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Determinants of low satisfaction with life among wheelchair users with spinal cord injury in Egypt: a cross-sectional study

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Abstract

Background Spinal cord injury (SCI) is one of the most catastrophic injuries that might lead to permanent use of a wheelchair and severely affects the quality of life, hence SCI patients report lower satisfaction with life (SWL) than the general population. Therefore, it is important to identify factors that determine SWL among wheelchair users with SCI. Our study aimed to assess the prevalence of low SWL and to identify its determinants among wheelchair users with SCI in Egypt.

Methods A cross-sectional study included 105 wheelchair users with SCI from the Al Hassan Foundation for wheelchair users in Egypt. The main outcome measure was low SWL, while the independent variables included sociodemographic characteristics, injury-related characteristics, anxiety, depression, neuropathic pain, functional independence, and environmental barriers.

Results The prevalence of low SWL among study participants was 57.1%. We found significant associations between SWL and age, area of living, and age at injury. Additionally, SWL correlated negatively with anxiety, depression, neuropathic pain, and environmental barriers, and positively with functional independence. Finally, the binary multiple logistic regression revealed that living in Upper Egypt ($p=0.017$, OR = 13.7), depression ($p=0.034$, OR = 6.08), older age ($p=0.002$, OR = 1.21), and work and school environmental barriers ($p=0.022$, OR = 0.46) were the predictors of low SWL.

Conclusion To improve the SWL for wheelchair users with SCI we need to effectively manage neuropathic pain, depression, and anxiety, and promote functional independence. There is an urgent need to reinforce legislation to improve the living conditions for wheelchair users with SCI in Egypt, especially in Upper Egypt.

Keywords Anxiety, Depression, Environmental barriers, Functional independence, Pain, Satisfaction with life, Spinal cord injury, Wheelchair

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Introduction

According to the Global Burden of Disease Study 2016, the number of prevalent cases of spinal cord injury (SCI) was 27.04 million with an incidence rate of 13 per 100,000 worldwide, while in Egypt the incidence rate of SCI was 8 per 100,000 with a prevalence rate of 234 per 100,000 population. Furthermore, SCI caused 9.5 million years of life lived with disability (YLDs) globally [1].

Severe SCI can result in disability and the requirement for wheelchair assistance [2]. In addition, after enduring SCI individuals face several health consequences as a direct or indirect effect of the injury and activity restriction [3]. These consequences can immensely affect one's autonomy, functioning, emotional health, and quality of life (QOL) [4]. The most frequently encountered secondary complications of SCI, with an incidence exceeding 70%, are pain, spasticity, sexual dysfunction, and neurogenic bowel dysfunction [5]. As many as 80% of people with SCI suffer from different types of chronic pain, and 86% of them have neuropathic pain [6, 7]. Furthermore, people with SCI have a prevalence of anxiety and depression of 27% and 22%, respectively [8, 9].

Apart from the health consequences of SCI, individuals with SCI encounter several obstacles daily, such as physical barriers to basic mobility, inadequate implementation of legislation, and negative attitudes leading to their exclusion from full social participation [10]. Consequently, QOL is fundamental when caring for individuals with SCI. The terms "QOL" and "satisfaction with life (SWL)" are frequently used interchangeably; SWL is a broad subjective assessment of one's current life based on physical, psychological, and social aspects [11]. Individuals with SCI express lower SWL than the general population [12]. Several studies have found significant positive correlations between SWL and SCI individuals' younger age at onset, greater education, high functional independence, strong social support, and high self-efficacy [13–15]. Contrariwise, factors that are associated with decreased SWL are pain, grief, anxiety, depression, and spasticity [11, 13, 15, 16]. Other factors that predict SWL are environmental barriers like the natural environment, transportation, need for help in the home, availability of health care, and government policies [17].

The living situation for people with SCI is even worse in low- and middle-income countries (LMICs) like Egypt where laws for disability exist but remain unenforced [18]. In Egypt, 16.6% of the population have a disability, and mobility disability is the most common type with a 12.81% prevalence rate [19]. In 2018, Egypt adopted Law No. 10/2018 on the Rights of Persons with Disabilities (PWDs) to ensure a decent life for PWDs. The law constitutes the legal framework for PWDs' rights including healthcare, education, vocational training and work, accessibility, social and legal protection, political and trade unions, and social participation [20].

However, the new laws and policies were not comprehensive enough and did not have tangible implementation guidelines. Consequently, very little progress has been made and there are still gaps between the declared policy and its implementation [21]. For instance, the law grants accessibility to public buildings and transportation. Still, implementation lags because the law does not outline the details of the modifications to be made nor does it address accessibility in private buildings and workplaces [22]. Additionally, despite new laws promising equal opportunities for work and vocational training for PWDs, a recent study found that having a mobility disability in Egypt was associated with a 28% lower likelihood of having a job and that PWDs are usually employed in low-paying entry-level positions that are unstable [19].

