

Determinants of quality of life among community-dwelling persons with spinal cord injury: A path analysis

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Abstract

Context: Recent advancement in technology and medical care has resulted in an increase not only in disability arising from spinal cord injury (SCI) but also its attendant challenges such as poor quality of life (QoL).

Aim: To test a theoretical model of predictors of QoL among persons with SCI.

Settings and Design: Study was conducted in the South Eastern Nigeria. A longitudinal study design was employed.

Materials and Methods: A total of 64 persons with SCI discharged from in-hospital admission participated in this study. QoL, state self-esteem (SSE), social support satisfaction (SSS), and functional potentials (FPs) were assessed using short form health survey-12, SSE scale, social support questionnaire 6, and spinal cord independent measure III, respectively. Their motor function (MF) and sensory function (SF) were assessed using the motor and sensory subscales of American Spinal Cord Association impairment scale.

Statistical Analysis Used: Data obtained were analyzed using path analysis. The level of significance was set at $\alpha = 0.05$.

Results: Most of the participants were male (92.3%) with incomplete type of SCI (65.4%). The selected variables (SSE, SSS, FP, MF, and SF) significantly predicted a large percentage ($R^2 = 0.861$) of QoL. All the predictor variables except age had a direct significant effect on QoL ($P < 0.05$). The trimmed model revealed that SSS ($\beta = 3.04$, $P = 0.002$) had the highest direct effect on QoL.

Conclusions: This study revealed that the combined assessment of SSE, SSS, FP, MF, and SF can be used to predict QoL significantly. Moreover, psychosocial factors are as important as clinical (biological) factors in predicting the outcomes of SCI, especially their QoL. Thus, the study buttresses the need to emphasize on the biopsychosocial model in the rehabilitation of persons with SCI.

Key words: Determinants, path analysis, quality of life, spinal cord injury

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Introduction

Spinal cord injury (SCI) has been defined as an acute traumatic injury of the spinal cord, including cauda equina and conus medullaris injuries, resulting in motor/sensory deficits and/or bladder/bowel dysfunction persisting for at least 72 h post-trauma.^[1] It is a devastating neurological injury resulting in varying degrees of paralysis, sensory loss, and sphincter disturbance which may be permanent or irreversible in cases.^[2] SCI is a medically complex and life-disrupting condition albeit survivable. As many as 500,000 people suffer an SCI each year. People with spinal cord injuries are 2-5 times more likely to die prematurely, with worse survival rates in low- and middle-income countries such as in Africa. Given recent advancement in technology and medical care, there has been an increase in survivor rate of individuals with SCI. However, this has resulted in an increase not only in disability arising from SCI but also its attendant challenges such as poor quality of life (QoL). QoL has been found to be diminished following SCI.^[3,4]

QoL has been defined as individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns.^[5,6] Studies^[7,8] have shown that after an SCI, people usually experience a reduced subjective well-being, life participation, and QoL. Prediction models have empirical and practical applications such as suggesting important factors to be considered and helping develop targets in promoting recovery after SCI. Models exist in predicting functional recovery after SCI. However, to date, no path analysis of the prediction of QoL in the population of persons with SCI has been published. Therefore, the primary objective of this study was to test a theoretical model of predictors of QoL which included the direct and indirect effects between psychosocial outcomes, physical outcome, and sociodemographic variables at twelve months posthospital discharge.

Subjects and Methods

Design, setting, and sample

The findings presented are part of a longitudinal study (prospective predictive research design) that followed up 64 spinal cord injured patients receiving treatment in four tertiary hospitals in the South Eastern part of Nigeria. Patients were recruited using a sample of convenience and the participating hospitals were selected using purposive sampling technique (based on the fact that they were the major tertiary hospitals and referral centers in the South Eastern part of Nigeria). Data were collected from the participants at 12 months after discharge from in-hospital admission while still receiving outpatient physiotherapy care (attrition rate: 18.8% over 12 months).

