Physical activity levels in Atlantic Canadian CVD Patients

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INTRODUCTION

Sixty years ago as many as 35% of Canadians who suffered a heart attack did not survive. Today, through early diagnosis and improved treatment options, as many as 95% of those who reach a hospital will survive.[1] As a result, an estimated 1.3 million Canadians are living with heart disease and an additional 317,500 are living with the effects of stroke.[2] Despite improved survival rates, many of those with a history of a heart attack or stroke struggle to recover and are often unable to maintain potentially lifesaving behavioral modifications. For example, despite the well documented health and cardio-protective benefits associated with physical activity, many individuals struggle to maintain optimal levels of physical activity following cardiac rehabilitation.[3-5] Using a population based sample from Atlantic Canada, this report describes and compares the physical activity levels of individuals with a self-reported history of a major cardiovascular event (i.e., myocardial infarction and/or stroke) with those who have never experienced either event.

METHODS

Study Design and Sample

This retrospective, population-based cohort study drew participant data from the Atlantic Partnership for Tomorrow's Health (PATH) project. A total of 26,115 participants were included in the present analyses. Participants who did not provide valid responses to physical activity behaviors and potential confounders (sex, age, smoking status, body mass index) were excluded from the final analyses (n=5,058).

Data Collection

Study conduct and data collection has been previously described.[6,7] In brief, baseline socio-demographics, presence/absence of a major cardiovascular event (i.e., myocardial infarction and/or stroke), smoking status, height and weight, and physical activity[8] were captured through self-report. Where available, height and weight measured by a research nurse at a study assessment center was used.

Statistical Analyses

Analyses were conducted using SAS 9.4 for Windows (SAS, Carey, NC). Descriptive statistics of the cohort were calculated as frequency with percentage, or mean with standard deviation where appropriate. Logistic regression was used to determine the relationship between cardiovascular events and physical activity from univariate model, and multivariable model while controlling for confounders. Individuals with no prior history of a major cardiovascular event were chosen as the reference group. For the primary outcome variable, physical activity, the probability of ***not*** meeting physical activity guidelines was modeled.

RESULTS

The study cohort included 26,115 PATH participants with age between 35 and 69 years old (69.6% female). The prevalence of a major cardiovascular event in the study cohort was 2.6% (n=681). A higher proportion of participants who have suffered a major event (23.8%) were classified as inactive, compared to those who had not reported a cardiovascular event (17%). Participants with a history of a major cardiovascular event were also older, more likely to have smoked and/or be obese than those who had never reported an event (Table 1).

In the univariate logistic regression analyses, participants with a self-reported cardiovascular event were more likely to fail to meet minimum physical activity guidelines[1] (OR=1.52, 95% CI 1.27-1.82) than participants without a history of a major cardiovascular event. These findings remained significant after

[1] The American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Survivors recommends that cancer survivors between the ages of 18-64 years engage in a minimum of 150 minutes of moderate intensity or 75 minutes of vigorous intensity (or some combination) physical activity each week.

adjusting for sex, age, smoking status, body mass index (BMI), and household income (OR=1.44, 95% CI 1.2-1.73) (Table 2).

Table 1. Characteristics of participants by cardiovascular disease status

Characteristic	Non-CVD participants N=25434		Participants with CVD events N=681		Total N=26115	
	n	%	n	%	n	%
Sex						
Male	7578	29.8	369	54.2	7947	30.4
Female	17856	70.2	312	45.8	18168	69.6
Physical activity[€]						
Inactive	4329	17.0	162	23.8	4491	17.2
Moderately active	7103	27.9	153	22.5	7256	27.8
Active	14002	55.1	366	53.7	14368	55.0
Age	Mean age=52.8 SD=9.0		Mean age=60.1 SD=7.3		Mean age=53, SD=9.1	
<40	2462	9.7	11	1.6	2473	9.5
40-59	15953	62.7	248	36.4	16201	62.0
>60	7019	27.6	422	62.0	7441	28.5
Household income						
$<25 000	1090	4.3	58	8.5	1148	4.4
$25 000–49 999	4004	15.7	195	28.6	4199	16.1
$50 000–74 999	5125	20.2	151	22.2	5276	20.2
$75 000–149 999	10433	41.0	181	26.6	10614	40.6
$>150 000	3127	12.3	41	6.0	3168	12.1
Unknown	1655	6.5	55	8.1	1710	6.5
Smoking status[ŧ]						
Never smoked	13023	51.2	221	32.5	13244	50.7
Ever smoked	12411	48.8	460	67.5	12871	49.3
Body mass index	Mean BMI=28.4 SD=5.9		Mean BMI=29.1 SD=6		Mean BMI=28.4, SD=5.9	
Low/normal weight (≤24.9kg/m^2)	7925	31.2	183	26.9	8108	31.0
Overweight (≥25.0 <30.0kg/m^2)	9225	36.3	236	34.7	9461	36.2
Obese (≥30.0kg/m^2)	8284	32.6	262	38.5	8546	32.7

CVD – cardiovascular disease (includes self-reported myocardial infarction and/or stroke).
[€] Physical activity levels: Inactive was classified as not meeting guidelines. Moderately active and active were classified as meeting guidelines. [ŧ] Never smoked = self-reported never having smoked 100 cigarettes in their life. Ever smoked = self-reported having smoked at least 100 cigarettes in their lifetime.