Furthermore, caring for people with SCI challenges healthcare systems especially in LMICs due to the need for multiple specialties and the high cost of care [23]. It was anticipated that PWDs and people with SCI would benefit from Universal Health Insurance (UHI), which Egypt began enacting in 2018 as part of its 2030 agenda for sustainable development. The UHI Law exempts PWDs from paying for services, promises to extend its services to remote and rural areas, and grants building accessibility to those with mobility impairments. Nevertheless, the insurance will not cover any additional costs related to the disability such as nursing, medical escorts, and transportation fees [24]. Despite these efforts, PWDs in Egypt still face many challenges in accessing healthcare services such as inadequate accessibility, discrimination, negative attitudes, lack of disability-friendly communication interfaces, and healthcare professionals who do not have the skills and experience to deal with PWDs [25].

Additionally, Egypt faces other challenges impeding the advancement of its human development programs due to its rapidly growing population, high inflation, and an ongoing unprecedented rise in external debt [26]. Unfortunately, we do not have reliable statistics about the living situation of people with SCI in Egypt. In light of the latest legislative updates, challenges, and the lack of research studies about SWL among wheelchair users with SCI patients in Egypt; we conducted this study to evaluate SWL and identify its determinants among wheelchair users with SCI patients in Egypt.

Methods

Study design and participants

We conducted a cross-sectional study among wheelchair users with SCI who are members of Al Hassan Foundation for wheelchair users in Egypt. Al Hassan Foundation is a non-profit organization operating under the Ministry

of Social Solidarity auspices. After their approval, we obtained a list of members from the Al Hassan Foundation registry who fulfilled the inclusion and exclusion criteria and generated a simple random sample. Then, we contacted them by phone to obtain their consent. The questionnaires were uploaded on Google Forms along with the informed consent and sent to those who agreed to participate through e-mail or social media applications from January 2022 to March 2022. The consent confirmed the confidentiality of the participant's data. The study protocol was approved by the Ethical Committee of the Faculty of Medicine, Suez Canal University (ref. 4490#).

Eligibility criteria

Inclusion criteria were wheelchair users with SCI either traumatic or non-traumatic and age ≥ 18 years. Exclusion criteria were wheelchair users due to causes other than SCI, those who are unable to read and write, and those who do not use the internet or social media.

Sampling

We calculated a sample of 105 wheelchair users with SCI based on the formula: $n = \left[\frac{z_{\alpha/2}}{E}\right] * P\,(1-P)$ [27]. Where: **n** = sample size, **Z α/2** = 1.96 (The critical value that divides the central 95% of the Z distribution from the 5% in the tail), **p** = the proportion of subjects with low SWL = 55.5% [13], **E** = the margin of error = 10%, and with the addition of 10% dropout. A simple randomized sample was recruited from the Al Hassan Foundation registry, which contained 6500 wheelchair users at the time of data collection; 3999 fulfilled the inclusion and exclusion criteria.

Study measures

Sociodemographic and injury-related characteristics

included age, gender, marital status, education, occupation, area of living, cause of SCI, type of SCI, age at time of injury, and time since injury.

Satisfaction with life (SWL)

We used the Arabic-validated version of the SWL Scale (SWLS) which is composed of 5 items rated on a 7-point Likert scale that ranges from 7 strongly agree to 1 strongly disagree. Scores range from 5 to 35 with higher scores indicating higher SWL [28]. We dichotomized the scale scores to low SWL (≤ 20) and average/high SWL (21 to 35) as described by Lavella et al. [13]. The internal consistency (Cronbach's alpha) of the Arabic version was 0.79 and test-retest reliability was 0.83 [28].

Anxiety and depression

We used the Arabic-validated version of the Hospital Anxiety Depression Scale (HADS). The scale consists of 14 items rated on a 4-point Likert scale (from 0 to 3). Each subscale (anxiety or depression) has a score ranging from 0 to 21. A score from 0 to 7 is interpreted as normal, 8 to 10 as borderline, and 11 to 21 as either depression or anxiety. The internal consistency coefficient for the HADS anxiety subscale was 0.83 while for the HADS depression subscale was 0.77 [29].

Neuropathic pain

We used the Arabic-validated version of the Neuropathic Pain Questionnaire- Short Form (NPQ-SF). The NPQ-SF consists of three items (tingling pain, numbness, and increased pain due to touch) which are rated on a scale from 0 (no pain) to 100 (worst imaginable pain/greatest intensity). Each item's score is multiplied by a discriminant function coefficient (tingling: 0.017, numbness: 0.015, increased pain due to touch: 0.011), the scores are then added together and combined with a predetermined constant value (-1.302) to create a discriminant function score. A score of 0 or above predicted neuropathic pain, while a score of less than 0 predicted nonneuropathic pain. The Arabic version of NPQ-SF had Cronbach's α = 0.45 and 0.48, correlation coefficient = 0.79, and intraclass correlation coefficient = 0.78 [30].

