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Influence Of Social Network on the Relationship Between Health-Related Quality of Life and Functional Impairment in Adult Stroke Survivors: A Cross-Sectional Study

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ABSTRACT: Stroke ranks first in frequency and importance among the neurological diseases of adult life and is a leading cause of long-term functional impairment. Its consequences extend beyond physical disability, disrupting the social networks that surround the survivor and shaping health-related quality of life (HRQoL). This study aimed to determine the relationship between functional impairment and HRQoL in adult stroke survivors and to examine whether social networks influence this relationship. A cross-sectional study was conducted on 57 medically stable stroke survivors aged 50 years and above, recruited from tertiary hospitals in Karnataka, India. HRQoL was measured with the World Health Organization Quality of Life–BREF (WHOQOL-BREF), functional impairment with the Functional Independence Measure (FIM) and social networks with Fillenbaum's questionnaire. Participants were divided by the median social-network score into a lower (Group A, n = 36) and a higher (Group B, n = 21) social-network group, and associations were assessed using the Pearson correlation test. Overall, functional impairment showed weak to moderate positive correlations with the psychological, social and environmental domains and a weak negative correlation with the physical domain ($r = -0.19$, $p = 0.14$). In survivors with a higher social network, lower functional impairment was associated with higher HRQoL across all domains, whereas in survivors with a lower social network this pattern was confined to the social-relationship and environmental domains. The findings indicate that a stronger social network broadens the beneficial link between preserved function and quality of life, underscoring the value of social support in stroke rehabilitation.

1. INTRODUCTION

Stroke is a major public health problem and one of the leading causes of death and adult disability worldwide. Among all the neurological diseases of adult life, stroke ranks first in frequency and importance, its common mode of expression being the relatively sudden occurrence of a focal neurological deficit. Strokes are broadly categorised as ischaemic, due to occlusion of a cerebral vessel, or haemorrhagic, arising within the brain substance or the subarachnoid space. The neurological deficit reflects both the location and the size of the lesion, and although hemiplegia is the most typical sign, survivors may also present with sensory loss, aphasia, visual-field defects, dysarthria and cognitive difficulties.

The global burden of stroke remains high. Cerebrovascular disease accounts for a substantial share of deaths and disability-adjusted life years each year, with an increasing burden in low- and middle-income countries¹⁻³. The cumulative effects of ageing and the progressive nature of vascular risk factors increase the risk of ischaemic stroke and intracerebral haemorrhage, the incidence of which rises steeply with age⁴. Physical inactivity, hypertension and a family history of stroke are recognised contributors to risk, and physically active individuals generally have a lower risk of stroke and mortality⁵.

Stroke causes significant physical, emotional and cognitive disability among survivors. Motor deficits are among the most common impairments hindering the performance of activities of daily living (ADL) and the functional use of the affected limb⁶. These limitations are not confined to severe stroke; even after a mild event, ADL and social roles may be affected, leading to participation restrictions⁷. Six months after stroke a considerable proportion of older survivors remain dependent in ADL and have cognitive deficits, and many return to their communities with impairments that require the assistance of a caregiver^{8,9}.

Health-related quality of life (HRQoL) has become a key indicator of post-stroke outcome. Its assessment is multidimensional, encompassing physical, psychological, social and environmental aspects¹⁰. Stroke survivors may have to leave their jobs and face uncertainty about the severity and evolution of their condition, changes in socioeconomic circumstances, and the availability of care and information—problems that are more pronounced when stroke results in multiple disabilities.

Stroke and its associated disabilities affect the capacity to work, and many survivors retire or become unemployed, which may lead to a breakdown of their social network. Social networks are the web of relationships that surround an individual, and their erosion can produce social isolation¹¹. Through social networks people gain access to social support and to the resources available in times of need; stronger and closer social ties reduce the sense of isolation and improve physical and mental functioning^{12,13}. Dissatisfaction with the information and support received after stroke has been widely reported¹⁴.

