Assessment of Patient Knowledge of Cardiac Rehabilitation: Brazil vs Canada

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Abstract

Background: Much of the relationship between health status and knowledge about health and disease can be attributed to the combined effects of disparate health-related behavior, environmental conditions, and socioeconomic structures as well as contact with and delivery of health care.

Objective: The aim of this study was to describe and compare knowledge of patients with coronary artery disease (CAD) enrolled in cardiac rehabilitation (CR) programs in Brazil and Canada about CAD-related factors.

Methods: Two samples of 300 Brazilian and 300 Canadian patients enrolled in CR were compared cross-sectionally. Brazilian patients were recruited from 2 CR centers in Southern Brazil, whereas Canadian patients were recruited from 1 CR center in Ontario. Knowledge was assessed using the Coronary Artery Disease Education Questionnaire (CADE-Q), psychometrically validated in Portuguese and English. The data were processed through descriptive statistics, post-hoc and the Student's t-tests.

Results: The mean total knowledge score for the whole sample was 41.42 ± 9.3. Canadian respondents had significantly greater mean total knowledge scores than Brazilian respondents. The most highly knowledgeably domain in both samples was physical exercise. In 13 of 19 questions, Canadian respondents reported significantly greater knowledge scores than Brazilian respondents.

Conclusions: Canadian outpatients reported significantly greater knowledge than their Brazilian counterparts. The results also suggest that having a structured educational curriculum in CR programs may contribute to increased patient knowledge, which may ultimately facilitate behavioral changes. (Arq Bras Cardiol. 2013;101(3):255-262)

Keywords: Cardiovascular Disease; REhabilitation; PatientEducation as Topic; Exercise; Brazil, Canada, Knowledge.

Introduction

The prevalence of coronary artery disease (CAD) is increasing and contributes importantly to the global burden of cardiovascular disease[1]. Although resources for the diagnosis and treatment of CAD are available in most countries, secondary preventive approaches such as cardiac rehabilitation (CR) may not be widely implemented[2]. CR programs are highly underutilized, with rates of enrollment approximately 20% in high-income countries such as Canada[3], and 14% in middle-income countries such as Brazil[4]. However, the availability of these programs is often limited in high-income countries and much more limited in middle-income countries, with less than 60% of the hospitals that treat cardiac patients in Latin America offering any form of CR[2]. Furthermore, the availability and the structure of CR is inadequate. For example, some programs in areas with low availability and underutilization, particularly those in Latin American countries[2], do not adequately address all core CR components.

Patient education has been recognized as a core component of CR, along with other key components such as lifestyle and medical risk factor management, psychosocial health, cardioprotective therapies, long-term management, and audit and evaluation[5,6]. Patient education has formally been defined as "the process by which health professionals and others impart information to patients, which will alter their health behavior or improve their health status[7]." As a facilitator of behavioral changes, patient education therefore plays a key role in the management of CAD[8-10].

While most studies have demonstrated the effects of cardiac patient education on core health outcomes, they fall short of elucidating the social and clinical patient characteristics associated with both outcomes and improved knowledge[11,12]. In this context, given the recognition of the burden of cardiovascular diseases, information regarding knowledge in different CR populations is greatly needed.

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Our intention was to compare these factors between the high-income country, Canada, and Brazil and to explore differences in knowledge about CAD.

Therefore, the aim of this study was to describe and compare knowledge of CAD among patients in Brazil and Canada enrolled in cardiac rehabilitation programs. It was hypothesized that Canadians would report significantly greater knowledge than their Brazilian counterparts.

Methods

Design and Procedure

This was a cross-sectional comparative study. Consent to participate was obtained from all patients. In the CR program, participants were asked to complete a sociodemographic survey and the Coronary Artery Disease Education Questionnaire (CADE-Q). Clinical data were extracted from medical charts.