Inclusion and exclusion criteria

This study involved both male and female community-dwelling persons with SCI receiving physiotherapy treatment on an outpatient basis in four tertiary hospitals in South-East Nigeria. All classes of SCI based on the American Spinal Cord Association (ASIA) classification system were included. However, SCI patients with further neurological disorders, for example, head injury, stroke, etc., were excluded from the study. Moreover, those with uncontrolled blood pressure, cognitive, and speech impairments were excluded.

Hypothesis

It was hypothesized that state self-esteem (SSE), social support, motor and sensory function (SF), functional potential (FP), and sociodemographic variables would influence the QoL of spinal cord injured patients 12 months after in-hospital discharge.

Measures

Quality of life

The short form health survey (SF-12) was used to assess health-related QoL of the participants. It is a 12-item scale, derived from the physical and mental domains of the SF-36. It assesses perceived health (QoL) that describes the degree of general physical health status and mental health distress.^[9] The scoring is norm-based, separate summary scores are obtained for each of the physical and mental domains by summing across all 12 items for each. Higher scores indicate higher QoL. In a study of veterans with SCI, the SF-12 was reported to have a good discriminant function, convergent validity, and correlated strongly with the SF-36.^[10]

State self-esteem

The SSE scale (SSES) was used to assess self-esteem of the participants. It comprises twenty items.^[11] Patients rate whether each item is true of themselves "right now," using a 5-point Likert scale with 1 = not at all, and 5 = extremely, yielding a total possible score of 20–100, with high scores indicating higher levels of SSE. The SSES has a high internal consistency with an alpha value of 0.92.^[11]

Social support

Social support questionnaire (SSQ6) was used to determine social support satisfaction (SSS). Participants' overall satisfaction with the support provided was rated using a 6-point Likert scale; higher SSQ6 satisfaction scores are indicative of more satisfaction with the social support received. The alpha coefficient of the SSQ6-satisfaction is 0.92.^[12]

Functional potential

Spinal cord independent measure was used to assess FPs. It is a comprehensive functional assessment and rating

scale for patients with spinal cord lesions.^[13] It covers 19 activities of daily living grouped into four areas of function (subscales): Self-care (scored 0–20), respiration and sphincter management (0–40), mobility in room and toilet (0–10), and mobility indoors and outdoors (0–30).^[13,14] It is a clinician-administered instrument.

Motor and sensory functions

The motor and sensory subscales of ASIA impairment scale were used to assess motor and SFs, respectively.^[15-17] These subscales have excellent ($r > 0.98$) intrarater reliability.^[18,19] The sensory subscale has adequate predictive validity ($r = 0.68$) for ambulatory capacity while the motor subscale has excellent predictive validity ($r = 0.79$) for ambulatory capacity.^[20] Furthermore, the motor subscale has an excellent ($r > 0.95$) construct validity.^[21,22] Both subscales are clinician-administered.

Ethical issues

Approval had been obtained from the university and hospital Ethics Committees. All patients meeting the inclusion criteria were invited to participate following an explanation of the purpose and were informed about their rights and freedom to withdraw from the study at any time without it influencing their treatment. Those that agreed to participate were asked to sign an informed consent form. All patients agreeing to participate were interviewed at 12 months following discharge from the inpatient admission.

Statistical analysis

Path analysis is a statistical technique that uses both bivariate and multiple linear regression techniques to test the causal relations among the variables specialized in the model.^[23] Path coefficients were computed through a series of multiple regression analyses based on the hypothesized model. The collinearity of the data was checked using the collinearity diagnostics in SPSS. Path diagrams were constructed with a single-headed arrow representing the causal order between two variables, with the head pointing to the effect and the tail to the cause. A curved, double arrow indicating a correlation between two variables.^[23]

Results

Most of the participants were male (92.3%), single (53.8%), and with incomplete type of SCI (65.4%). The mean age and FP score were 36.21 ± 13.57 years and 27.98 ± 15.11 , respectively, as shown in Table 1. Majority of the participants (92.3%) had FPs classified as mild/poor (i.e., below the score of 60). Moreover, most of the participants (75%) had QoL that could be described as poor as shown in Table 1.

