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ORIGINAL REPORT

PROSPECTIVE ANALYSIS OF BODY MASS INDEX DURING AND UP TO 5 YEARS AFTER DISCHARGE FROM INPATIENT SPINAL CORD INJURY REHABILITATION

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Objective: **To investigate the prevalence of overweight/obesity and the course of the body mass index (BMI) in persons with spinal cord injury during and after inpatient rehabilitation.**
Design: **Multi-centre longitudinal study.**
Subjects: **A total of 184 persons with spinal cord injury.**
Methods: **BMI was determined at the start of active rehabilitation, 3 months later, at discharge, and 1, 2 and 5 years after discharge.**
Results: **The percentage of persons who were overweight/obese (BMI ≥22 kg/m²) increased over the years from 56% to 75%. The absolute BMI did not significantly increase during rehabilitation, but showed a significant increase the year after discharge from inpatient rehabilitation ($p<0.001$). From examining the personal or lesion characteristics, age was the only factor that was related to the absolute BMI. BMI increased by 1 kg/m² for each 10-year increase in age. Men, persons with paraplegia and older people had more chance of being overweight/obese compared with women, persons with tetraplegia and younger people.**
Conclusion: **The BMI of people with spinal cord injuries gradually increases during and after inpatient rehabilitation, with significant increases in the first year after discharge. It is recommended that emphasis is placed on weight-management protocols (diet and exercise) to encourage a healthy lifestyle.**

Key words: body mass index; spinal cord injuries; rehabilitation; prospective studies.

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INTRODUCTION

People with spinal cord injuries (SCI) often have sedentary lifestyles due to paralysis (1). This may result in increased body mass index (BMI; weight (kg)/height (m²)); it has been shown that BMI is lower in active, compared with inactive, persons with SCI (2). Another study has shown that 32% of people with SCI experienced an increase in body mass as a health problem, and 14% mentioned this as one of their top 5 health problems (3). A high BMI is associated with an unfavourable lipid profile (4) and, subsequently, cardiovascular disease. Furthermore, a higher body mass will lead to an increase in load on the upper extremities during wheelchair propulsion or when making a transfer. This can lead to problems due to musculoskeletal overuse of the upper extremities (5), which is common in people with SCI (6) and leads to a further decrease in activity.

BMI is an easy and low-cost measurement to use. Therefore, it is often used in the able-bodied population to screen whether an individual is overweight or obese (BMI ≥ 25 kg/m²) (7). BMI is also often applied to persons with SCI. However, the BMI underestimates obesity in this population due to the inability to distinguish between fat mass and fat-free mass (8, 9). In general, due to muscle atrophy in the lower body, people with SCI have greater fat mass and less fat-free mass per unit BMI than age-matched able-bodied controls (8, 9). Therefore, based on both percentage fat mass and biomarkers, such as C-reactive protein, an adjusted BMI cut-off (≥ 22 kg/m²) was suggested to be used in persons with SCI to identify overweight/obese persons (9). Therefore, for comparison reasons, in this study the cut-off points for the general population were used (underweight: BMI < 18.5 kg/m²; normal: 18.5 ≤ BMI < 25 kg/m²; overweight: 25 ≤ BMI < 30 kg/m²; obese: BMI ≥ 30 kg/m²) (10) as well as the adjusted cut-off points for people with SCI (recommended: BMI < 22 kg/m²; overweight: 22 ≤ BMI < 25 kg/m²; obese: BMI ≥ 25 kg/m²) (9, 11).

As far as we know, no study has yet been performed that has investigated the prospective trend of the BMI during the first years after SCI, and the effect of personal and lesion characteristics on this course. Therefore, the objectives of this study were: (*i*) to investigate the prevalence of being overweight or obese in people with SCI during and after rehabilitation; (*ii*) to study the course of the absolute BMI during inpatient rehabilitation up to 5 years after discharge from inpatient rehabilitation and the effect of personal (age, gender) and lesion (level and

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completeness) characteristics on this course; and (*iii*) to study which personal and lesion characteristics were related to being overweight/obese, using the criteria for both able-bodied (≥25 kg/m^2) and SCI populations (≥22 kg/m^2).