Table 2. Unadjusted and adjusted odds ratios and 95 % confidence intervals from logistic regression for relationship between physical activity level and CVD status (probability of "not meet minimum PA guidelines" was modeled)

	Physical activity (PA)[€]

CVD status	Meeting minimum PA guidelines N (%)	Not meeting minimum PA guidelines N (%)	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)[£]
Non-CVD participants	21105(82.98)	4329(17.02)	Reference	Reference
CVD participants	519(76.21)	162(23.79)	1.52(1.27,1.82)	1.45(1.21,1.74)

CVD – cardiovascular disease (includes self-reported myocardial infarction and stroke).
[€] Physical activity levels: Inactive was classified as not meeting guidelines. Moderately active and active were classified as meeting guidelines.
[£]Adjusted for sex, age, smoking status, body mass index, and household income

DISCUSSION

The role that physical activity plays in both the primary (i.e., reduce disease risk) and secondary (i.e., reduced disease impact) prevention of cardiovascular disease has been well-documented.[9] Thus, it was not surprising to find that those participants within the PATH cohort that were *not* meeting physical activity guidelines were also more likely to report having a history of a major cardiovascular event. However, given the retrospective nature of the study, we cannot report with certainty whether the lower levels of physical activity preceded the cardiovascular event or were a product of having suffered such an event. While physical activity has been shown to play an important role in reducing the impact of disease (including disease progression and recurrence), there is evidence that a major cardiovascular event can have a significant negative impact on overall physical activity levels.[3-5] For example, myocardial infarction has been shown to decrease aerobic capacity, which then impacts the amount and intensity of physical activity an individual can perform.[10] However, given the high levels of physical inactivity[2] reported within the Atlantic Provinces (47.6% NS, 50.8% NB, 50.8% PEI, 51.7% NL)[11] it reasonable to speculate that many participants had low levels of physical activity *prior to* developing a major cardiovascular event.

The development of cardiovascular disease has been linked with several additional risk factors, including age, smoking, and overweight/obesity.[9,12] In the present cohort, of those participants who reported a major cardiovascular event, 62% were over the age of 60 at the time of the event, 67% had smoked sometime in their lifetime, 34.7% were overweight and 38.5% were obese. With the exception of being overweight all the

[2] Physical inactivity was defined as an average daily energy expenditure of less than 1.5 kcal/kg/day.

aforementioned values were higher in those that reported a history of a major cardiovascular event verses those who did not report a cardiac event. Thus, it is likely that increased age and higher levels of unhealthy lifestyle behaviors (including physical activity) in participants with a history of a major cardiovascular event were contributing factors to the development of their disease.[9]

One of the most striking findings of this study was that 83% of participants without a history of a major cardiovascular event and 76.2% of participants who reported an event met the recommended guidelines for physical activity. This is in stark contrast to the results from the Canadian Health Measures Survey (CMHS) which reported that only 15% of Canadians met physical activity guidelines.[13] The marked difference in results between studies is likely a factor of how levels of physical activity were calculated. In contrast to the CMHS study which measured physical activity objectively using accelerometers, the PATH study utilized the self-reported International Physical Activity Questionnaire (IPAQ).[8] While the IPAQ is a valid and widely used measure of physical activity, there are several limitations associated with its use. Specifically, self-reported physical activity is subject to recall and social desirability bias, which can lead to an overestimation of physical activity levels.[14] In fact one study that compared self-reports (IPAQ) to objective measures found that of the 90% of respondents that self-reported meeting the minimal physical activity guidelines fewer than 30% met guidelines when assessed with an objective measure.[15] Thus, it is likely that the overall levels of physical activity presented among PATH participants are lower than reported.

Another interesting finding was that the prevalence of a major cardiovascular event in the PATH cohort was only 2.6%. This is 2-fold lower than the self-reported prevalence of heart disease at a national level (5%) and 2-3 fold lower than what has been reported regionally (6.3% NS, 6.3% NB, 6.1% NF, 5.4% PEI).[16] Similar to physical activity levels, the differences in the prevalence of self-reported heart disease are likely attributable to how the data were collected. For example, data from the Canadian Community Health Survey (CCHS) show rates of heart disease in the Atlantic provinces ranging from 5.4%-6.3%.[16] However, the CCHS included data from participants 12 years or older, whereas the PATH data only included individuals between 35 and 69 years of age.

Thus, it is possible that differences in cardiac disease prevalence are attributable to the different age ranges surveyed. Although the data from the CCHS show that the prevalence of cardiovascular disease in individuals aged 12 to 39 years was 1% or less, the prevalence of cardiovascular disease in those 70-79 years was 18.9% and 25.9% in those over 80 years.[16] Thus, the differences in ages ranges sampled between the two studies is likely partially attributable to the differences in the prevalence of cardiovascular disease reported. Another notable difference between the two studies was how the question about heart disease was asked. In the CCHS participants were asked "do you have heart disease?" whereas PATH participants were specifically asked if they had ever had suffered a heart attack (myocardial infarction) or a stroke. The differences in the structure of the question regarding heart disease/prior CVD events also likely contributed to the difference in the self-reported prevalence of cardiovascular events between the two studies.

CONCLUSIONS/IMPLICATIONS

Overall, this study shows that those participants with a history of a major cardiovascular event tended to older, less physically active, and have more unhealthy behaviors (e.g., ever smoker). These findings suggest that despite public health efforts to educate the public on how to prevent cardiovascular disease through lifestyle change, behaviors associated with CVD risk, such as physical inactivity, persist at high levels among those with a history of cardiovascular events.

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