ORIGINAL ARTICLE

Physical Activity Levels, Perceived Barriers to Exercise and Development of Secondary Conditions in Community Dwelling Persons with Spinal Cord Injury

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ABSTRACT

Objective: *To determine physical activity levels of community dwelling persons with spinal cord injury (SCI) who received inpatient rehabilitation at the Sir John Golding Rehabilitation Centre (SJGRC). This study also explored the perceived barriers to exercise and the development of secondary health complications.*

Methods: *A non-experimental cross-sectional analysis of relationships was done. Participants were recruited from the SJGRC discharge files. Three questionnaires (The Physical Activity and Disability Scale, Spinal Cord Injury Secondary Conditions Scale and the Barriers to Exercise and Disability Scale) were administered* via *a telephone interview.*

Results: *Only 58.3% of patients were engaged in some form of exercise and of that amount only 6% engaged in vigorous exercise. The main secondary conditions affecting both persons with paraplegia and quadriplegia were spasticity, chronic, muscle and joint pain. There were no significant differences between persons having paraplegia and quadriplegia in relation to physical activity levels, development of secondary conditions or barriers to exercise. Most persons were interested in an exercise programme but the most common barriers to exercise were cost and not knowing where they could go to exercise.*

Conclusion: *Regardless of injury level, persons with spinal cord injury living in their communities in Jamaica are not engaged in adequate levels of exercise to confer health benefits and aid with healthy ageing. Barriers like cost, availability and accessibility of facilities must be addressed if this situation is to improve.*

Keywords: Barriers to exercise, physical activity levels, secondary health conditions, spinal cord injury

Niveles de Actividad física, Barreras Percibidas para Ejercitar, y Desarrollo de Condiciones Secundarias en Personas con Lesión de la Médula Espinal que Viven en sus Comunidades

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RESUMEN

Objetivo: *Determinar los niveles de actividad física de las personas con lesión de la médula espinal (LME) que viven en sus comunidades –es decir, en sus casas en vez de asilos o instituciones asistenciales– y que recibieron rehabilitación hospitalaria en el Centro de Rehabilitación*

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 DOI: 10.7727/wimj.2018.178

Sir John Golding (SJGRC, en inglés). Este estudio también exploró las barreras percibidas para hacer ejercicios, y el desarrollo de complicaciones secundarias de salud.
Métodos: *Se realizó un análisis transversal no experimental de las relaciones. Los participantes fueron reclutados a partir de los archivos de altas del Centro SJGRC. Se aplicaron tres cuestionarios mediante entrevista telefónica (Escala de Actividad Física y Discapacidad, Escala de Condiciones Secundarias de la Lesión Medular, y Escala de Discapacidad y Barreras al Ejercicio).*
Resultados: *Sólo el 58.3% de los pacientes se hallaban participando en alguna forma de ejercicio, y de este número sólo el 6% practicaba ejercicios fuertes. Las condiciones secundarias principales que afectaban a ambas personas con paraplejia y cuadriplejia eran la espasticidad, y el dolor muscular y articular crónico. No había diferencias significativas entre las personas que tenían paraplejia y cuadriplejia en lo referente a los niveles de actividad física, el desarrollo de condiciones secundarias o las barreras al ejercicio. La mayoría de las personas estaban interesadas en un programa de ejercicios, pero las barreras más comunes eran el costo y el no saber dónde ir a hacerlos.*
Conclusión: *Independientemente del nivel de la lesión, las personas con lesión medular que viven en sus comunidades en Jamaica no participan en niveles adecuados de ejercicio que brinden beneficios de salud y ayuden a un envejecimiento saludable. Las barreras como el costo, la disponibilidad y la accesibilidad de las instalaciones deben ser abordadas, si se quiere mejorar esta situación.*

Palabras clave: Barreras al ejercicio, niveles de actividad física, condiciones de salud secundarias, lesión de la médula espinal

West Indian Med J 2017; 66 (6): 358

INTRODUCTION

Worldwide, between 250 000 and 500 000 people suffer a spinal cord injury (SCI) each year with these survivors experiencing accelerated pathological states and conditions normally associated with physical deconditioning and premature ageing (1, 2). The physical therapy department of the Sir John Golding Rehabilitation Centre Jamaica sees an average of fifty new cases of spinal cord injuries per year (Harris-Henry, 2013). This figure represents approximately annual occurrence of 16 cases per million, which is like that reported for other parts of the world (3). The incidence of SCI is higher in younger persons leading to heavy physical, emotional and financial strain (4). Methods to ensure healthy ageing for this population are important.