METHODS

Participants

The current longitudinal study was part of the Dutch prospective cohort study "Physical strain, work capacity and mechanisms of restoration of mobility in the rehabilitation of persons with SCI" (12). Participants from 8 rehabilitation centres that are specialized in SCI rehabilitation in the Netherlands were included. They were eligible to enter the study if they had an acute SCI, were between 18 and 65 years of age, were classified as A, B, C, or D on the American Spinal Injury Association (ASIA) Impairment Scale (13), were expected to remain permanently wheelchair dependent, did not have a progressive disease (such as a malignant tumour) or psychiatric problem, and had sufficient understanding of the Dutch language to understand the purpose of the study and the testing methods. Persons with data for BMI on at least 3 test occasions were included in the analysis.

All tests and protocols were approved by the medical ethics committee of the SRL/iRv Hoensbroeck. After they were given information about the testing procedure, all participants completed an informed consent form.

Design

Data for the current study were collected at the start of active rehabilitation (T1, when patients could sit for 3–4 h), 3 months later (T2), at discharge from inpatient rehabilitation (T3), 1 year after discharge (T4), 2 years after discharge (T5), and 5 years after discharge (T6). Data were collected by trained research assistants with paramedical backgrounds using standardized procedures.

Body mass index

The body mass of participants were measured by the research assistant on each test occasion, except for the T5 measurement. At T5 the participants did not return to the rehabilitation centre, but were interviewed by telephone. During this interview they were asked to report their weight. The height of the participant was reported at T1. Thereafter the BMI was calculated (BMI; body mass (kg)/height (m^2)). The prevalence of overweight and severely overweight or obesity was determined using the calculated BMI. For comparison reasons, the cut-off points for the general population were used (underweight: BMI < 18.5 kg/m^2; normal: 18.5 ≤ BMI < 25 kg/m^2; overweight: 25 ≤ BMI < 30 kg/m^2; obese: BMI ≥ 30 kg/m^2) (10) as well as the adjusted cut-off points for people with SCI (recommended: BMI < 22 kg/m^2; overweight: 22 ≤ BMI < 25 kg/m^2; obese: BMI ≥ 25 kg/m^2) (9, 11).

Personal and lesion characteristics

Participant information regarding age, gender and lesion characteristics at T1 was collected. Lesion characteristics (level and completeness) were determined by a physiatrist using the ASIA criteria (13). Tetraplegia was defined as a lesion at or above the T1 segment, and paraplegia as a lesion lower than T1. A lesion was defined as motor complete when subjects met the criteria of the ASIA Impairment Scale A or B.

Statistical analyses

Descriptive statistics (means and standard deviations (SD)) of BMI at all test occasions and for the personal and lesion characteristics were calculated. Furthermore, the prevalence of being overweight or obese was calculated with the cut-off points for the general and SCI populations.

Changes in BMI were studied using random coefficient analysis (MLwiN (14)), with 3 levels (time, participant, centre). The dependent variable of this regression analysis was the absolute BMI. First, BMI was modelled over time by using time periods as categorical variables (dummy), with T3 and T6 as reference. The regression coefficient for a time dummy describes the change in BMI over that time period.

Secondly, the longitudinal relationships between BMI, on the one hand, and lesion and personal characteristics, on the other, were investigated. Lesion level (tetraplegia = 0, paraplegia = 1), motor completeness of the lesion (incomplete = 0, complete = 1), age, and sex (women = 0, men = 1) and their interactions with time (to investigate the difference in development over time between the groups) were used as independ-

Table I. *Descriptives of body mass index (BMI) over time (mean (standard deviation (SD))) and the percentage of participants who are overweight/obese based on the cut-off points for the general population (≥25 kg/m^2) and spinal cord injury population (≥22 kg/m^2)) for the sample used to develop the random coefficient models, a sample that was measured on all 6 test occasions and a sample that was measured at the start and discharge from inpatient rehabilitation and 5 years after discharge*