Functional independence

Functional independence was measured using the self-reported version of Spinal Cord Independence Measure III (SCIM III) which consists of 19 items of daily tasks grouped into three subscales (self-care, respiration, and sphincter management and mobility). Each item has between 2 and 9 grades. The total SCIM III score ranges from 0 to 100, with higher scores reflecting higher levels of performance or independence of a person [31]. We classified the participants as either completely functionally independent or not completely functionally independent using the cut-off values established by Richard et al. [32]. A bilingual expert translated the SCIM from English to Arabic then back from Arabic to English. Cronbach's alpha of the SCIM Arabic translation was 0.842 and the average inter-item correlation coefficient was 0.417.

Perceived environmental barriers

Perceived environmental barriers were measured using the Craig Hospital Inventory of Environmental Factors Short Form (CHIEF-SF). The CHIEF-SF consists of 12- items arranged into 5 subscales: physical/structure subscale, services/assistance, work/school, attitudes/support, and policies. Each item is scored by multiplying the frequency score (0 to 4) by the magnitude of impact score (1 to 2) to produce an item score that ranges from 0 to 8, higher scores indicate greater frequency and or magnitude of environmental barriers [33]. The CHIEF-SF was also translated by a bilingual expert from English to

Arabic and then back from Arabic to English. Cronbach's alpha of the CHIEF-SF Arabic translation was 0.904 and the average inter-item correlation coefficient was 0.446.

Four family and rehabilitative medicine specialists evaluated the validity and appropriateness of the Arabic version of SCIM and CHIEF-SF items'. Furthermore, we conducted a pilot study on 20 wheelchair users with SCI from the Al Hassan Foundation which were not included in the sample to evaluate the reliability, understandability, clarity, and acceptability of Arabic translation of the SCIM and CHIEF-SF. The translation process did not involve any modifications to the original SCIM and CHIEF-SF items.

Table 1 Characteristics of the study participants ($n=105$)

Characteristic	No. (%)/ Mean ± SD
Age (years)	
Mean ± SD (range)	33.9 ± 7.8 (18–57)
Gender	
Male	84 (80.0)
Female	21 (20.0)
Marital status	
Single/ Divorced	60 (57.1)
Married	45 (42.9)
Geographical area *	
Greater Cairo	36 (34.3)
Suez Canal area	18 (17.1)
Alexandria	15 (14.3)
Delta	15 (14.3)
Upper Egypt	21 (20.0)
Education	
Basic	11 (10.4)
Secondary	28 (26.7)
Higher Education	55 (52.4)
Postgraduate	11 (10.5)
Occupation	
Not working	43 (41.0)
Manual work	9 (8.6)
Trading/ business owner	10 (9.5)
Semi-professional	24 (22.9)
Professional	19 (18.1)
Causes of Spinal Cord Injury (SCI)	
Traumatic	91 (86.7)
Non-traumatic	14 (13.3)
Type of SCI **	
Complete paraplegia	76 (72.4)
Incomplete paraplegia	10 (9.5)
Complete tetraplegia	9 (8.6)
Incomplete tetraplegia	10 (9.5)
Age at injury (years)	
Mean ± SD (range)	25.0 ± 10.1 (< 1–55)
Time living with SCI (years)	
Mean ± SD (range)	8.4 ± 6.2 (0.25–30)

* Greater Cairo (Cairo, Giza, Qalubaya); Suez Canal area (Ismailia, Port said, Suez, Sinai, Sharqia); Alex (Alex, Matrouh, El-Behaira); Delta (all other lower Egypt governorates); Upper Egypt (starting from Fayoum to Aswan) **Type of SCI injury was self-reported

Statistical analysis

We used the Statistical Package for the Social Sciences (SPSS version 25.0; IBM Corporation) to analyze and manage data. The normality of continuous data was tested by the Kolmogorov-Smirnov test. Non-normally distributed data were further summarized as median and interquartile range. Categorical variables were described as frequencies and percentages, while continuous variables were summarized as mean, standard deviation, and range. Associations between categorical variables were tested for statistical significance by the Chi-square test or Fisher's exact test (if > 20% of expected values were less than 5). We used Spearman's rank correlation to test for associations between the scores of the study scales. Additionally, we designed a binary multiple logistic regression model to identify the predictors of low SWL among the studied patients. Potential predictors were entered into the model based on the p-value of bivariate associations (if p-value < 0.20). Findings from the regression model were presented as B, p-value, Odds ratio (OR), and its 95% confidence interval. A p-value < 0.05 was considered statistically significant.

Results

The mean age of the participants was 33.9 (7.8), 80% of them were males, 86.7% of them had traumatic SCI, and 72.4% reported a complete paraplegia type of injury. The mean age at injury and time living with SCI were 25.0 (10.1) and 8.4 (6.2) respectively. Table 1 shows the detailed characteristics of the participants. The mean score of the SWLS was slightly dissatisfied 19.3 (7.2) and 57.1% of the participants reported low SWL as shown in Table 2.