In the past, respiratory and renal complications were leading contributors to mortality in SCI; however, in recent years, cardiovascular disease has become the leading cause of mortality in persons with a chronic SCI (5). A higher prevalence of cardiovascular disease has been seen in patients with SCI compared to age matched ambulatory populations, with prevalence rates for symptomatic cardiovascular disease ranging from 30 to 50% (4–7). Studies investigating physical capacity in wheelchair dependent persons commonly report low values for VO_{2max} and peak power output, with one in four healthy persons with paraplegia failing to achieve levels of oxygen required to perform many essential activities of daily living (8–9).

Apart from cardiovascular impairments, persons with SCI can develop other secondary conditions that may have adverse effects on overall quality of life and lead to early death (10). These include: pressure sores, genitourinary complications, autonomic dysreflexia, respiratory problems, circulatory problems, spasticity, joint and muscle pain. Though pressure sores are most common following SCI, studies have shown presence of chronic pain interfering with daily activities in up to 44% of persons with SCI (11–12).

Regular exercise has been shown to be beneficial in partially reversing some of the negative metabolic, musculoskeletal and psychological changes that occur following a spinal cord injury (5, 8, 10). Improvements in functional capacity, bone density in upper limbs, endurance, muscle strength, cardiovascular conditioning, pain and psychological well-being have all been

reported in addition to reduced stress (13). To maintain these benefits individuals with SCI must maintain a lifetime adherence to exercise in keeping with the guidelines recommended for able bodied individuals (14–16).

The noted benefits of exercise adherence is poor when persons with SCI are left to continue exercising on their own. In a North American study exploring barriers to exercise post discharge, most of the sample (79.2%) felt an exercise programme could help them and 73.6% indicated they would like to begin an exercise programme, however, only 45.8% was engaged in exercise (17). Research in other countries has shown the occurrence of numerous physiologic, psychological and environmental barriers to exercise that can impede participation in exercise in this population with transportation, availability of facilities, financial resources, lack of motivation, interest and energy and not knowing where to exercise being the most common barriers (15). Though persons with paraplegia have a greater capacity to exercise, studies have shown conflicting results regarding their fitness levels when compared to those with quadriplegia. One study showed similar levels of exercise amongst the two groups, (2) whilst another showed higher physical activity among persons with lower levels of injury (18).

There is no documented literature in Jamaica, regarding exercise participation or barriers to exercise in persons with spinal cord injuries. This study examined physical activity levels in community dwelling persons with spinal cord injury in Jamaica, their perceived barriers to exercise, concerns about exercise and development of secondary conditions.

SUBJECTS AND METHODS

A non-experimental cross-sectional analysis of relationships was conducted after ethical approval and patient consent was received for this study. Persons were included if they had been discharged between four months to five years from the facility following rehabilitation for a spinal cord injury. Persons with other chronic medical conditions were excluded. A total of 114 eligible patients were identified from medical records. Only 48 could be tracked and agreed to participate in the study. Questionnaires were administered *via* a telephone interview.

Instrument

The Physical Activity and Disability Scale was used to obtain information on current physical activity level. There instrument consists of six main items with subquestions to each (exercise, leisure time activity, general activity, therapy, employment/school and wheelchair). The Barriers to Exercise and Disability Scale was used to obtain information on barriers to exercise as well as concerns about exercise which may prevent exercise participation. The Spinal Cord Injury Secondary Conditions Scale was used to assess for the development of secondary conditions in the past three months and lists likely secondary conditions with a brief descriptor.

Data analysis

Data analysis was done using the Statistical Package for the Social Sciences. Descriptive and summary statistics was used to analyse the physical activity and barriers to exercise data. A Chi- square test was done to ascertain differences between physical activity levels for persons with paraplegia and quadriplegia. A student's *t*-test was used to determine whether there was a difference in the mean number of secondary conditions between those who exercised and those who did not exercise. A concern index was calculated by summing up the total number of concerns and a student's *t*-test was done to determine if there was a difference in the mean concern index score for persons with paraplegia and quadriplegia.

RESULTS

Demographic Data

A total of forty-eight subjects (40 males, 8 females) with mean age of 35.4 ± 12.18 years and mean time post injury of 43.6 ± 32.84 months participated in the study. Twenty-eight had a complete spinal cord injury and the remainder were classified as incomplete. Most participants (92%) utilized a wheelchair for mobility, 6% used a cane and 2% a walker. The majority (85.4%) had full use of their upper limbs and 37.5% had some movement in their legs. Most of the participants (68.8%) were unemployed.