	T1 Start active rehab		T2 3 months later		T3 Discharge rehab		T4 1-year after discharge		T5 2-years after discharge		T6 5-years after discharge	
Model data (≥3 measurements)	*n*	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)
BMI (kg/m^2)	177	22.8 (3.9)	142	23.2 (4.0)	176	23.6 (4.0)	144	24.5 (4.5)	82	24.4 (4.8)	112	25.6 (4.7)
% Participants with a BMI ≥25 kg/m^2	177	28%	142	30%	176	35%	144	47%	82	39%	112	54%
% Participants with a BMI ≥22 kg/m^2	177	56%	142	61%	176	63%	144	70%	82	68%	112	75%
People who performed all measurements (*n* = 42)												
BMI (kg/m^2)	42	23.2 (3.8)	42	23.5 (3.8)	42	23.8 (4.0)	42	25.2 (5.0)	42	25.3 (4.8)	42	26.6 (4.8)
% Participants with a BMI ≥25 kg/m^2	42	31%	42	36%	42	43%	42	52%	42	50%	42	60%
% Participants with a BMI ≥22 kg/m^2	42	62%	42	69%	42	64%	42	71%	42	71%	42	81%
People who performed measurements T1, T3, T6 (*n* = 100)												
BMI (kg/m^2)	100	22.9 (4.0)	–	–	100	23.5 (4.0)	–	–	–	–	100	25.7 (4.9)
% Participants with a BMI ≥25 kg/m^2	100	30%	–	–	100	38%	–	–	–	–	100	54%
% Participants with a BMI ≥22 kg/m^2	100	59%	–	–	100	64%	–	–	–	–	100	76%

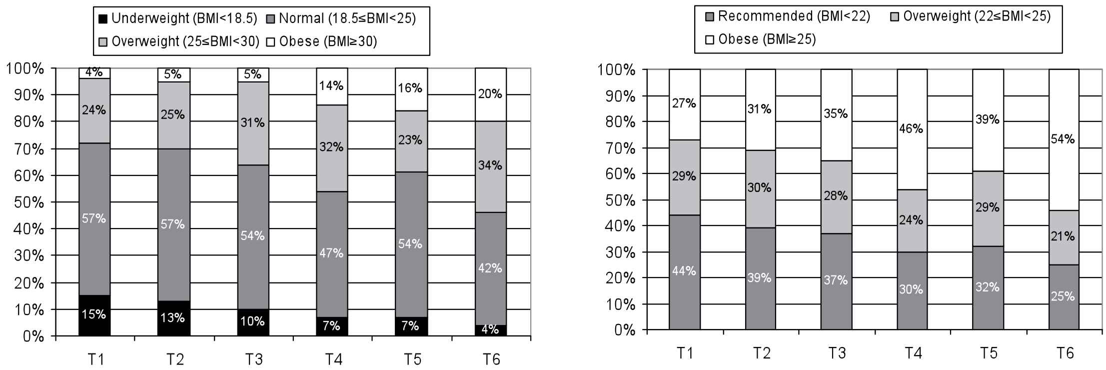

Fig. 1. Percentages of people with a spinal cord injury in the 4 body mass index (BMI) classification groups of the World Health Organization (10) (left-hand figure) and the 3 classification groups for people with spinal cord injuries (9, 11) (right-hand figure).

ent variables. First, the independent variables were included separately, and if they showed a *p*-value below 0.1 the variables were added to the multivariate model. Secondly, a backward elimination technique was used until only significant determinants remained ($p<0.05$). The above-mentioned analysis was also performed with time since injury (TSI, in months) instead of time as dummy variables.

The same analysis was performed with a binomial random coefficient analysis to investigate the change in percentage of participants that are overweight/obese (not overweight/obese = 0, overweight/obese = 1) during and after rehabilitation. This binomial analysis was performed twice; once with the overweight/obese criteria for the general population (BMI ≥ 25 kg/m^2) and once with the criteria for SCI (BMI ≥ 22 kg/m^2).

RESULTS

Descriptives

A total of 184 persons participated in 3 or more test occasions. The number of participants per test occasion varied between 82 and 177 (Table I). Since two centres did not participate 2 years after discharge, a lower number of persons appeared in this T5 measurement. However, the pattern of increase in BMI over time was found in the data that were used for the model, as well as for people who participated in all measurements as in the measurements T1, T3 and T6 (Table I), indicating that including people with an incomplete data-set did not show a different course of BMI over time. Reasons for drop-out are described in De Groot et al. (15).

At T1 75% of the participants were male, 61% had paraplegia and 70% had a complete lesion. The mean age of the participants was 40.2 (SD = 14.1) years and the mean time since injury at the first test occasion was 94.8 (SD = 65.8) days (median: 75 days). The mean duration of inpatient rehabilitation was 227.6 (SD = 135.1) days (median: 191 days). Descriptive results of the BMI are presented in Table I. The lowest BMI found was 13.9, the highest BMI was 39.3.