The hypothesis predicting that FP, SSE, SSS, motor and SFs, type of injury, and sociodemographic variables

Table 1: Frequency distribution of quality of life, functional potential, motor function, and demographic variables of participants (n=52)

Variables	Categories	Frequency	Percentage
Sex	Male	48	92.3
	Female	4	7.7
Occupation	Civil servants	5	9.6
	Drivers	8	15.4
	Traders	12	23.1
	Students	17	32.7
	Others	10	19.2
Marital status	Single	28	53.8
	Married	24	46.2
Type (Asia)	A	18	34.6
	B	4	7.7
	C	2	3.8
	D	28	53.8
Quality of life	Poor	39	75.0
	Fair	13	25.0
Functional potential	Poor	26	50.0
	Mild	22	42.3
	Excellent	4	7.7
Motor function	Poor	15	28.8
	Fair	20	38.5
	Good	9	17.3
	Excellent	8	15.4
Sensory function	Poor	10	19.2
	Fair	7	13.5
	Good	15	28.8
	Excellent	20	38.5

Table 2: Mean distribution of participants variables (n=52)

Variables	Mean	SD	Minimum	Maximum
Age	36.21	13.57	15.00	65.00
Motor function	42.90	27.21	0.00	94.00
Sensory function	138.90	67.21	2.00	224.00
Functional potential	27.98	15.12	5.00	66.00
Social support	2.85	0.67	2.00	4.40
Self esteem	66.81	11.45	41.00	85.00
Quality of life	37.12	8.14	20.50	55.20

SD=Standard deviation

influence QoL at 12 months was tested with path analysis. QoL was the dependent variable. Exogenous independent variables were motor and SFs, sex, and age. Endogenous independent variables were FP, state self-esteem, and SSS. No problem of multicollinearity was detected as bivariate correlations did not exceed 0.80.^[24] Residual plots were used to check normality and no violation of the assumption of normality was detected. Path coefficients were calculated through a series of multiple regression analyses based on the hypothesized model and the results are presented in Table 2.

Table 3: Path coefficients calculated through a series of multiple regression analyses based on the hypothesized model

Outcome variables	R ²	Predictor variables	B	P
Quality of life	0.861	Functional potential	0.105	0.042*
		Self esteem	0.349	<0.0001*
		Social support	2.432	0.015*
		Motor function	0.104	0.023*
		Sensory function	0.042	0.007*
		Age	-0.087	0.095
		Sex	5.693	0.014*
Functional potential	0.735	Self esteem	0.090	0.579
		Social support	1.089	0.482
		Motor function	0.291	0.001*
		Sensory function	0.075	0.011*
		Age	-0.156	0.128
Self esteem	0.362	Motor function	0.304	0.003*
		Sensory function	0.081	0.020*
		Age	0.194	0.107
		Sex	-8.673	0.101
Social support	0.204	Motor function	0.001	0.839
		Age	-0.021	0.002*
		Sex	0.267	0.416

*=Significant

Table 4: Final model of quality of life

Outcome variables	R ²	Predictor variables	B	P
Quality of life	0.852	Functional potential	0.133	0.045
		Self esteem	0.323	<0.0001
		Social support	3.038	0.002
		Motor function	0.116	0.013
		Sensory function	0.033	0.024
		Sex	5.662	0.017
Functional potential	0.710	Motor function	0.348	<0.0001
		Sensory function	0.060	0.026
Self esteem	0.214	Motor function	0.292	0.001
		Sensory function	0.344	0.015
Social support	0.191	Age	-0.02	0.001

All the predictor variables except age had a direct significant effect on QoL. For the final model, nonsignificant variables from regression models were deleted and repeated with only the significant variables [Table 3]. Standardized regression beta weights were used to calculate the direct (the influence of one variable on another that is not mediated by any other variable in a model) and indirect (the effect of one variable on another through at least one other variable in a model) effects of significant variables on QoL.