Data was collected in Brazil between March and June 2009. The Brazilian healthcare structure is divided into public and private systems, with 75.4% of the population covered exclusively by the public system[13]. Most secondary and tertiary health institutions are private and are located in the wealthiest and most populated regions. Neither healthcare system reimburses the cost of CR intervention[13]. CR patients from one private and one public health center in Southern Brazil were approached to participate. Irrespective of the patients having been treated in phase 1 (hospital phase), both Brazil CR programs primarily manage patients who are in phases 2 and 3of CR. Patients attend sessions 2 or 3 times/week, where they mainly undertake exercises. Participation in the program is unlimited, and there is no established educational component.

Data was collected in Canada between July and September 2009. CR patients from the largest program in Ontario were approached to participate. The program is a national leader in the provision of comprehensive, long-term outpatient services involving medical evaluation, prescribed exercise training, cardiac risk factor modification, education and counseling. It intends to manage patients in phase 2 of treatment. Patients have 1 session/week over period of 6–12 months. Each session includes an educational class and exercise. Other activities that may be included are lectures, therapy sessions with psychologists, consultation with doctors, assessment by nutritionists, and peer support groups.

Participants

This study included CR participants with a clinical diagnosis of CAD. The exclusion criteria were age less than 18 years; lack of proficiency in English or Portuguese language (for Canada and Brazil, respectively); and any visual, cognitive, or psychiatric condition that would preclude the participant from completing the survey.

Measures

Participants' clinical characteristics were obtained from their medical charts and focused on cardiac history and risk factors. Sociodemographic characteristics were self-reported. The duration of CR enrollment was self-reported, and recorded in months. CADE-Q was administered to measure and describe the level of knowledge that CR patients had about their disease and related factors[14].

CADE-Q is a 19-item knowledge test used to assess CR patients' level of knowledge of topics related to coronary disease and CR. These topics include (1) pathophysiology and signs and symptoms of the disease; (2) risk factors and lifestyle; (3) diagnosis, treatment, and medication; and (4) physical exercise. Each item has 4 alternatives or statements that correspond to a knowledge level: a correct statement showing "complete knowledge;" a correct statement showing "incomplete knowledge;" an incorrect statement showing "wrong knowledge;" and a "do not know" statement showing a "lack of knowledge." Each alternative is scored as follows: 3 = complete knowledge; 1 = incomplete knowledge; and 0 = wrong knowledge or "do not know." The sum of the final scores leads to a mean total knowledge (maximum of 57 points), which classifies patients into excellent, good, acceptable, poor, or insufficient knowledge about coronary disease and CR. Scores that demonstrate acceptable, good, or excellent knowledge should be more than 70% of maximum score.

CADE-Q was originally developed and psychometrically validated in Brazil by Ghisi et al[14]. It was later translated, culturally adapted, and psychometrically validated to Brazilian Portuguese by Melo Ghisi et al[15]. The Brazilian CADE-Q takes respondents approximately 13 minutes to complete and was shown to have good reliability (Cronbach's alpha = 0.68) and consistency [intraclass correlation coefficient (ICC) = 0.78), and strong construct validity[14]. The English version of CADE-Q takes approximately 11 minutes to complete and has also been shown to have good reliability (Cronbach's alpha = 0.809), consistency (ICC = 0.846) and strong construct validity[15].

Statistical Analysis

SPSS Version 19 was used. Descriptive statistics were used to describe the sociodemographic and clinical characteristics of each group of patients. The Pearson's chi-square, Student's t-test, and analysis of variance (ANOVA), as applicable, were computed to test for significant differences between countries. To establish the reliability of the scale in each language, Cronbach's alpha was computed for the total scale and each subscale.

A descriptive examination of the mean total knowledge and the mean item scores by sample (Brazil vs Canada) was performed. To test for differences between countries, t-tests and ANOVAs were applied. Overall mean differences in total knowledge, and mean item scores were compared in the Brazilian vs Canadian samples.

Results

Respondent Characteristics

With regard to the Brazilian sample, 189 (63%) were recruited from the private site and 111 (37%) from the public site; in the Canadian sample, 300 participants fully completed CADE-Q from the single site. The total number of participants in this study was 600.