Prevalence

When using the BMI cut-off points of the general population, the percentage of participants who were overweight/obese increased from 28% to 54% from T1 to T6 (Table I, Fig. 1). There was a simultaneous decrease in the percentage of participants who were underweight (from 15% to 4%, Fig. 1). When the BMI cut-off points for people with SCI were used, the percentages of participants who were overweight/obese were much higher and increased from 56% to 75% (Table I, Fig. 1).

Course and determinants of BMI over time

Table II shows that there was not a significant increase in BMI during rehabilitation. However, a significant increase in BMI was found in the year after discharge from inpatient rehabilitation ($p<0.001$). Furthermore, a trend was found for an increase in BMI from 2 years to 5 years after discharge from inpatient rehabilitation ($p=0.056$).

Of the personal and lesion characteristics, age was the only factor that was related to the absolute BMI: for every 10 years increase in age the BMI increased by 1 kg/m^2 (Table II, Fig. 2). No interaction effects were found between time and any of the personal or lesion characteristics, indicating that the change in BMI over time was similar for the different lesion, age and gender groups.

The regression analysis using TSI (in months) instead of time as dummy variables showed the same results, i.e. besides TSI

Table II. *Results of the random coefficient regression analysis for body mass index (BMI) (in kg/m^2). Columns 2 and 3 give the effect of time on BMI and columns 4 and 5 show the results of adding the significant personal and lesion characteristics to the model*

	BMI		BMI	
	Beta (SE)	*p-value*	Beta (SE)	*p*-value
Cons	23.59 (0.32)		19.51 (0.50)	
T3T1	–0.74 (0.45)	0.101	–0.76 (0.43)	0.077
T3T2	–0.43 (0.48)	0.371	–0.47 (0.45)	0.298
T3T4	0.96 (0.48)	0.046	1.04 (0.45)	0.021
T3T5	0.82 (0.57)	0.150	1.03 (0.54)	0.057
T3T6	2.00 (0.52)	<0.001	2.17 (0.49)	<0.001
Age	NE	–	0.10 (0.01)	<0.001
Gender	NE	–	NS	–
Lesion level	NE	–	NS	–
Completeness	NE	–	NS	–

All results are regression coefficients (Beta) and their standard error (SE) for the model. The regression coefficients represent the change in outcome associated with an increase in the independent variable of one unit.
The time dummies T3T1, T3T2 etc. indicate the change in BMI between those two test occasions. NE: not entered; NS: not significant.

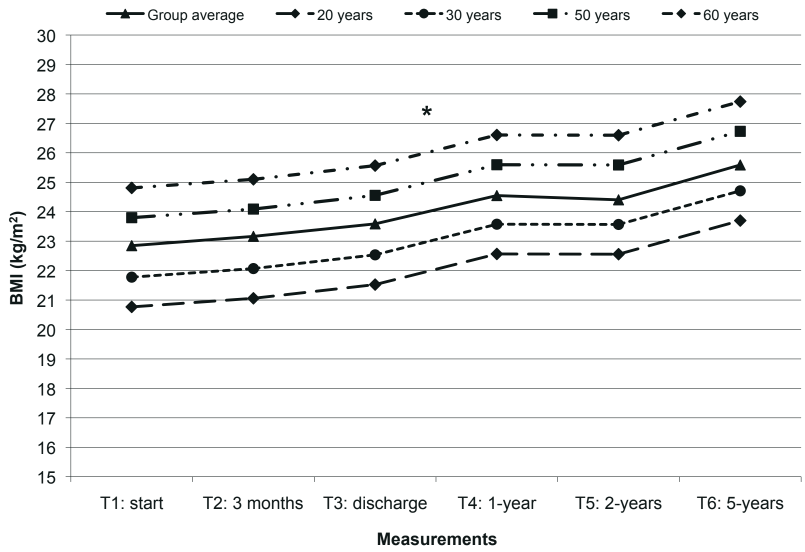

Fig. 2. Model data for the course of body mass index (BMI) over time during inpatient rehabilitation (T1–T3) and the years after discharge (T4–T6) for the whole group and for different age groups. *Significant change in BMI between T3 and T4.

($p < 0.0001$), age was the only factor that was related to the absolute BMI ($p < 0.0001$). The final model was:

BMI = 19.038 + 0.037 (SE = 0.006)* TSI + 0.101 (SE = 0.010) * age

This indicates that, with an increase in TSI and age of 12 months/1 year, the BMI will increase by 0.545 (Fig. 3).

