

## ORIGINAL RESEARCH

# Evaluation of Qatar's First Cardiac Rehabilitation Program: A Brief Report

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**Background:** There are few studies on the impact of cardiac rehabilitation (CR) in the Eastern Mediterranean Region (EMR), where the burden of risk factors and context is somewhat different from Western countries where much of the evidence is derived.

**Objective:** To evaluate patient engagement in, and outcomes associated with, participation in Qatar's first and only CR program, from inception.

**Methods:** This was a retrospective, observational study of patients referred to Heart Hospital's CR program from January 2013-September, 2018. The program offered 3 sessions/week over 6–12 weeks, depending on patient risk. An initial assessment was performed, and outcomes (i.e., functional capacity, risk factors, and psychosocial well-being (quality of life [SF-36] and depressive symptoms) were re-assessed post-program in those who did not drop-out. Session attendance was recorded.

**Results:** 682 patients enrolled; they attended 77.6% of prescribed sessions; 554 (81.2%) completed the program and post-assessment. Improvements in functional capacity were statistically and clinically meaningful (METs  $9.3 \pm 3.3$  pre and  $11.1 \pm 3.7$  post;  $p < 0.001$ ). There were significant improvements in body mass index ( $28.7 \pm 5.2$  kg/m<sup>2</sup> pre and  $28.2 \pm 5.4$  post;  $p < 0.001$ ), waist circumference ( $102.8 \pm 13.0$  cm pre and  $101.8 \pm 13.2$  post;  $p < 0.001$ ), low-density lipoprotein (LDL  $1.9 \pm 0.9$  mmol/L pre and  $1.6 \pm 0.8$  post;  $p < 0.001$ ), total cholesterol ( $3.6 \pm 1.1$  mmol/L pre and  $3.3 \pm 0.8$  post;  $p < 0.001$ ), systolic blood pressure (SBP  $128.5 \pm 17.7$  mmHg pre and  $123.7 \pm 14.8$  post;  $p < 0.001$ ), hemoglobin A1c ( $6.8 \pm 1.6\%$  pre and  $6.5 \pm 1.3$  post;  $p < 0.001$ ) and depressive symptoms (Cardiac Depression Scale score  $78.3 \pm 23.9$  pre and  $66.3 \pm 21.3$  post;  $p < 0.001$ ). Improvements on 7 of the 8 quality of life domains were also observed (all  $p < .05$ ; e.g., physical functioning  $68.2 \pm 24.0$  pre and  $74.9 \pm 24.4$  post).

**Conclusion:** The new Qatari CR program is very engaging to patients, and resulted in clinically significant risk factors (LDL, SBP, and cholesterol) as well as functional capacity and health-related quality of life improvements, which likely translate to reduced morbidity and mortality.

**Keywords:** Cardiac rehabilitation; health-related quality of life; cardiovascular disease; adherence; quality of care; depression

Cardiovascular diseases (CVD) in the Eastern Mediterranean Region (EMR) are the leading cause of disability, accounting for 9.2% of total disability-adjusted life years. The burden of risk factors is also very high in those with CVD in the EMR, yet there is poor control. This puts patients at increased risk of recurrent events.

Cardiovascular rehabilitation (CR) is an established model of outpatient care to mitigate this burden. Network meta-analyses of randomized trials, all of them primarily from Western settings, demonstrate that CR participation results in significantly lower mortality and morbidity. However, despite the fact that CR exists in 12 of the 22 EMR countries [1], there have been few studies on the benefits of CR in the EMR,

stemming only from Saudi Arabia, Egypt, Pakistan and Iran [2–5]. This is despite the fact that risk factor burden (e.g., tobacco use) and hence patient profile differs in this context, which could impact program utilization and outcomes. Indeed, there are also differences in culture, transport, weather and environment, among other factors, in the EMR compared to other regions which could impact utilization, and hence outcomes.

In 2013, Qatar opened a first CR program; it remains the sole program in the country. The purpose of the current study was to evaluate patient: (1) engagement in the program (i.e., adherence and completion), and (2) change in outcomes (i.e., functional capacity, risk factors and psychosocial well-being (quality of life [QoL] and depressive symptoms)) from pre- to post-program among those participating in this new program for the first time.