Table 1 displays the participant characteristics. Overall, Canadian respondents were significantly more likely than Brazilian respondents to have undergone cardiac surgery or revascularization; have higher education; and have higher family income. Canadian respondents were also less likely than Brazilian respondents to be retired; have heart failure; and have dyslipidemia.

Psychometric Performance of CADE-Q

CADE-Q performed reliably in both contexts and languages, with Cronbach's alpha for the Canadian and Brazilian Portuguese versions being 0.87 and 0.89, respectively.

Binational Comparison of Knowledge

Table 2 displays scores for the 4 types of knowledge assessed using CADE-Q: the mean total knowledge (given by the sum of the final scores), the specific knowledge (derived from the sum of the scores from each area or subscale), the knowledge of each alternatives (based on alternatives marked), and the knowledge per group (expressed in terms of personal characteristics).

The mean total knowledge score for the whole sample was 41.42 ± 9.3, which is classified as very good. Canadian respondents presented significantly greater mean total knowledge scores than Brazilian respondents (Table 2). When calculating the specific knowledge scores for the Canadian sample, the mean subscale scores were 11.78 ± 3.54 for pathophysiology and signs and symptoms of the disease; 17.26 ± 3.89 for risk factors and lifestyle; 18.93 ± 4.34 for diagnosis, treatment, and medication; and 19.63 ± 3.78 for physical exercise. For the Brazilian sample, the mean subscale scores for specific knowledge were 11.19 ± 4.49 for pathophysiology and signs and symptoms of the disease; 16.33 ± 3.79 for risk factors and lifestyle; 13.85 ± 3.76 for diagnosis, treatment, and medication; and 16.87 ± 3.97 for physical exercise. Canadian respondents presented significantly greater knowledge in 3 of the 4 areas than their Brazilian counterparts. With regard to knowledge scores per alternative marked, Canadian responders had significantly superior scores than Brazilians; the latter gave significantly more "do not know" scores.

Means and standard deviations of each question for Brazilian and Canadian respondents are reported in detail in Table 3. As shown, Canadian respondents reported significantly greater knowledge scores than Brazilians in 13 of the 19 questions. The greatest disparities in mean scores between Brazilian and Canadian respondents were in the following questions: the definition of coronary artery disease, 1.51 ± 1.6 vs 2.10 ± 9.1, respectively; the use of "nitroglycerin," 1.17 ± 4.2 vs 2.05 ± 2.5, when to avoid physical exercise, 0.52 ± 2.6 vs 1.75 ± 1.9, respectively; and the psychological stress 2.78 ± 2.5 vs 1.85 ± 6.3, respectively.

Table 1 – Sociodemographic and Clinical Characteristics of Brazilian and Canadian Respondents by Country (n = 600)

Characteristics/Categories	Brazil (n = 300; 50%)	Canada (n = 300; 50%)	p†
Sociodemographic[a]			
Age, years (mean ± SD)	63.72 ± 1	64.02 ± 9.9	0.717
Sex, female n (%)	73 (24.3%)	64 (21.3%)	0.381
Participation in CR, months (mean ± SD)	22.83 ± 38.8	4.2 ± 2.6	< 0.001†††
Occupation n (%)			< 0.01††
Retired	153 (51.5%)	119 (40%)	
Secondary Level	48 (16%)	22 (7.3%)	
University Level non-medical	33 (12%)	86 (28.8%)	
University Level medical-related	4 (1.2%)	10 (3.3%)	
Home	35 (11.6%)	8 (3%)	
Autonomous	14 (5%)	12 (4%)	
Government work	8 (3%)	0 (0%)	
Did not answer	1 (0.3%)	41 (13.6%)	
Education Level n (%)			< 0.01††
Elementary School	97 (32.3%)	2 (0.6%)	
High School	72 (24%)	66 (22%)	
College	40 (13.3%)	75 (25%)	
University	68 (22.6%)	89 (29.6%)	
Graduate School	22 (7.3%)	48 (16%)	
Did not answer	1 (0.3%)	20 (10%)	
Family Income n (%)			< 0.01††