Course and determinants of the percentage of participants who are overweight/obese

The binomial random coefficient analyses showed that 5 years after discharge there was 1.75 times more chance of being overweight/obese (with the cut-off point BMI ≥22) than at discharge from inpatient rehabilitation (Table III). For the cut-off point of BMI ≥25, it was found that, compared with the BMI at discharge, persons with SCI had 1.60 times more chance of being overweight/obese 1 year later and 2.12 times more chance 5 years later (Table III).

For every increase in age of 10 years, persons with SCI had 1.82 and 1.65 times more chance of being overweight/obese when using the cut-off points BMI ≥ 22 and ≥ 25 kg/m², respectively (Table III). When using the criterion BMI ≥22 kg/m², we found that men had 1.59 times more chance of being overweight/obese than women. Sixty-seven percent of the men were classified as overweight/obese, compared with

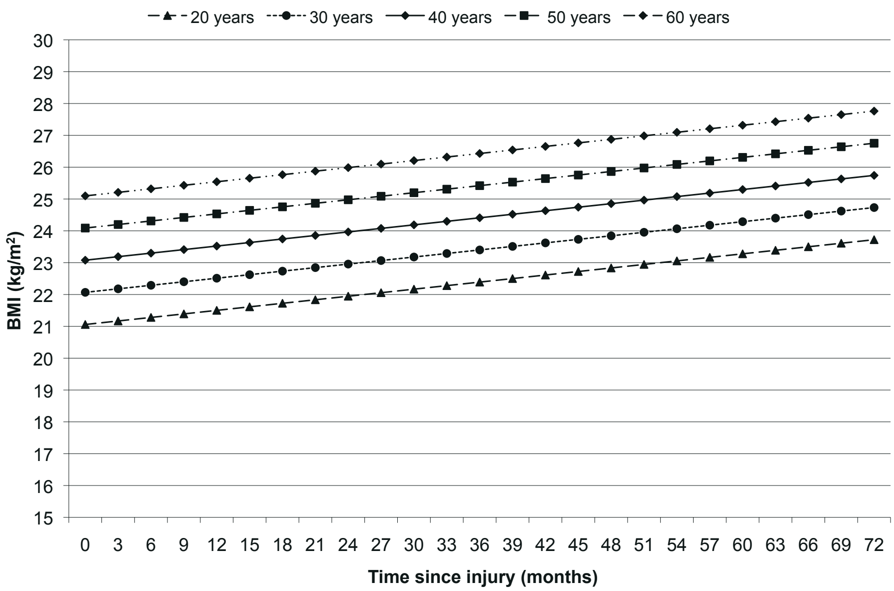

Fig. 3. Model data for the course of body mass index (BMI) as a result of time since injury and for different age groups.

Table III. *Course of the percentage of participants who are overweight/obese calculated with binomial random coefficient analysis. The odds ratios (OR) of being overweight/obese at T1, T2, T4, T5 and T6 compared with T3 are shown. The left side of the table shows the results for the cut-off point body mass index (BMI) ≥22 kg/m², the right side for the cut-off point of BMI ≥25 kg/m². For both cut-off points a model with only the time dummies is presented and a model including the significant personal and lesion characteristics*

	BMI at risk (≥22)			BMI at risk (≥22)			BMI at risk (≥25)			BMI at risk (≥25)		
	Beta (SE)	OR	*p*-value	Beta (SE)	OR	*p*-value	Beta (SE)	OR	*p*-value	Beta (SE)	OR	*p*-value
Cons	0.54 (0.16)			–1.72 (0.30)			–0.61 (0.16)			–2.85 (0.30)		
T3T1	–0.27 (0.22)	0.76	0.220	–0.33 (0.24)	1.39	0.169	–0.32 (0.23)	0.73	0.165	–0.37 (0.24)	0.69	0.124
T3T2	–0.11 (0.23)	0.90	0.633	–0.14 (0.25)	1.15	0.575	–0.19 (0.24)	0.83	0.430	–0.24 (0.26)	0.79	0.358
T3T4	0.32 (0.24)	1.38	0.184	0.41 (0.26)	1.51	0.115	0.47 (0.23)	1.60	0.041	0.58 (0.25)	1.79	0.020
T3T5	0.23 (0.28)	1.26	0.412	0.34 (0.31)	1.40	0.273	0.21 (0.28)	1.23	0.453	0.36 (0.29)	1.43	0.215
T3T6	0.56 (0.27)	1.75*	0.038	0.72 (0.29)	2.05	0.013	0.75 (0.25)	2.12	0.003	0.95 (0.26)	2.59	<0.001
Age	NE	–	–	0.06 (0.01)	1.06	<0.001	NE	–	–	0.05 (0.01)	1.05	<0.001
Gender	NE	–	–	0.46 (0.16)	1.58	0.005	NE	–	–	NS	–	–
Lesion level	NE	–	–	0.40 (0.16)	1.49	0.012	NE	–	–	NS	–	–
Completeness	NE	–	–	NS	–	–	NE	–	–	NS	–	–