There was a significant association between age and SWL (p-value = 0.005) as older age was associated with a higher rate of low SWL. In addition, there was a significant association between the area of living and SWL (p-value = 0.025) as participants who lived in Upper Egypt had a higher rate of low SWL than participants who lived in other areas. Also, there was a significant association between age at the time of injury and SWL (p-value = 0.031). Participants younger than 10 years and older than 30 at the time of injury reported higher rates of low SWL than others as shown in Table 3.

Participants who were free from anxiety and depression reported significantly higher rates of average/high SWL 66.7% and 71.1% (p-value = 0.005 and 0.002) respectively. A higher percentage of the participants who had a low SWL (81.7%) suffered from neuropathic pain compared to those who had an average/high SWL (62.2%) (p-value = 0.026). The percentage of participants who

Table 2 Distribution of satisfaction with life scale (SWL) among study participants ($n=105$)

Satisfaction with Life Scale (SWLS)	No. (%)/ Mean ± SD
Partcipants' responses to SWLS	
Extremely satisfied	7 (6.7)
Satisfied	18 (17.1)
Slightly satisfied	20 (19.0)
Neutral	3 (2.9)
Slightly dissatisfied	26 (24.8)
Dissatisfied	23 (21.9)
Extremely dissatisfied	8 (7.6)
SWLS Total score,	
Mean ± SD (range)	**19.3** ± 7.2 (5–35)
Median (IQR)	**18.0** (14.0–25.0)
Level of Life Satisfaction	
Low	60 (57.1)
Average/ High	45 (42.9)

SWLS: Satisfaction with Life Scale, SD: Standard Deviation, IQR: Interquartile range

have a ≥3 score of perceived total environmental barriers among those with low SWL was significantly higher than those with average/high SWL (48.3% vs. 24.4%) (p-value 0.013). In addition, we found significant associations between complete functional independence in many activities and SWL. For instance, the proportion of individuals who were completely independent in mobility indoors was significantly higher among those with average/high SWL compared to those with low SWL (p-value 0.036). Table 4 shows the details of all associations.

Figure 1 shows a significant strong negative correlation between the SWLS score and the HADS depression score ($r=-0.52$, $p<0.01$). In addition, there are significant moderate negative correlations between the SWLS score and HADS anxiety ($r=-0.43$, $p<0.01$), and CHIEF-SF scores ($r=-0.33$, $p<0.01$). Also, there are significant weak negative correlations between the SWLS score and NPQ-SF score ($r=-0.24$, $p<0.01$). Nevertheless, there was a significant weak positive correlation between the SWLS score and SCIM score ($r=-0.26$, $p<0.01$).

The binary multiple logistic regression revealed that the predictors of low SWL were living in Upper Egypt (OR=13.7, 95% CI 1.59–117.80), depression (OR=6.084. 95% CI 1.15–32.21), older age (OR=1.21, 95% CI 1.07–1.37), and work and school environmental barriers (OR=0.46, 95% CI 0.24–0.89) as shown in Table 5.

Discussion

More than half of the participants reported low SWL, this is high compared to high-income countries (HICs) like Germany, the USA, Sweden, and Australia [34–39]. Additionally, our study's SWLS mean score indicated a slight dissatisfaction which is comparable to other low-income countries like Bangladesh, India, Vietnam, and Sri Lanka, where the mean total score of SWLS indicated overall dissatisfaction [40, 41]. However, it is lower than HICs like the USA and Poland, which reported a higher mean score of SWL ranging from neutral to rather satisfied [42–44]. This is consistent with the International Spinal Cord Society (InSCI) survey finding that SWL among people with SCI was influenced mainly by their country's economic standing [45].

Sociodemographic characteristics and SWL

We found a significant association between age and SWL; those who were older than 45 years had the highest rates of low SWL, and older age was a predictor of low SWL. This is consistent with Nasidi et al. in Nigeria and other studies' findings [14, 37, 46, 47]. Aging with SCI was perceived as an unavoidable deterioration. Maintaining one's health, mobility, and independence has been seen as a never-ending battle from the beginning of one's SCI, and this only becomes more difficult as one ages [48]. However, Nizeyimana et al. and Finley et al. reported that older age was associated with better QOL [49, 50]. In these studies, it was considered that the positive aspects of getting used to SCI outweighed the general trend of decreasing QOL with age [50].

We found no significant association between SWL and employment status this is consistent with Parimbelli et al. and Rivers et al. findings [51, 52]. However, other studies reported that individuals who were employed had significantly higher SWL [35, 38, 41, 49, 50]. Additionally, we found no significant association between gender and SWL. The relation between gender and SWL is somewhat controversial. Jörgensen et al. in Sweden and other studies agree with our findings, where no association existed [35, 38, 53, 54]. Conversely, studies in Italy, Bangladesh, and Nigeria revealed that females reported a better SWL [40, 47, 51], while in South Africa male participants had significantly better QOL [49]. We believe the relation between gender and SWL could be mediated by social and cultural factors. For instance, gender roles in providing for one's family, support from relatives and peers, and prevalent social norms. In Egypt, both males and females contribute financially to their families, which in turn supports both genders, whether they are single or married.