Continuation			
Level 1	14 (4.6%)	2 (0.6%)	
Level 2	137 (45.6%)	53 (17.6%)	
Level 3	69 (23%)	104 (34.6%)	
Level 4	37 (12.3%)	62 (20.6%)	
Level 5	42 (14%)	34 (11.3%)	
Did not answer	1 (0.3%)	45 (15%)	
Clinical[b] n (%)			
Hypertension	234 (78%)	157 (52.3%)	< 0.01††
Heart Failure	53 (17.7%)	19 (6.3%)	< 0.01††
Diabetes Type I	17 (5.7%)	9 (3%)	0.109
Diabetes Type II	63 (21%)	51 (17%)	0.212
Peripheral Vascular Disease	43 (14.3%)	36 (12%)	0.398
Dyslipidemia	196 (65.3%)	88 (29.3%)	< 0.01††
Chronic Obstructive Pulmonary Disease	4 (1.2%)	8 (2.7%)	0.251
Previous MI	51 (17%)	130 (43.3%)	0.078
Prior Cardiac Surgery	204 (68%)	236 (78.7%)	< 0.01††
Prior CABG	98 (32.7%)	129 (43%)	< 0.01††
Prior PCI	70 (23.3%)	60(20)	0.235
Prior CABG + PCI	35(11.7%)	26(8.7%)	0.271

CR: cardiac rehabilitation; MI: myocardial infarction; CABG: coronary bypass artery graft surgery; PCI: percutaneous coronary intervention. Family income is presented in "levels;" each level corresponds to an adjusted value related to each countries own classification (monthly or annually), as follows:
Level 1: Brazil: 1–5 minimum salaries monthly; Canada: less than C$10.000 per year
Level 2: Brazil: 5–10 minimum salaries monthly; Canada: between C$11.000 and C$50.000 per year
Level 3: Brazil: 10–15 minimum salaries monthly; Canada: between C$51.000 and C$100.000 per year
Level 4: Brazil: 15–20 minimum salaries monthly; Canada: between C$101.000 and C$150.000 per year
Level 5: Brazil: above 20 minimum salaries monthly; Canada: above C$150.000 per year.
[†]significant differences between countries: [†]p < .05; [††]p < .01; [†††]p < .001; [a]self-reported; [e]extracted from medical chart.

Table 2 – Mean CADE-Q Knowledge Scores for Brazilian and Canadian Respondents by the 4 types of knowledge assessed using CADE-Q (n = 600)

Type of Knowledge		Maximum Scores	Brazil (n = 300, 50%)	Canada (n = 300, 50%)	p[†]	p[§]
			Mean ± SD			
General Knowledge		57	39.34 ± 9.1	43.49 ± 9.4	< 0.01††	-
Specific Knowledge	Area 1	15	11.19 ± 4.5	11.78 ± 3.5	0.07	-
	Area 2	24	16.33 ± 3.8	17.26 ± 3.9	< 0.01††	-
	Area 3	24	13.85 ± 3.8	18.93 ± 4.3	< 0.01††	-
	Area 4	24	16.87 ± 4.0	19.63 ± 3.8	< 0.01††	-
Knowledge per Questions	Complete	19	11.86 ± 3.4	13.47 ± 3.4	0.03†	-
	Incomplete	19	3.78 ± 2.0	3.00 ± 2.0	0.06	-
	Wrong	19	0.99 ± 1.1	0.64 ± 0.7	0.07	-
	Do not know	19	2.39 ± 2.5	1.88 ± 2.6	0.01†	-