*Example: at T6 the chance of having a BMI above 22 kg/m² compared with T3 is 1.75 times higher.

T1: start of active rehabilitation; T2: 3 months after start of active rehabilitation; T3: at discharge; T4: 1 year after discharge; T5: 2 years after discharge; T6: 5 years after discharge; Beta: regression coefficient for each independent variable; SE: standard error; NE: not entered; NS: not significant. Gender (women = 0; men = 1); lesion level (tetraplegia = 0; paraplegia = 1).

57% of the women. Persons with paraplegia had 1.49 times more chance of being overweight/obese than persons with tetraplegia (Table III). Sixty-nine percent of the persons with paraplegia were classified as overweight/obese compared with 57% of persons with tetraplegia.

DISCUSSION

This is the first study to investigate the prospective trend of BMI during the first years after SCI. The percentage of persons who were overweight/obese increased over the years from 56% to 75% when the BMI cut-off points for people with SCI were used. The absolute BMI did not increase significantly during rehabilitation, but showed a significant increase the year after discharge. From examining the personal or lesion characteristics, age was the only factor found to be related to the absolute BMI. Men, persons with paraplegia and older people had more chance of being overweight/obese (BMI ≥ 22 kg/m²) compared with women, persons with tetraplegia and younger people, respectively.

The percentage of people with SCI who were overweight/obese increased over time (28% to 54% using the BMI cut-off points for the general population) and 5 years after discharge was higher than the percentage of overweight or obese people in the general Dutch population (47% in 2008) (16). Furthermore, the percentage of people with obesity was higher in the population with SCI (20%) (Fig. 1) than in the general Dutch population (11%) (16). Gupta et al. (17) investigated the BMI of people with SCI in a retrospective study. Sixty-six percent of their population was overweight/obese. This higher percentage might be due to the, on-average, longer time since injury (19 years) compared with our study.

There has been discussion in the literature of the usefulness of using the BMI in a population with SCI. Buchholz & Bugaresti (8) describe, in their review of BMI and SCI, the pitfalls in using BMI in this population, and recommend that SCI-specific BMI classifications should be developed and used. The cut-off recommended by the World Health Organization (WHO) (10) might not be very useful in people with SCI due to the inability of body mass to distinguish between fat mass and fat-free mass (8). In general, people with SCI have greater fat mass and less fat-free mass per unit BMI than age-matched able-bodied controls (8). Therefore, specific BMI classifications have been made for people with SCI (9). These above-mentioned percentages are even higher when the cut-off scores for people with SCI are used (Tables II and III) (9). In that case, 5 years after discharge 75% of the population with SCI is classified as overweight/obese. This indicates that an increase in body mass may be an even greater problem in people with SCI compared with the general Dutch population.

When using the BMI cut-off points for the general population, a quite high percentage (15%) was classified as underweight (BMI ≤ 18.5 kg/m²) at the start of inpatient rehabilitation. The percentage of persons who are underweight diminishes over time. In a retrospective study among people with a mean duration of SCI of 19 years, 3.6% were underweight (17). Immediately after the trauma, many patients report poor appetite (18) and the body is in shock, resulting in a faster metabolism. As a result, newly injured patients commonly experience weight loss (19). Over time, the metabolism of the body slows down due to inactivity and a decrease in muscle mass (19). If the calorie intake remains the same, individuals will gain weight.

As far as we know no study has investigated the change in BMI in people with SCI. Our study clearly shows that the BMI gradually increases over time, with a significant increase in the year after discharge from inpatient rehabilitation. Persons with SCI have 1.75 times more chance of being overweight/obese 5 years after discharge compared with at discharge.