Furthermore, we found no significant association between SWL and marital status which aligns with many other studies including Tasiemski et al. findings in three Asian countries [41, 54–57]. However, Rivers et al. and other studies reported that being married is associated with higher SWL and better QOL [13, 35, 51, 52]. Parimbelli et al. proposed that the absence of a close relative living with people with SCI leads to a lack of emotional and physical support, and subsequently a low SWL [51]. In Egypt, cultural and traditional norms necessitate living with family and other relatives if you are single, this may

Table 3 Association between satisfaction with life (SWL) and participants' characters

Characteristics	Satisfaction with Life (SWL), row %		*p*-value
	Low	Average/High	
Age (years)			
18–24	3 (37.5)	5 (62.5)	**0.005***[f]
25–34	25 (45.5)	30 (54.5)	
35–44	21 (70.0)	9 (30.0)	
45 +	11 (91.7)	1 (8.3)	
Gender			
Male	49 (58.3)	35 (41.7)	0.622
Female	11(52.4)	10 (47.6)	
Marital status			
Single/ Divorced	34 (56.7)	26 (43.3)	0.275 [f]
Married	26 (57.8)	19 (42.2)	
Geographical area			
Greater Cairo	16 (44.4)	20 (55.6)	**0.025***
Suez Canal area	13 (72.2)	5 (27.8)	
Alexandria	5 (33.3)	10 (66.7)	
Delta	10 (66.6)	5 (33.3)	
Upper Egypt	16 (76.2)	5 (23.8)	
Education			
Basic	9 (81.8)	2 (18.2)	0.225 [f]
Secondary	18 (64.3)	10 (35.7)	
Higher Education	26 (47.3)	29 (52.7)	
Postgraduate	7 (63.6)	4 (36.4)	
Occupation			
Not working	30 (69.8)	13 (30.2)	0.052 [f]
Manual work	5 (55.6)	4 (44.4)	
Trading/ business owner	4 (40.0)	6 (60.0)	
Semi-professional	15 (62.5)	9 (37.5)	
Professional	6 (31.6)	13 (68.4)	
Causes of SCI			
Traumatic	52 (57.1)	39 (42.9)	1
Non-traumatic	8 (57.1)	6 (42.9)	
Type of SCI			
Complete paraplegia	41 (53.9)	35 (46.1)	0.095 [f]
Incomplete paraplegia	4 (40.0)	6 (60.0)	
Complete quadriplegia	6 (66.7)	3 (33.3)	
Incomplete quadriplegia	9 (90.0)	1 (10.0)	
Age at injury (years)			
< 10	4 (80.0)	1 (20.0)	**0.031***[f]
10–19	11 (47.8)	12 (52.2)	
20–29	22 (46.8)	25 (53.2)	
30 +	23 (76.7)	7 (23.3)	
Time since injury (years)			
< 5	18 (51.4)	17 (48.6)	0.638 [f]
5–9	21 (63.6)	12 (36.4)	
10–19	16 (53.3)	14 (46.7)	
20 +	5 (71.4)	2 (28.6)	

*. Statistically significant p-value at $p<0.05$

[f]. Fisher's exact test

Table 4 Association between satisfaction with life (SWL) and selected study independent variables

Characteristics	Satisfaction with Life (SWL), column %		*p*-value
	Low	Average/ High	
Anxiety status:			
Normal	23 (38.3)	30 (66.7)	**0.005***
Borderline	11 (18.3)	8 (17.8)	
Abnormal	26 (43.3)	7 (15.6)	
Depression status:			
Normal	22 (36.7)	32 (71.1)	**0.002***
Borderline	17 (28.3)	7 (15.6)	
Abnormal	21 (35.0)	6 (13.3)	
Pain:			
Non-neuropathic pain	11(18.3)	17 (37.8)	**0.026***
Neuropathic pain	49 (81.7)	28 (62.2)	
Perceived Environmental Barriers (≥ 3):			
Physical and Structural	32 (53.3)	17 (37.8)	0.114
Services and Assistance	30 (50.0)	17 (37.8)	0.213
Work and School (n = 92) *	22 (43.1)	13 (31.7)	0.262
Attitude and Support	28 (46.7)	14 (31.1)	0.107
Policies	33 (55.0)	16 (35.6)	**0.048***
Total	29 (48.3)	11 (24.4)	**0.013***
Complete functional independence:			
Self-care			
Feeding	48 (80.0)	43 (95.6)	**0.020***
Bathing	40 (66.7)	41 (91.1)	**0.003***
Dressing	42 (70.0)	40 (88.9)	**0.021***
Grooming	43 (71.7)	39 (86.7)	0.066
Respiration & Sphincter management			
Respiration	56 (93.3)	45 (100.0)	0.133 [f]
Sphincter management-Bladder	20 (33.3)	20 (44.4)	0.06
Sphincter management-Bowel	21 (35.0)	24 (53.3)	0.246
Use of toilet	29 (48.3)	30 (66.7)	0.061 [f]
Mobility & Transfers			
Mobility in bed and prevention of pressure sores	32 (53.3)	34 (75.6)	**0.020***
Transfers bed-wheelchair	45 (75.0)	43 (95.6)	**0.005***
Transfers wheelchair-toilet-tub	40 (66.7)	41 (91.1)	**0.003***
Mobility indoors	35 (58.3)	35 (77.8)	**0.036***
Mobility for moderate distance	31 (51.7)	31 (68.9)	0.076
Mobility outdoors	26 (43.3)	26 (57.8)	0.143
Stair management	0 (0.00)	0 (0.00)	NA
Transfers wheelchair-car	33 (55.0)	33 (73.3)	0.054
Transfers ground-wheelchair	14 (23.3)	10 (22.2)	0.893