Continuation

Knowledge of groups	Age	Above 65 years of age	43.2 ± 7.5	44.9 ± 8.3	0.001††	< 0.001§§§
		Up to 65 years of age	35.7 ± 10	42.4 ± 10	0.03†	
	Gender	Male	39.9 ± 8.8	44.5 ± 8.6	0.02†	0.01§
		Female	37.5 ± 9.8	39.9 + 11.3	0.24	
	Clinical	Hypertension	38.9 ± 9.6	43.6 ± 9.5	0.17	-
		Heart Failure	43.2 ± 6	44.3 ± 7.3	0.14	-
		Dyslipidemia	39.6 ± 8.9	44.92 ± 8.2	0.05	-
		Diabetes Type I	46 ± 3.8	38.22 ± 11.6	< 0.001†††	-
		Diabetes Type II	38 ± 10.3	45.8 ± 6.9	0.02†	-
		Peripheral Vascular Disease	41.3 ± 7.8	45.42 ± 6.6	0.96	-
		Chronic Obstructive Pulmonary Disease	44.25 ± 3.8	44.63 ± 10.2	0.52	-
		Previous Myocardial Infarction	35.14 ± 11.6	44.08 ± 9.1	0.007††	-
		Prior Cardiac Surgery	40.02 ± 8.9	44 ± 8.8	0.87	-
	Participation in CR	1 month	38.6 ± 9.1	43.5 ± 8	< 0.001†††	0.01§
		2–6 months	36.1 ± 9.8	43.6 ± 9.6	< 0.001†††	
		7–12 months	40.7 ± 8.5	43.7 ± 9.0	0.01†	
		More than 1 year	43.3 ± 6.3	-	-	
	Occupation	Retired	37.48 + 9.7	42.33 ± 9.6	0.002††	0.05
		Secondary Level	41.10 ± 6.6	45.18 ± 7.8	0.06	
		University Level non-medical	46.45 ± 3.6	46.12 ± 7.8	0.98	
		University Level medical	49.75 ± 4.3	49.9 ± 3.2	0.95	
		Home	34.86 ± 10.2	32.38 ± 12.3	0.03†	
		Autonomous	39.5 ± 4.7	45.75 ± 6.06	0.12	
	Education Level	Elementary School	35.52 ± 9.7	39.50 ± 9.1	< 0.001†††	< 0.001§
		High School	36.86 ± 9.3	40.38 ± 10	0.01†	
		College	42.58 ± 7.3	41.92 ± 9.4	0.07	
		University	43.65 ± 6.1	46.79 ± 7.1	0.04†	
		Graduate School	45.64 ± 4.9	46.4 ± 8.4	0.8	
	FamilyIncome	Level 1	37.36 ± 6.7	39.50 ± 9.1	0.05	0.04§
		Level 2	36.6 ± 9.1	39.21 ± 10.9	0.01†	
		Level 3	38.41 ± 10.2	44.25 ± 8.4	0.001††	
		Level 4	43.92 ± 5.5	46.52 ± 6.3	0.01†	
		Level 5	46.17 ± 4.4	47.32 ± 6.4	0.04†	

CR indicates cardiac rehabilitation. Family income is presented in "levels;" each level corresponds to an adjusted value related to each countries own classification (monthly or annually), as follows:
Level 1: Brazil: 1–5 minimum salaries monthly; Canada: less than C$10.000 per year
Level 2: Brazil: 5–10 minimum salaries monthly; Canada: between C$11.000 and C$50.000 per year
Level 3: Brazil: 10–15 minimum salaries monthly; Canada: between C$51.000 and C$100.000 per year
Level 4: Brazil: 15–20 minimum salaries monthly; Canada: between C$101.000 and C$150.000 per year
Level 5: Brazil: above 20 minimum salaries monthly; Canada: above C$150.000 per year
†significant differences between countries: †p < .05; ††p < .01; †††p < .001; §significant differences between some groups, not taking country into account: §p < .05; §§p < .01; §§§p < .001.

