49	**0.624**

DISCUSSION

Presence of traditional risk factors for cardiovascular disease and / or vascular damage is the key to association of increased cardiovascular disease risk in patients with inflammatory joint diseases such as rheumatoid arthritis. The genetic risk also plays an important role in defining the overall risk of cardiovascular disease in addition to traditional risk factors such as sedentary lifestyle, diabetes mellitus, smoking, family history, age, gender and dyslipidaemias. Auto-immunity and chronic inflammation both result in development of accelerated atherosclerosis. The increased cardiovascular risk is also indicated by different markers of disease activity and disease severity scores.[19]

A number of triggers such as autoantibodies, chemokines, inflammatory cells, proteases and cytokines play their role in triggering accelerated atherosclerosis by starting or maintain cascades that affect all components of the cardiovascular system.[20] In addition, the different pharmaceutical options for immunosuppression in patients with inflammatory joint diseases such as corticosteroids, leflunomide, NSAIDs, cyclosporin etc may also cause hypertension, adding to the morbidity in these patients.[21]

The high cardio-vascular disease risk of patients with inflammatory joint diseases is a well-known fact, but unfortunately, many patients do not receive appropriate preventive care for cardiovascular disease. This could be due to rheumatologists overlooking the cardiovascular disease prophylaxis in their patients because they are too focused on the musculoskeletal system. In addition, there is a general lack of awareness of cardiovascular risk stratification in general population as well as patients with inflammatory joint disease. It is not easy to diagnose cardiovascular disease in these patients because of atypical symptom, asymptomatic patients, and misinterpretation of chest pain by the rheumatologist and presence of a high inflammatory state.[5]

Furthermore, no proper cardiovascular risk prevention guidelines exist for patients with inflammatory joint disease resulting in inability to offer prevention strategies to those who may need it in this patient population. The absence of mandatory regular follow-up visits for these patients also hampers early cardiovascular disease detection in these patients.[22] In our study, two cardiovascular risk stratification scores, the QRISK®2 and the Reynolds Risk Score were compared in terms of the patients' 10-year cardiovascular disease risk. Both risk assessment tools fared comparably. They were able to identify patients with low, moderate or high cardiovascular risk in an almost similar fashion. However, these and other risk stratification scores for cardiovascular disease such as the Framingham Risk Score and the SCORE chart, generally use the data obtained from randomized cohort studies conducted in general population. Since the data for the original risk assessment tools, was not obtained from patients with inflammatory joint disease, questions have been raised over the validity of these risk stratification systems in these patients.[5]

The study population for QRISK®2 study had endemic rheumatoid arthritis, therefore, it was included as an independent risk factor for coronary artery disease. The Reynolds Risk Score uses CRP values, though the values used in the score are not as high as those found generally in these patients.[8] None of these tools provide information about the role inflammation or measures taken to control inflammation play in causation of coronary artery disease.

These tools do not also take into account the variable presentation of the inflammatory joint diseases as well as the patient demographics which is considerably more female-dominated.[5] The QRISK®2 as well as the ESC 2012 guidelines consider rheumatoid arthritis as a risk factor for cardiovascular disease, however the ESC protocols do not consider the impact of rheumatoid arthritis in management of coronary artery disease.[23] However, the risk assessment tools which use rheumatoid arthritis as a risk factor for cardiovascular disease, are not better than the tools which do not incorporate rheumatoid arthritis as a risk factor, and, therefore, there is a need for improvement in the risk stratification tools for this population.[24,25]

Our study also found that there was no significant correlation between QRISK®2 and the Reynolds Risk Score in prediction of future cardiovascular risk (p >0.05); QRISK®2 incorporates rheumatoid arthritis as a risk factor and the Reynolds Risk Score doesn't include rheumatoid arthritis. Unless improved risk assessment tools are available for prediction of cardiovascular risk in this population, early detection and prevention of cardiovascular disease will remain a dream.

AUTHORS' CONTRIBUTION

FM, FH, UH, MMS: Conceptualization of study design, data collection, and data interpretation. FSZ, MIQ, SAK, AF, MAM: Conceptualization of study design, Literature search, data collection, data interpretation, proof reading.

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