*. Statistically significant *p*-value at $p < 0.05$

[f]. Fisher's exact test

NA: not applicable (no statistics are computed because this measure was constant)

explain our finding that there is no association between SWL and marital status.

Additionally, there was no association between SWL and educational level. The same findings were supported by Celik et al. and Tonack et al. in Turkey and Canada [56, 57]. This contradicts LaVela et al. and Post et al.'s finding in the USA and four European countries that a higher education level was associated with higher SWL [13, 14]. Although people with SCI usually experience obstacles during education, they still acknowledge the vital role of education in better employment chances [58]. In our study, more than half the participants were employed as the Al Hassan Foundation provides re-occupation opportunities regardless of educational level. This might explain our finding of the lack of association between educational level and SWL. Conversely, a study in Italy reported that higher education is associated with lower QOL. Parimbelli et al. owed this to more adaptability of

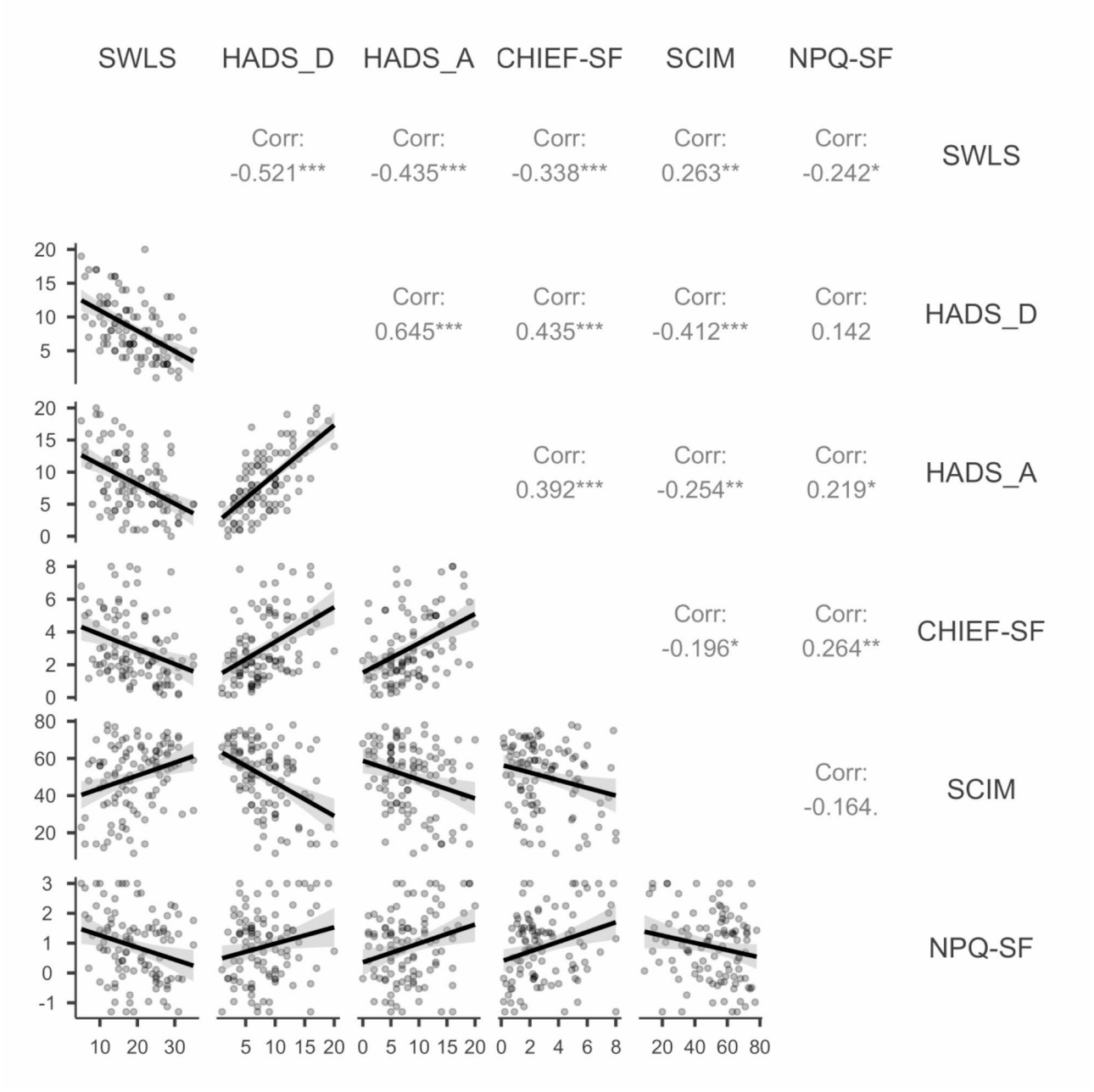

Fig. 1 Correlation matrix of bivariate correlations between the score of satisfaction with life scale (SWLS) and scores of selected study variables Spearman's Correlation

***. Correlation is significant at the 0.001 level (2-tailed)

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

SWLS: Satisfaction with Life Scale, HADS-A: Hospital Anxiety Depression Scale-Anxiety, HADS-D: Hospital Anxiety Depression Scale-Depression, NPQ-SF: Neuropathic Pain Questionnaire-Short Form, SCIM: Spinal Cord Independence Measure III, CHIEF – SF: Craig Hospital Inventory of Environmental Factors – Short Form

people with lower levels of education than people with higher education who are aware that they are currently not able to benefit from their education which is frustrating for people with higher aspirations [51].

The logistic regression model revealed that living in Upper Egypt is the strongest predictor of low SWL. Upper Egypt is the poorest region in Egypt, especially in rural areas [59]. Additionally, this area faces significant gaps in education, health, and employment. Services in

Table 5 Predictors of low satisfaction with life (SWL) among study participants

Characteristics	Low Satisfaction with Life			
	B	*p*-value	OR	95% CI