Table 3 – Mean CADE-Q Knowledge Scores for Brazilian and Canadian Respondents by questions (n = 600)

	CADE-Q Questions (mean ± SD)	Brazil (n = 300, 50%)	Canada (n = 300, 50%)	p†
		Mean ± SD		
Q1	Coronary Artery Disease (CAD) is	1.51 ± 1.6	2.10 ± 9.1	< 0.001†††
Q2	Which factors have the most influence on the risk of myocardial infarction?	2.67 ± 3.4	2.61 ± 1.3	0.16
Q3	Which description below is a typical symptom of CAD?	2.24 ± 3.6	2.54 ± 0.8	0.007††
Q4	Which of the following statements is most accurate regarding our understanding of CAD?	2.11 ± 2.5	2.55 ± 8.9	< 0.001†††
Q5	The best time of the day for people with coronary disease to carry out their prescribed exercise is:	2.37 ± 5.2	2.68 ± 2.1	< 0.001†††
Q6	Of the investigations listed below, which ones provide the most precise information about the diagnosis and prognosis of CAD?	2.46 ± 3.0	2.22 ± 3.3	0.02†
Q7	Which of the following statements about the management of blood cholesterol levels is most accurate?	2.34 ± 1.8	2.70 ± 3.3	< 0.001†††
Q8	Which of the following statements about the use of "nitroglycerin" is most accurate?	1.17 ± 4.2	2.05 ± 2.5	< 0.001†††
Q9	Which of the following dietary components is usually recommended to persons with CAD?	1.70 ± 4.8	1.55 ± 1.5	0.01†
Q10	Which values for LDL cholesterol and HDL cholesterol are the optimal targets persons with established CAD (values in mmol/l)?	1.18 ± 2.7	1.55 ± 1.7	< 0.001†††
Q11	Under which of the following conditions would you avoid carrying out your usual physical exercise?	0.52 ± 2.6	1.75 ± 1.9	< 0.001†††
Q12	While walking, if you experience a new episode of severe chest discomfort that you think that is angina, you should:	2.20 ± 3.2	2.51 ± 7.6	< 0.001†††
Q13	Based on your knowledge about physical exercise and CAD, choose the most appropriate statement below:	2.65 ± 2.4	2.75 ± 2.1	0.09
Q14	Guidelines for Physical Activity for people with coronary disease should be based upon which of the following:	2.20 ± 5.1	2.59 ± 1.4	< 0.001†††
Q15	Which of the following favourable physiological and bodily changes resulting from regular physical exercise are most important to long term cardiac health?	1.64 ± 1.8	2.08 ± 1.9	< 0.001†††
Q16	Which of the following statements best describes the pattern for exercise activity in persons recovering from a heart event:	2.42 ± 1.8	2.20 ± 1.4	0.02†
Q17	Which of the following statements is the most appropriate guidance around levels of blood pressure levels in persons with CAD:	2.45 ± 8.3	2.26 ± 1.7	< 0.001†††
Q18	Which of the statements below regarding psychological stress is most correct?	2.78 ± 2.5	1.85 ± 6.3	< 0.001†††
Q19	Which interventions can extend and improve a patient's quality of life for persons recovering from a cardiac event?	2.73 ± 3.8	2.90 ± 2.3	< 0.001†††

CADE-Q indicates Coronary Artery Disease Education Questionnaire
†significant differences between countries: †p < .05; ††p < .01; †††p < .001.

Validity of both language versions of CADE-Q was also supported by mean total knowledge results per group. As shown in Table 2, younger respondents (<65 years old) presented significantly greater knowledge scores than participants older than 65 years, in both countries. Differences were also observed with regard to gender, with male participants having significantly greater knowledge scores than female respondents. Moreover, when comparing respondents with previous myocardial infarction and type II diabetes, Canadians had significantly greater knowledge than their Brazilian counterparts. However, Brazilian respondents with type I diabetes had superior knowledge to their Canadian counterparts.

An additional 4 groups were created for the analysis of knowledge scores by duration of participation in CR: 1 month; 2–6 months; 7–12 months; and more than 1 year. Overall, there were significant differences between these participation groups. It was found that patients that had spent more time in CR, had higher knowledge scores; however, the difference and gradual increase applied only to the Brazilian sample.