According to the trimmed model with path coefficients at 12 months [Figure 1], the path coefficients showed that SSS had the largest direct effect on QoL ($\beta = 3.04$). Furthermore, improved motor function (MF) ($\beta = 0.11$), more SF ($\beta = 0.03$), increased FP ($\beta = 0.13$), high SSE ($\beta = 0.32$), and male

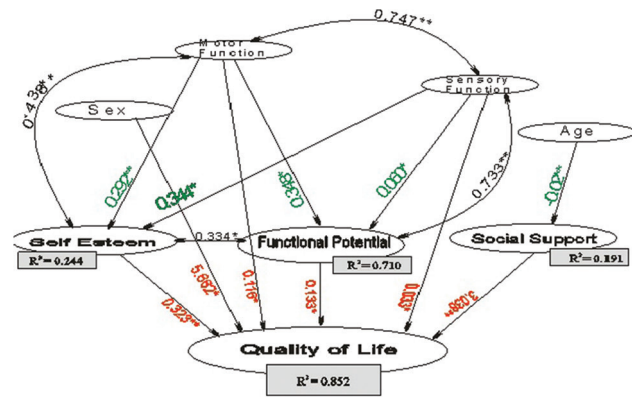


Figure 1: Trimmed model with path coefficients at 12 months

sex ($\beta = 5.66$) have a direct effect on QoL. The explanatory variables accounted for 85% of the variance in explaining QoL at 12 months as shown in Table 4. Although age had no direct effect on QoL, older age ($\beta = -0.02$) had an indirect effect on QoL through SSS. MF and SF had a significant indirect effect on QoL through their effects on FP and state self-esteem. The model variables account for 71% and 24% of the variance of FP and state self-esteem, respectively.

Discussion

Quality of life model

QoL is a dynamic phenomenon concerned with the cognitive and emotional reactions that people experience when they compare their current health status with their aspirations, needs, and other expectations. The International Classification of Functioning, Disability and Health challenges mainstream ideas on how people understand health and disability (biomedical model) and take into account the psychosocial aspects of disability.^[25] Although this framework provides a broader conceptual framework for understanding health and disability, further conceptual development has been recommended to facilitate understanding of the QoL under various health conditions.^[26] Prediction models have empirical and practical applications,^[27] such as suggesting important factors to be considered and helping develop targets in promoting recovery after SCI. Models exist in predicting functional recovery after SCI.^[28,29] Path analysis used in this study to predict the QoL of persons with SCI has been considered superior to ordinary regression analysis as it provides an explanation of both the casual relation and the relative importance of alternative paths of influence.^[23]

Direct effects

The path coefficients show that social support has the largest direct effect and explains the most variance on QoL. An increase of one standard deviation in perceived social support produces an increase of more than three standard deviations in QoL level. The result also supports the notion

that higher FP, more SSE have a direct effect on QoL. Sociodemographic (male gender) and clinometric (motor and SFs) factors also have a direct effect on QoL. The explanatory variables accounted for substantial proportions of variance (85%) in explaining QoL at 12 months.

Similar to previous studies,^[30-32] social support in this study significantly predicted QoL among persons with SCI. Social support is generally understood as the support and assistance provided by others which fosters a belief that the individual is loved, esteemed, and cared for.^[33] The relationship between social support and recovery from illness is well-established.^[26,32] To further buttress the effect of social support on QoL of persons with SCI, Holicky and Charlifue,^[34] in their study on the impact of spousal support on rehabilitation outcomes of persons with SCI reported that marital status was significantly related to QoL, with married participants reporting higher QoL. They speculated that this was due to a number of roles and functions performed by spouses, one of which was surely the facilitation of social contacts. This finding becomes more disturbing given the fact that the prevalence of SCI is more among young male adults who usually are single and independent. It is therefore pertinent that experts in the field of neurological rehabilitation of patients with SCI assess and promote factors that will improve perceived social support.