Age (years)	**0.191**	**0.002***	**1.21**	**1.07–1.37**
Geographical area				
Greater Cairo/ Alexandria	Ref	Ref	1	
Suez Canal/ Delta	1.41	0.068	4.08	0.90–18.46
Upper Egypt	**2.62**	**0.017***	**13.7**	**1.59–117.80**
Occupation				
Not working	Ref	Ref	1	
Manual work (unskilled/ skilled)	-1.21	0.345	0.3	0.02–3.69
Trading/ business owner	-2.46	0.051	0.09	0.01–1.01
Semi-professional/ Professional	-1.75	0.062	0.17	0.03–1.09
Type of Spinal cord injury				
Incomplete paraplegia	Ref	Ref	1	
Complete paraplegia	-0.19	0.873	0.83	0.08–8.46
Complete/Incomplete quadriplegia	1.8	0.301	6.07	0.20–184.75
Depression score	**1.806**	**0.034***	**6.084**	**1.15–32.21**
Pain				
Non-neuropathic pain	Ref	Ref	1	
Neuropathic pain	0.143	0.864	1.15	0.22–5.94
Functional independence subscales				
Self-care	0.147	0.263	1.16	0.90–1.50
Respiration & Sphincter management	0.014	0.818	1.01	0.99–1.15
Mobility & Transfers	-0.015	0.879	0.99	0.81–1.20
Perceived environmental barriers subscales				
Physical and Structural	0.113	0.613	1.12	0.72–1.73
Services and Assistance	0.772	0.101	2.16	0.86–5.45
Work and School	**-0.775**	**0.022***	**0.46**	**0.24–0.89**
Attitude and Support	0.086	0.737	1.09	0.66–1.80
Policies	0.166	0.299	1.18	0.86–1.62
Constant	-11.182	**0.005***	0	

OR: Odds Ratio, CI: Confidence Interval, B: regression coefficient

Model fit: Chi-square = 52.57, df = 21, $p < 0.001$), Model predictability = 83.7%

Hosmer and Lemeshow test: Chi-square = 6.654, df = 8, $p = 0.574$), Nagelkerke **R Square** = 0.583

*. Statistically significant p-value at $p < 0.05$

these areas are both less available and of poor quality [60].

Injury-related characteristics and SWL

We found that SWL was significantly associated with age at injury in a bimodal manner. Those who were younger than 10 years at the time of injury had the highest rates of low SWL followed by those who were older than 30 years at the time of injury. Individuals who sustain SCI at a younger age appear to have lower QOL compared to those who are injured later in life since they endured more years of premature deterioration as a result of their early injury [61]. However, other studies reported that those who acquired SCI at an older age are more likely to report low SWL [13, 14]. This can be explained by Post et al. finding that people injured at an older age showed worse social participation than those injured at a younger age [14].