In addition to these groups, patient knowledge was assessed by occupation, educational level, and family income. Overall, higher educational level and higher family income were significantly associated with higher knowledge scores. With regard to occupation, retired Canadian respondents had significantly greater knowledge scores than their Brazilian counterparts; conversely, Brazilian respondents who worked from home presented significantly greater knowledge scores than their Canadian counterparts.

Discussion

This study investigated knowledge related to CR across two different countries; we believe this is the first such comparison. CR programs have not only been offered in a limited number of Brazilian institutions for the last three decades[16] but also have inadequately addressed the core components of CR, including patient education. Given the growing epidemic of non-communicable diseases such as CVD in low and middle-income countries, this study sought to compare the knowledge of patients with CAD in such countries with comparable patients in a high-income context where patient education is explored, but not well investigated. In agreement with our hypothesis, Canadian outpatients reported significantly greater knowledge than their Brazilian counterparts. The most highly knowledgably areas in Canada were risk factors and lifestyle; diagnosis, treatment, and medication; and physical exercise.

Of note, the identification of participants with higher knowledge levels is an important finding in this study and could be useful in identifying CR participants who have educational barriers. Participants with higher knowledge levels included: younger, male, Canadian respondents with previous myocardial infarction and diabetes type II; Brazilian respondents with diabetes type I, higher educational levels and higher family income; and retired Canadians and Brazilians who work from home. Of note, the impact of sociodemographic factors on cardiac patient education has been reported elsewhere[10,17-20]. Our study agreed that an individual's cultural and sociodemographic status are crucial to how they perceive and interpret the world; therefore, these factors influence the knowledge acquired by different groups as well as their reactions to them and the strategies necessary to promote patient education.

The participation in CR arguably has an impact on knowledge. In this study, a significant difference was identified between participation groups and patients with more months of participation demonstrated higher knowledge scores. However, there is insufficient evidence for this relationship in the Canadian sample. This may be due to the need for healthcare providers to educate cardiac patients in the hospital setting in a better manner, or it may be that Canadian health campaigns and current educational practices may not be in line with the needs of patients.

Caution is warranted when interpreting our results. The chief limitation is selection bias, and it is unknown how generalizable the samples from each country are, particularly in relation to "the average" CR patient. Given the low attendance and enrollment in CR programs, it is likely that the results are underrepresented in this sample. Moreover, there were significant differences in the sociodemographic and clinical characteristics of the Canadian and Brazilian samples as well as the characteristics of each CR program, which may have affected the knowledge levels reported. Second, and also related to generalizability, the context of recruitment within each country should be taken into consideration. In Canada, participants were recruited from the province of Ontario where CR is paid through local healthcare coverage. In Brazil, participants were recruited from Santa Catarina, the Brazilian state with the most established CR history[16]. Finally, due to the multiple comparisons, error rates could have been inflated. Repeating the study with a greater number of high and middle income countries is warranted, using a multivariate approach. Moreover, a comparison of the knowledge differences between CR attendees and non-attendees would be valid in understanding the true impact of CR programs in patient education.

Conclusion

This study has examined the knowledge of CR participants in two different settings: a middle-income country (Brazil) and a high-income country (Canada). The results support our hypothesis that Canadian respondents have higher levels of knowledge about their condition. The results also suggest that having a structured educational curriculum in the CR program may contribute to increased patient knowledge, which ultimately may facilitate behavioral changes.

Author contributions

Conception and design of the research, Statistical analysis and Obtaining funding: Ghis GLM, Benetti M; Acquisition of data, Analysis and interpretation of the data and Critical revision of the manuscript for intellectual content: Ghis GLM, Oh P, Thomas S, Benetti M; Writing of the manuscript: Ghis GLM.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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References

1. Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, et al; American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics – 2012 update: a report from the American Heart Association. Circulation.2012;125(1):e2-e220. Erratum in: Circulation. 2012;125(22):e1002.
2. Korenfeld Y, Mendoza-Bastidas C, Saavedra L, Montero-Gómez A, Perez-Terzic C, Thomas RJ, et al. Current status of cardiac rehabilitation in Latin America and the Caribbean. Am Heart J.2009;158(3):480-7.
3. Suaya JA, Shepard DS, Normand SL, Ades PA, Prottas J, Stason WB. Use of cardiac rehabilitation by Medicare beneficiaries after myocardial infarction or coronary bypass surgery.Circulation. 2007;116(15):1653-62.
4. Avram A, Iurciuc S, Craciun L, Avram C, Iurciuc M, Sarau C, et al. Euroaspire III Romania: The need to reinforce cardiac rehabilitation patients with coronary artery disease. TMJ. 2010;60(4):299-304.
5. Stone JA, Arthur HM, &Suskin N. Canadian guidelines for cardiac rehabilitation and cardiovascular disease prevention: translating knowledge into action.3rded. Winnipeg: CanadianAssociationofCardiacRehabilitation; 2009.
6. British Association for Cardiac Rehabilitation. (BACPR).The BACPR standards and core components for cardiovascular disease prevention and rehabilitation.2nd ed. 2012.[Cited in 2012 Dec 10]. Available from: http://www.bacs.com/documents/afiliates/bacr/BACR%standards%2022007.pdf
7. Koongstvedt P. The managed health care handbook.Gaithersburg: Aspen Publishers; 2001.
8. Karner A, Goransoon A, Bergdahl B. Patients' conceptions of coronary heart disease a phenomenographic analysis. Scand J Caring Sci. 2003;17(1):43-50.
9. Alm-Roijer C, Fridlund B, Stagmo M, Erhardt L. Knowing your risk factors for coronary heart disease improves adherence to advice on lifestyle changes and medication. J CardiovascNurs. 2006;21(5):E24-31.
10. Kayaniyil S, Ardem CI, Winstanley J, Parsons C, Brister S, Oh P, et al. Degree and correlates of cardiac knowledge and awareness among cardiac inpatiens. Patient Educ Counsel. 2009;75(1):99-107.
11. FredericksS, Guruge S, Sidani S, Wan T. Postoperative patient education: a systematic review.*ClinNurs Res.2010;19(*2):144-64.
12. Brown JP, Clark AM, Dalal H, Welch K, Taylor RS. Effect of patient education in the management of coronary heart disease: a systematic review and meta-analysis of randomized controlled trials. Eur J PrevCardiol.2012 May 22. [Epub ahead of print].
13. Polanczyk CA, Ribeiro JP. Coronary artery disease in Brazil: contemporary management and future perspectives. Heart. 2009;95(11):870-6.
14. GhisiGL, Durieux A, Manfroi WC, Herdy AH, Carvalho T, Andrade A, et al. [Construction and validation of the CADE-Q for patient education in cardiac rehabilitation programs].Arq Bras Cardiol. 2010;94(6):813-22.
15. de MeloGhisi GL, Oh P, Thomas S, Benetti M. Development and validation of an English version of the Coronary Artery Disease Education Questionnaire (CADE-Q). Eur J PrevCardiol.2013;20(2):291-300.
16. Guzman SV, López-Grillo L, Dorossiev DL, Fehér J, Rosenthal J. Cardiac rehabilitation in different geographic areas. AdvCardiol. 1986;33:142-51.
17. Potvin L, Richard L, Edwards AC. Knowledge of cardiovascular disease risk factors among the Canadian population: relationships with indicators of socioeconomic status. CMAJ. 2000;162(9 Suppl):S5-11.
18. Roter DL, Stashefsky-Margalit R, Rudd R. Current perspectives on patient education in US. Patient EducCouns. 2001;44(1):79-86.
19. Khan MS, Jafary FH, Jafar TH, Faruqui AM, Rasool SI, Hatcher J, et al. Knowledge of modifiable risk factors of heart disease among patients with acute myocardial infarction in Karachi, Pakistan: a cross sectional study. BMC CardiovascDisord. 2006;6:18.
20. Fiscella K, Tancredi D.Socioeconomic status and coronary heart disease risk prediction. JAMA. 2008;300(22):2666-8.