Planning an appropriate rehabilitation programme therefore requires a comprehensive assessment not only of physical and functional status but also of disability, social network and quality of life. Despite growing recognition of the importance of social support, the extent to which social networks modify the relationship between functional impairment and HRQoL in stroke survivors has been little explored. The present study was undertaken to address this gap.

Hypotheses

Null hypothesis (H0): Social networks do not influence health-related quality of life and functional impairment in adult stroke survivors.

Alternate hypothesis (H1): A better social network is associated with higher health-related quality of life and lower functional impairment in adult stroke survivors.

Objectives

- (i) To determine the relationship between functional impairment and health-related quality of life in adult stroke survivors; and
- (ii) To determine the influence of social networks on the relationship between functional impairment and health-related quality of life in adult stroke survivors.

2. MATERIALS AND METHODS

2.1. Study design and participants

This cross-sectional study was conducted over a period of one year on medically stable adults aged 50 years and above with a principal diagnosis of ischaemic or haemorrhagic stroke at discharge, referred by specialists from selected tertiary hospitals in southern Karnataka, India. The study population was recruited by convenient sampling.

2.2. Sample size

The sample size was estimated using the formula $n = Z^2P(1-P)/d^2$, with a level of significance (α) of 5%, an absolute precision (d) of 10% and an anticipated proportion (P) of 20% based on the parameters reported by Bergland et al.¹⁵ This

yielded a required sample of 57 participants.

2.3. Eligibility criteria

Survivors were included if they were aged 50 years or above (either sex), had a principal diagnosis of ischaemic or haemorrhagic stroke of more than one month's duration, required the assistance of at least one person for daily activities such as transfers, self-care and mobility, and resided with a primary caregiver at home. Survivors were excluded if they had post-procedural stroke (for example following coronary artery bypass grafting, angiography or surgery), global aphasia or an inability to communicate, functional dependence due to other pre-existing conditions (such as amputation, fracture or dementia), no primary caregiver, severe cognitive impairment (a Montreal Cognitive Assessment score below 20), or were unwilling or unable to adhere to the study protocol.

2.4. Outcome measures

Health-related quality of life was assessed using the World Health Organization Quality of Life–BREF (WHOQOL-BREF), a cross-culturally validated 26-item self-report instrument covering four domains: physical health (Domain I, 7 items), psychological health (Domain II, 6 items), social relationships (Domain III, 3 items) and environment (Domain IV, 8 items), together with two items on overall quality of life and general health¹⁶. Items are rated on a five-point Likert scale; domain mean scores were transformed to a 0–100 scale, with higher scores indicating better quality of life.

Functional impairment was assessed using the Functional Independence Measure (FIM), an 18-item instrument (13 motor and 5 cognitive tasks) rated on a seven-point ordinal scale ranging from total assistance to complete independence. Total scores range from 18 to 126, with higher scores indicating greater functional independence¹⁷.

Social networks were assessed using Fillenbaum's questionnaire, comprising five questions on social contact, loneliness, frequency of contact with relatives and friends, availability of help and telephone contact, which have established validity and reliability¹⁸. Higher scores indicate a better social network.

2.5. Procedure

Ethical clearance for the study was obtained from the Institutional Ethics Committee of Laxmi Memorial College of Physiotherapy, Mangalore (Approval number:AJEC/REV/77/2019). After clinical evaluation, survivors fulfilling the inclusion criteria were enrolled, and written informed consent was obtained from each participant following an explanation of the procedure. Each participant completed the WHOQOL-BREF, FIM and Fillenbaum's questionnaire in a single session (Figure 1). Based on the median score of Fillenbaum's questionnaire (median = 5), participants were divided into a lower social-network group (Group A) and a higher social-network group (Group B).



Figure 1. Administration of the outcome measures to a participant (identity masked).

2.6. Statistical analysis

Descriptive statistics (frequency, percentage, mean and standard deviation) were used to summarise the demographic data and study variables. The Pearson correlation test was used to examine the correlation between functional impairment (FIM score) and each transformed WHOQOL-BREF domain score, for the whole sample and separately within each social-network group. A p-value below 0.05 was considered statistically significant.