In our study, age was the only personal or lesion characteristic that related to BMI. However, in addition to age, gender and lesion level were also determinants for the risk for being overweight or obese. Older persons, men and persons with paraplegia have more chance of being overweight/obese compared with younger persons, women and persons with tetraplegia. Weaver et al. (20) also found that, for white veterans, being older was associated with being overweight or obese. In the general Dutch population the BMI increases by 1 unit with every 5 years increase in age (21). Our data showed that over a 6-year period there is a mean increase in BMI of 2.8–3.4 in persons with SCI, i.e. a much larger increase. Other studies (17, 20, 22) found a similar difference between persons with tetraplegia and paraplegia. A speculative explanation was that persons with paraplegia have easier access to food, since they are not so dependent on others for eating (17). Another possibility could be a difference in fat; the fat-free mass between persons with tetraplegia and paraplegia. For example, active people with paraplegia might increase the muscle mass of their upper extremities during and after rehabilitation in contrast to people with tetraplegia. This increase in muscle mass leads to a higher body mass and, subsequently, higher BMI.

Groah et al. (22) showed that 75% of the women with SCI had a recommended BMI (<25 kg/m^2) compared with 39% of the men with SCI. This result might be related to their finding that women tended to consume proportionally less fat than men (22).

The completeness of the injury had no effect on BMI. This might be explained by our inclusion criterion "wheelchair-dependent" resulting in a subject group with more severe incomplete injuries.

The sedentary lifestyle of persons with SCI due to the paralysis means that it is easy for them to gain weight and difficult to lose weight. An increase in BMI is a risk factor for unfavourable lipid profiles (23) and, consequently, coronary heart disease, but also for overuse injuries of the upper extremities (6). Therefore, it is very important to stimulate an active lifestyle and give proper dietary advice. Chen et al. (24) showed that a 12-week weight loss programme, covering nutrition, exercise and behaviour modification, is effective for overweight/obese individuals with SCI to lose weight. Although their study (24) had some limitations, e.g. lack of a control group, a decrease in abdominal, subcutaneous and total fat was found in a group with chronic SCI.

Strengths and limitations

The longitudinal design of this study made it possible to study the course of BMI during inpatient rehabilitation up to 5 years after discharge. In longitudinal studies drop-outs are a risk that might result in a positive selection of participants. However, as shown in Table I, the pattern of change in BMI over time was similar in groups that performed all measurements or missed 1–3 measurements.

The body mass was not measured by the research assistant at the T5 measurement, but the participants were asked about their body mass. Therefore, this is a less reliable measurement and might explain why the BMI remains quite stable between T4 and T5, with subjects underestimating their body mass. Although body mass was measured on each test occasion except at T5, it is not easy to obtain an accurate height measurement for people who are wheelchair dependent. In our study we used the participants' recall of height at the first test occasion. However, recalled height and measured length have been found to disagree (25). In a study among the general Dutch population, the body mass was significantly under-reported by participants (by 1.4 kg on average) and the height significantly over-reported (by 0.7 cm on average). As a consequence, the BMI was significantly under-reported by 1.1 kg/m^2 (26). If the BMI was under-reported by the same degree in the present study, the percentage of persons with SCI who are overweight/obese will, in reality, be even higher.

Recommendations

Weight management is an important lifestyle issue, especially for people with SCI. One needs to learn and use skills to lose and maintain weight loss through proper nutrition, behavioural changes and physical activity. Clinicians should be aware of weight gain in people with SCI and should provide advice about a healthy diet and active lifestyle. Randomized controlled trials (RCTs) are needed to study the effect of interventions related to active lifestyle or diet on the body mass and subsequent complications in people with SCI. Specific attention should be given to older people, men and individuals with paraplegia, since those persons are most at risk for being overweight or obese.

In conclusion, the BMI of people with SCI gradually increases during and after inpatient rehabilitation, with a significant increase in the first year after discharge from inpatient rehabilitation. Depending on the cut-off point used to classify overweight or obesity, the percentage of persons who were assessed as overweight or obese was 7–19% higher in the population with SCI compared with the general population. Age was the only personal or lesion characteristic that was related to the absolute BMI. Men, persons with paraplegia and older people are more at risk for being overweight or obese compared with women, persons with tetraplegia and younger people, respectively. Since a high BMI is related to several health disorders, such as unfavourable lipid profile, it is strongly recommended that attention is given to weight management protocols, focusing on diet and an active lifestyle, in order to encourage a healthy lifestyle.

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