We also found that SWL did not differ by level of injury which aligns with Middleton et al. in Australia and previous studies [13, 35, 62, 63]. Furthermore, we found no significant association between SWL and time since injury, consistent with Gurcay et al. and other studies' findings [54, 64–66]. However, other studies reported that a longer duration of injury was associated with higher SWL [13, 46, 62].

Anxiety, depression, and SWL

We found a significant association between SWL and anxiety and depression; higher percentages of participants with average/high SWL were associated with the absence of anxiety and depression, which is consistent with Wang et al. finding [67]. Our findings are also similar to other studies finding that depression was reported by a greater proportion of persons with low SWL (vs. average/high SWL) [13, 43, 46]. The multivariant regression

model revealed that depression is a predictor of low SWL this is consistent with the SCIRehab Project finding [43]. While Wang et al. reported that anxiety is a negative predictor of QOL [67], and Van Leeuwen et al. reported that both anxiety and depression predict low SWL [15]. This emphasizes the necessity of early screening and management of anxiety and depression to enhance the SWL of people with SCI.

Neuropathic pain and SWL

There was a negative correlation between SWL and neuropathic pain which aligns with other studies reporting that pain (both neuropathic and nociceptive pain) was associated with low SWL and QOL [13, 36–38, 57]. People reported that experiencing chronic neuropathic pain following SCI has immense drawbacks to their physical, and psychosocial welfare [68].

Functional independence and SWL

We found a significant association between SWL and complete functional independence. The proportion of participants who reported complete functional independence among those with low SWL is lower than those with average/high SWL. This is similar to Kifley et al. in Australia and other studies' findings [13, 15, 36, 52]. Our findings and other studies that SWL is significantly associated with functional independence rather than the level of injury further emphasize the fundamental role of rehabilitation programs in improving SWL for individuals with SCI.

Environmental barriers and SWL

There was a significant negative correlation between environmental barriers and SWL this is consistent with the Moroccan, Australian, and German SCI Survies [34, 36, 69]. Contrary to our expectation, the multiple logistic regression model showed that work/school barriers decreased the odds of lower SWL. This could be explained by Hilton et al.'s finding that people with SCI who returned to their jobs after the injury were enthusiastic, confident in their ability to overcome barriers, and committed to achieving their goals. They also were satisfied with their ability to blend into society, have a purpose, and fulfill their potential and autonomy [70].

Study limitations

This is the first study to report on the SWL among wheelchair users with SCI in Egypt. However, some limitations need to be discussed. We recruited participants from the Al-Hassan Foundation because they provide a comprehensive database of wheelchair users from all over Egypt, which was convenient, and supportive of our objectives. However, the services provided by the Foundation may have affected some of the findings of our study, which may lead to an underestimation of the SWL, and thus limit the generalization of our results to all SCI patients in Egypt. Additionally, due to the cross-sectional nature of the current study, we are cautious about causal inferences regarding the associations and correlations that were found; we can only suggest associations for further research.

Conclusion

An alarming percentage of wheelchair users with SCI in Egypt reported low SWL. SWL correlated negatively with anxiety, depression, neuropathic pain, and environmental barriers, and positively with functional independence. Therefore, we believe that healthcare services for people with SCI must include appropriate screening and management of pain, depression, and anxiety and adopt rehabilitation protocols in community settings. The Egyptian government must enforce and implement rights for PWDs legislation to enhance the SWL for wheelchair users with SCI, particularly those residing in Upper Egypt. Finally, we recommend future research studies including qualitative ones to assess other determinants of SWL for wheelchair users with SCI in Egypt.

Abbreviations

CHIEF-SF	Craig Hospital Inventory of Environmental Factors – Short Form
HADS	Hospital Anxiety Depression Scale
HICs	High-Income Countries
InSCI	International Spinal Cord Society
LMICs	Low- and Middle-Income Countries
NP	Neuropathic Pain
NPQ-SF	Neuropathic Pain Questionnaire- Short Form
OR	Odds Ratio
PWDs	Persons with Disabilities
QOL	Quality of Life
SCI	Spinal Cord Injury
SCIM	Spinal Cord Independence Measure
SPSS	Statistical Package for the Social Sciences
SWL	Satisfaction With Life
SWLS	Satisfaction With Life Scale
UHI	Universal Health Insurance
USA	United States of America
YLD	Years of Healthy Life Lost Due to Disability

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Author contributions

SA, SE, MI, WZ, and HN conceived and designed the research; SA collected and analyzed data; SA, MI, and HN interpreted the results of the study; SA prepared figure, SA, MI drafted the manuscript; all the authors revised and approved the final version of the manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Research Ethical Committee of the Faculty of Medicine, Suez Canal University, Ismalia, Egypt (ref. 4490#). An informed consent was sent to those who agreed to participate through e-mail or social media applications. The consent confirmed the confidentiality of the participant's data.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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