Physical Activity Levels

Only twenty-five per cent of participants indicated that they were involved in any form of leisure time activity. When asked if they were currently exercising 60.4% indicated yes. Only 12.2% however, were exercising at intensities that would result in health benefits. Most participants in fact spent the majority of their waking hours sitting down or lying down (9.3 ± 3.9 hours). There was no significant difference between the exercise behaviour of persons with paraplegia and those with quadriplegia ($p = 0.46$). Fifty-seven per cent of those with paraplegia exercised while 43 % did not and 63% of persons with quadriplegia exercised while 37% did not.

Barriers to Exercise

Forty of the respondents indicated that they would like to begin an exercise programme, whilst two indicated that they would not. Only six participants indicated they were already in an exercise programme (Table 1). The two main barriers to exercise were the cost of transportation (75%) and not knowing of a fitness centre to exercise (58.3%). Some participants knew of facilities to exercise, were able to get to the facility *via* various modes of transportation (62.5%), but, the majority could not afford to spend this money. Thirty-seven per cent of the participants indicated that they had concerns related to exercising in a facility like a gym.

The mean concern index score was 3.5 ± 2.02. Persons with paraplegia were noted to have a higher mean concern index score (3.75 ± 2.25) compared to those with quadriplegia (3.21 ± 1.654), however, this was not statistically significant (p = 0.37). It was found that those who were exercising had a lower mean concern index (3.31 ± 2.06) than those who were not exercising (3.79 ± 1.99). Most persons were concerned about cost (75%), lack of transportation (62.5%) and not knowing where to exercise (41.7%) [Table 2].

Development of Secondary Conditions

From Table 3 most participants had not experience much secondary conditions in the past three months. Muscle spasm (31.25%), chronic pain (20.83%) and joint and muscle pain (18.75%) were the more commonly seen secondary conditions. There was no difference between the number of secondary conditions experienced by those with paraplegia and those with quadriplegia. The sample was too small to allow for evaluation of associations between level of exercise and occurrence of secondary conditions.

Table 2. Concerns about exercise

Concerns in relation to exercise	Yes, n (%)	No, n (%)
Lack of motivation	17 (35.4)	31 (64.6)
Lack of energy	12 (25)	36 (75)
Cost of exercise programme	36 (75)	12 (25)
Do not know where to exercise	28 (58.3)	20 (41.7)
Lack of interest	7 (14.6)	41 (85.4)
Lack of time	6 (12.5)	42 (87.5)
Exercise is boring	3 (6.3)	45 (93.8)
Too lazy	11 (22.9)	37 (77.1)
Do not know how to exercise	8 (16.7)	40 (83.3)
Health conditions prevent exercising	5 (10.4)	43 (89.6)
Exercise will make condition worse	1 (2.1)	47 (97.9)
Exercise will not improve condition	3 (6.3)	45 (93.8)
Exercise is too difficult	1 (2.1)	47 (97.9)
Lack of transportation	30 (62.5)	18 (37.5)

DISCUSSION

It is evident from this study that persons with SCI living in Jamaica are not on an optimal path to healthy ageing. Only a quarter of the sample indicated that they were

Table 1. Response to some of the questions on the Barriers to Exercise and Disability Scale

Item	Yes, n (%)	No, n (%)
1. Would you like to begin an exercise programme?	40 (83.3)	2 (4.2)
2. Have you ever exercised?	42 (87.5)	6 (12.5)
3. Do you know of a fitness centre that you could get to?	21 (43.8)	26 (54.2)
3a. IF "Yes" Would you have a means of transportation to get there?	20 (41.7)	3 (6.3)
3b. IF "Yes" Would you have to pay to be transported to the exercise facility?	16 (33.3)	4 (8.3)
3c. IF "Yes" Could you afford to spend this amount of money?	3 (6.3)	14 (29.2)
4. Would you have any concerns about exercising in a facility like a Gym?	37 (77.1)	11 (22.9)
5. Do you feel that an exercise instructor in a fitness centre like a gym would know how to set up an exercise programme to meet your needs?	46 (95.8)	2 (4.2)
6. Do you feel that an exercise programme could help you?	46 (95.8)	2 (4.2)
7. Are you ever afraid to leave your home?	6 (12.5)	42 (87.5)
8. Has your doctor ever told you to exercise?	21 (43.8)	27 (56.3)