3. RESULTS AND DISCUSSION

3.1. Participant characteristics

Of 69 stroke survivors screened, 12 were excluded (three with global aphasia, one with dementia, two without a caregiver, four with a Montreal Cognitive Assessment score below 20 and two unwilling to participate). A total of 57 survivors formed the study population (Figure 2). The mean age was 58.81 ± 6.67 years, with mean height, weight and body mass index of 170.18 ± 3.49 cm, 62.21 ± 4.67 kg and 21.48 ± 1.43 kg/m² respectively (Table 1). Of the 57 participants, 36 were male and 21 were female; 22 (38.6%) had haemorrhagic and 35 (61.4%) had ischaemic stroke (Figure 3), and the mean duration since stroke was 8.61 ± 4.87 months (Table 2).

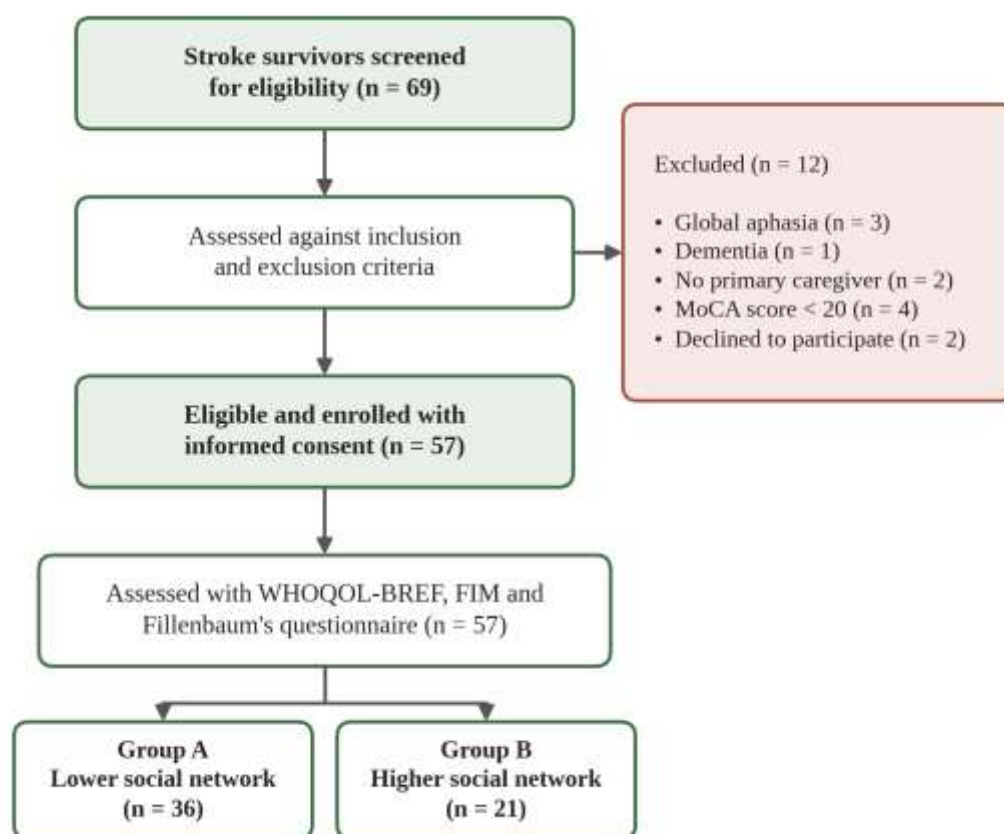


Figure 2. Flow diagram of the study.

Table 1. Descriptive statistics of age, height, weight and body mass index of the study participants (n = 57).

Variable	Age (years)	Height (cm)	Weight (kg)	BMI (kg/m ²)
Mean	58.81	170.18	62.21	21.48
Standard deviation	6.67	3.49	4.67	1.43

Table 2. Distribution of sex, stroke type and duration since stroke among the study participants (n = 57).