This is an observational retrospective cohort study, analyzing patients' records obtained from the CR program at the Heart Hospital in Qatar. A waiver of patient consent was received (Hamad Medical Cooperation Medical Research Center [MRC-01-18-431], and Qatar University Institutional Review Board [QU-IRB 1068-E/19]).

Details about the institutional setting and CR program are shown in the Supplemental file.

**Table 1:** Change in Patient Outcomes, N = 554.

Outcome	Pre-CR	Post-CR	Mean Difference	95% CI	p	
Functional capacity (METs)	9.3 ± 3.3	11.1 ± 3.7	1.8 ± 2.1	1.63	1.98	<0.001
Risk Factors						
BMI (kg/m <sup>2</sup> )	28.7 ± 5.2	28.2 ± 5.4	-0.5 ± 2.2	-0.70	-0.31	<0.001
WC (cm)	102.9 ± 13.0	101.8 ± 13.2	-1.2	-1.6	-0.6	<0.001
LDL (mmol/L)	1.9 ± 0.9	1.6 ± 0.80	-0.3 ± 0.8	-0.38	-0.24	<0.001
HDL (mmol/L)	1.0 ± 0.3	1.1 ± 0.3	0.0 ± 0.3	-0.00	0.04	0.066
Cholesterol (mmol/L)	3.6 ± 1.1	3.3 ± 0.8	-0.3 ± 0.9	-0.39	-0.24	<0.001
SBP (mmHg)	128.5 ± 17.7	123.7 ± 14.8	-4.7 ± 15.9	-6.08	-3.42	<0.001
HbA1c (%) <sup>‡</sup>	6.8 ± 1.6	6.5 ± 1.3	-0.3 ± 15.9	-0.45	-0.22	<0.001
Current tobacco use (%)	107 (19.3)	50 (9.0)	-10.3 <sup>†</sup>			<0.001
Quality of life*:						
Physical functioning	68.2 ± 24.0	74.9 ± 24.4	6.7 ± 25.9	2.08	11.35	0.004
Social functioning	77.9 ± 22.2	84.5 ± 18.1	6.5 ± 22.3	2.66	10.53	0.001
Emotional well-being	75.5 ± 17.5	81.3 ± 15.3	5.8 ± 15.9	3.13	8.57	<0.001
General health	67.8 ± 19.2	74.6 ± 19.1	6.8 ± 15.9	4.10	9.61	<0.001
Role limitation due to physical health	71.1 ± 36.3	81.9 ± 30.5	10.0 ± 34.7	3.85	16.31	0.002
Role limitation due to emotional problems	74.1 ± 37.0	81.1 ± 32.3	7.0 ± 38.1	0.18	13.86	0.044
Energy/fatigue	67.6 ± 18.6	74.1 ± 17.0	6.5 ± 16.1	3.57	9.42	<0.001
Pain	79.0 ± 22.7	82.1 ± 18.9	3.1 ± 21.2	-0.74	6.94	0.113
CDS (scores)	78.3 ± 23.9	66.3 ± 21.3	-12.0 ± 15.3	-13.3	-10.8	<0.001

Values are expressed as mean ± standard deviation.

CI, confidence interval; CR, cardiac rehabilitation; BMI, body mass index; WC, waist circumference; LDL, low-density lipoprotein; HDL, high-density lipoprotein; SBP, systolic blood pressure; HbA1c, hemoglobin A1c; CDS, Cardiac Depression Scale (CDS).

\* n = 124. According to Cohen, an effect size of 0.2 is an indicator of at least a small effect [9]. Effect sizes for physical functioning (d = 0.27, 95% confidence interval [CI] = 0.11–0.47), social functioning (d = 0.29, 95% CI = 0.11–0.47), emotional well-being (d = 0.33, 95% CI = 0.17–0.48), role limitation due to physical health (d = 0.27, 95% CI = 0.10–0.44), role limitation due to emotional problems (d = 0.21, 95% CI = 0.005–0.42), energy/fatigue (d = 0.34, 95% CI = 0.19–0.50) and general health (d = 0.35, 95% CI = 0.21–0.50) were all above this threshold.

<sup>‡</sup> Among n = 224 patients diagnosed with diabetes.

<sup>†</sup> Change in percentage.

The study sample included all patients who enrolled in the sole Qatar CR program, from program inception (January 2013) to September 2018. Patients were  $\geq 18$  years. There were no exclusion criteria for the study.