Table: 3. Secondary conditions experienced in the past three months (% of respondents)

Secondary Condition	0	1	2	3
Pressure sore(s)	81.25	10.42	6.25	2.08
Injury caused by loss of sensation	81.25	16.67	2.08	0.00
Muscle spasms (spasticity)	33.33	18.75	16.67	31.25
Contractures	77.08	12.50	6.25	4.17
Heterotopic bone ossification	89.58	0.00	10.42	0.00
Diabetes mellitus	91.67	2.08	4.17	2.08
Bladder dysfunction	60.42	20.83	6.25	12.50
Bowel dysfunction	70.83	10.42	8.33	10.42
Urinary tract infections	77.08	10.42	10.42	2.08
Sexual dysfunction	77.08	4.17	2.08	16.67
Autonomic dysreflexia	77.08	14.58	8.33	0.00
Postural hypotension	83.33	6.25	6.25	4.17
Circulatory problems	66.67	22.92	6.25	4.17
Respiratory problems	83.33	16.67	0.00	0.00
Chronic pain	43.75	27.08	8.33	20.83
Joint and muscle pain	64.58	8.33	8.33	18.75

0 = Not experienced in the last three months or is an insignificant problem,
1 = Mild of infrequent problem
2 = Moderate or occasional problem, three = significant or chronic problem.

participating in some leisure time activity with only 12.2% exercising at beneficial intensities. It was our perception that persons with paraplegia would have demonstrated higher levels of physical activity, however, the results showed no difference between the two groups. This was like the findings of Scleza *et al* (16) but contrary to that of Manns and Chad (1999) who found persons with lower injury level had higher levels of physical activity. Exercise is the core of rehabilitation programmes for these patients and on discharge they are counselled on the importance of continuing to exercise. The low levels of exercise adherence indicated that counselling alone is inadequate and we need to explore other methods to ensure continued exercise engagement. The lack of significance between the two groups could be due to the small sample size.

The two main barriers to exercise were the cost of transportation and not knowing of a fitness centre to exercise. Some participants knew of facilities to exercise, were able to get to the facility *via* various modes of transportation, but, the majority could not afford to spend this money. Of those who could afford to spend the money, the facility was not accessible to them since there were no ramps or elevators to allow for wheelchair accessibility. This was different from the North American population where barries such as transportation, cost and availability of facilities were least problematic (16). In the North American population, barriers were more related to exercising in facilities like a YMCA and qualifications of the fitness instructors. These differences are probably due to the differences in social support systems for persons with disabilities. It was noted that the majority of the participants in this study were unemployed and this would have accounted for cost being a barrier to exercise.

The items that stood out with regards to concerns about exercise were cost of an exercise programme, lack of transportation and not knowing where to exercise. During the interviews, persons expressed concern regarding their inadequate finances and indicated that they refrained from going to exercise programmes since they did not want to be a "burden". This is of concern since the resulting medical complications that can occur from inactivity may in fact be a bigger financial burden on families and the society. Whilst it is agreed that cost can be a barrier if one chooses to go to a private facility, there are many other low cost physical activity programmes that can be done within the confines of the home environment. Numerous workout programmes are available from the internet for free and persons can follow these in their home environment. Many persons have smart phones that whilst they are still patients at the rehabilitation centre they could record themselves doing exercise routines which they can aim to replicate and follow at home when they are discharged.

Most participants in this study indicated that they would like to be involved in an exercise programme. They had the time, they had the energy, they were not lazy and were motivated, yet they did not actually exercise. It is our duty as healthcare providers to take an active role in health promotion and prevention for all and physical therapists may need to be more creative in their approach to designing physical activity programmes for these patients. The rehabilitation centre should also consider putting in place mechanisms to follow-up on persons with disabilities after discharge from the facility to try and keep the population healthy and reduce readmissions for preventable problems.

CONCLUSION

From this study, it can be concluded that persons with spinal cord injuries, regardless of level of injury, are not exercising at levels that will provide health benefits. Major barriers to exercise are cost, transportation and accessible facilities. Motivation and lack of energy though less commonly seen must be addressed from early. Healthy ageing for persons with disabilities is just as important as for able-bodied individuals and attention should be given to improving access to facilities for exercise in this population and developing creative ways to ensure continued engagement in exercise following discharge from rehabilitation. The number of secondary complications were low however, as more time goes by it is likely that these will increase if persons continue to remain physically inactive.

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