Characteristic	Frequency (n)	Percentage (%)
Sex: Male	36	63.2
Sex: Female	21	36.8
Stroke type: Haemorrhagic	22	38.6
Stroke type: Ischaemic	35	61.4
Duration since stroke (months), mean $\pm$ SD	8.61 $\pm$ 4.87	Range 2–24

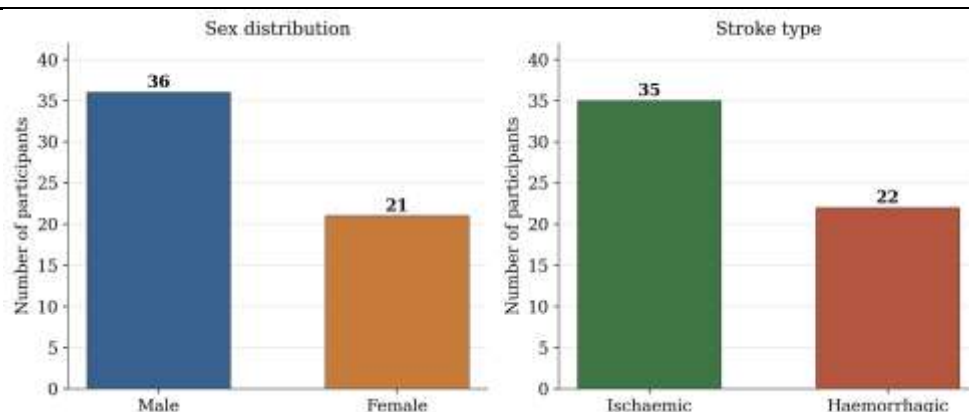


Figure 3. Distribution of participants by sex and stroke type (n = 57).

3.2. Descriptive profile of the study variables

The mean transformed WHOQOL-BREF scores were 48.61 ± 12.99 for the physical domain (Domain I), 46.49 ± 15.54 for the psychological domain (Domain II), 65.56 ± 27.67 for the social-relationships domain (Domain III) and 54.93 ± 23.75 for the environment domain (Domain IV). The mean FIM score was 113.47 ± 12.71 and the mean Fillenbaum social-network score was 7.98 ± 5.31 (Table 3). The relatively high mean FIM score indicates that, on average, participants retained a moderate to high level of functional independence, while the wide standard deviations for the social and environmental domains reflect considerable heterogeneity in these aspects of quality of life.

Table 3. Mean and standard deviation of the WHOQOL-BREF domains, FIM and Fillenbaum social-network scores (n = 57).

Measure	n	Mean	SD
Domain I – Physical health (transformed)	57	48.61	12.99
Domain II – Psychological (transformed)	57	46.49	15.54
Domain III – Social relationships (transformed)	57	65.56	27.67
Domain IV – Environment (transformed)	57	54.93	23.75
Functional Independence Measure (FIM)	57	113.47	12.71
Social network (Fillenbaum)	57	7.98	5.31

3.3. Relationship between functional impairment and HRQoL

Since higher FIM scores denote better functional independence and higher WHOQOL-BREF scores denote better quality of life, a positive correlation indicates that preserved function is associated with better quality of life. In the whole sample,

functional impairment was correlated only weakly to moderately with HRQoL. The physical-health domain (Domain I) showed a weak negative correlation with the FIM score ($r = -0.19$, $p = 0.14$), while the psychological, social and environmental domains showed positive correlations that did not reach statistical significance (Table 4; Figure 4). The weak overall associations suggest that, when survivors are considered as a single group, functional independence alone does not strongly explain differences in quality of life—consistent with the view that HRQoL after stroke is shaped by emotional, social and environmental factors in addition to physical function^{19,20}.

Table 4. Correlation between functional impairment (FIM) and the WHOQOL-BREF domains for the whole sample ($n = 57$).