Measures of FPs^[35,36] and state self-esteem^[37-39] are consistently identified in the literature just as found in this study to be related to the QoL of persons with SCI. Stevens and his colleagues^[35] found a strong, positive correlation between some measures of functionality (such as physical activity) and QoL and reported the former to be a significant predictor of QoL. This therefore implies that rehabilitation interventions that promote ADL and recovery of function through the implementation of compensatory techniques may improve the QoL of persons with SCI. Moreover, in line with the findings in this study, self-esteem which is regarded as often compromised by SCI^[37] is strongly related with the QoL of persons with SCI^[38] and therefore plays a vital role in the well-being of persons with SCI.^[37,39] This may be due to the social comparison which plays a role in self-esteem, particularly among persons with high levels of stress and uncertainty,^[40] such as in SCI.^[2] Therefore, knowledge and application of social comparison theory would be a very helpful tool in the hands of clinicians, especially those involved in the rehabilitation of persons with SCI. This is because it would enhance the understanding and implementation of the coping strategies which have been linked with the change in the self-esteem of persons with chronic illnesses.^[41] Social comparison theory centers on the belief that individuals compromise themselves to others to reduce uncertainty about their opinions and abilities and as a mean to define themselves.^[42] Coping strategies such as upward contrast (negative feelings toward those who are better off) and downward identification (fear of becoming

like others who are worse off) should be discouraged while wishful thinking, for example, upward identification (hope to be like others who are better off) should be reinforced in the rehabilitation of persons with SCI.

The path analysis model in this study showed that with the exception of age, the other factors (e.g., sensory/motor impairment and sex) directly predicted QoL of the participants. This may be explained by the fact that neural damage usually characterized with the loss of sensory and MF causes decreased activity/participation as well as mobility disability that are capable of diminishing QoL.^[35] In addition, in line with the findings from this study, Jain *et al.*^[43] using a multivariate regression model revealed that the level of motor impairment of SCI patient is independently associated with their QoL. Furthermore, Putzke *et al.* and Hosseini *et al.* in a similar study found that being male was uniquely associated with some measures QoL among spinal cord injured patients^[44,45] just as similarly observed in this study.

Indirect effects

Although age had no direct effect on QoL, older age however had an indirect effect on QoL through SSS. This may imply that older persons (who are assumed to be married) with SCI had a higher self-report of health-related QoL mediated through the level of social support (e.g. from their spouse). In addition, MF and SF had a significant indirect effect on QoL through their effects on FP and state self-esteem. This may attribute to the idea that improvement in motor and SF may be related with the improvement in functionality and self-worth.

There are a number of limitations to this study. Persons with SCI who do not have access to hospital-based rehabilitation services, for example, physiotherapy, were not included. Consequently, the results of this study cannot be extrapolated to all community-dwelling persons with SCI. The method of recruiting patients in this study was that of convenience sampling; therefore, generalization of these findings might thus be limited. The attrition rate of about 19% over 12 months also reduced external validity of the findings.

Conclusion

This study using a broader, more inclusive framework to assess post-SCI outcomes, indicates that persons with SCI in their 1st year after discharge have attendant challenges such as poor QoL. The study identifies important factors to be considered in helping adaptation and in promoting recovery. These factors accounted for 86.1% of the variance in explaining QoL. The above findings indicate that rehabilitation services need to continue to focus on restoring functional independence but also need to diagnose and improve motor and SFs in order to minimize the poor

perception of their position in life. Assisting patients in redefining their identity (self-esteem) and providing social support after SCI could be an important aspect in the rehabilitation of SCI.

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Conflicts of interest

There are no conflicts of interest.

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