For objective 1, adherence was defined as proportion of prescribed sessions attended. Completion was defined as undertaking the post-program assessments. Outcomes were: functional capacity (peak metabolic equivalents [METs]), risk factors (i.e., systolic blood pressure [SBP; mmHg] using automated blood pressure monitors, lipids [cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL)], body mass index [BMI; kg/m<sup>2</sup>], and self-reported tobacco use), as well as psychosocial well-being (QoL [SF-36] and depressive symptoms [Cardiac Depression Scale]; further details regarding these scales are found in the Supplemental file).

Data were analyzed using STATA v16. A paired-sample t-test was performed to assess change from pre- to post-program in the continuous outcome measures, and chi-square test for categorical measures (e.g., tobacco use % pre to post-program).

During the period of study, 682 patients enrolled in the program; their characteristics are shown in Supplemental Table 1. Participants attended a mean of  $20.4 \pm 12.3$  sessions (median = 22.0), or 77.6% of prescribed sessions and 554 (81.2%) patients completed the program and post-program assessment. As also shown in the Table, there was some retention bias.

As shown in **Table 1**, participants experienced statistically-significant improvements in all outcomes, except for HDL. QoL also improved significantly in all domains except pain. There was a statistically significant reduction in the proportion of current tobacco users from pre to post-program.

This is the first study to test the effects of CR in Qatar; as anticipated the patients who accessed CR were very engaged in the program, and realized significant improvements in outcomes; the implications of these findings are shown in the Supplemental Appendix. Although rates of adherence and completion vary and are not well-established, these rates do seem much higher than what is observed in Western settings (e.g., 70% adherence in a meta-analysis) [6], but are consistent with the higher adherence shown in other low-resource settings [7].

Functional capacity improved by 19.3%, or approximately 2 METs, which is greater than the .5–1 MET threshold to indicate a “quality” program and which is associated with mortality reductions [8]. With regard to risk factors, LDL decreased by 15.7%, which could be due to adherence to statins (>90%). A reduction of 10% is clinically significant as it is associated with reduced coronary deaths. Moreover, SBP decreased  $\geq 2$  mmHg, considered clinically-significant. BMI decreased by 1.7%, which would not be considered clinically significant; However, this weight loss was statistically significant and often does not reach significance in most studies, so the results of the program are promising. Tobacco use reductions are also often not assessed or observed with CR, so the reduction observed with the Qatar CR program is very promising, given tobacco cessation is the most impactful secondary prevention change in terms of reducing mortality. QoL subscale scores significantly increased in all domains except pain; this is likely because of a ceiling effect. Effect sizes are shown in **Table 1**, and at least small [9]. Reductions in depressive symptoms were similarly remarkable.

Caution is warranted when interpreting these results. First, with regard to generalizability, data come from a single centre, and therefore generalizability to other programs in the EMR is unknown; certainly, these results are consistent with the benefits observed with CR in Iran [2–5]. Generalizability may also be limited in that the program did not track some key characteristics of the indicated patients at their institution or beyond, to understand how characteristics of the population being referred and receiving CR is different from the characteristics of the population who should be. Second, there is some retention bias in the sample. Third, due to the nature of the design, causal conclusions cannot be drawn; however, these results are in line with the few randomized trials on CR in countries of the EMR [10] and hence it is likely the effects are robust. Indeed, there was no control group, and in future evaluation it will be important to incorporate such a comparison arm.

In conclusion, the new Qatari CR program is very engaging to patients, and results in clinically significant risk factor reduction, as well as functional capacity and psychosocial well-being improvements, which likely translate to reduced morbidity and mortality. Some areas to potentially improve program processes and quality were identified, which will likely be implemented through the program expansion and piloting of the International Cardiac Rehab Registry (ICRR; <https://globalcardiacrehab.com/ICRR-Governance>).

## Additional File

The additional file for this article can be found as follows:

- **Online supplementary file.** This includes: Supplemental Table 1; CR setting description; and Measures description. DOI: <https://doi.org/10.5334/gh.862.s1>

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Data used in the research project have not been made available because Qatar Cardiac Rehabilitation program participants were not asked to consent to make the data available online. However, the corresponding author will consider reasonable requests for data from established investigators with appropriate approvals.

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## Competing Interests

The authors have no competing interests to declare.

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