FIM score	Domain I	Domain II	Domain III	Domain IV
r value	-0.19	0.57	0.17	0.23
p value	0.14	0.08	0.22	0.08

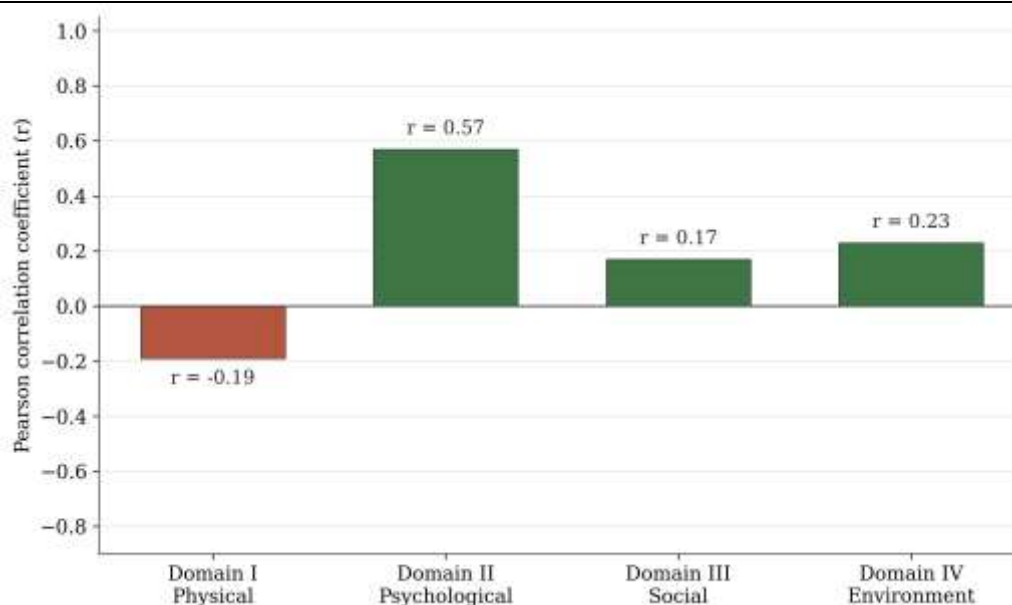


Figure 4. Pearson correlation coefficients (r) between functional impairment (FIM) and the WHOQOL-BREF domains for the whole sample ($n = 57$). Green bars denote positive and red bars negative correlations.

3.4. Influence of social networks on the relationship

When participants were stratified by the median social-network score, the relationship between functional impairment and HRQoL differed markedly between the two groups (Table 5; Figures 5 and 6). In survivors with a lower social network (Group A, $n = 36$), the social-relationships domain (Domain III) showed a very strong positive correlation with the FIM score ($r = 0.84$, $p = 0.19$) and the environment domain (Domain IV) a weak positive correlation ($r = 0.40$, $p = 0.15$), whereas the physical ($r = -0.64$, $p = 0.00$) and psychological ($r = -0.35$, $p = 0.04$) domains were negatively correlated. In survivors with a higher social network (Group B, $n = 21$), a very strong positive correlation was found between the environment domain and the FIM score ($r = 0.82$, $p = 0.05$) and a strong correlation for the physical domain ($r = 0.73$, $p = 0.08$), while the psychological ($r = 0.37$, $p = 0.20$) and social-relationships ($r = 0.39$, $p = 0.08$) domains were weakly correlated.

The pattern indicates that in survivors with a higher social network, lower functional impairment was associated with higher HRQoL across all four domains, whereas in survivors with a lower social network this beneficial association was confined to the social-relationships and environmental domains. A supportive social network therefore appears to broaden the extent to which preserved physical and psychological function translates into better quality of life. This is consistent with reports that social networks influence both HRQoL and functional recovery, that greater social engagement is associated with better quality of life, and that stronger social ties act as resources in times of need^{13,15,21}. Conversely, poor social networks have been

associated with worse HRQoL²², and social relationships are frequently identified as among the most important domains of quality of life in older adults^{23,24}. High levels of social support have also been linked to faster and more extensive functional recovery after stroke, with socially isolated survivors at particular risk of poor outcome²⁵, and social isolation is an established risk factor for cardiovascular disease and stroke²⁶.

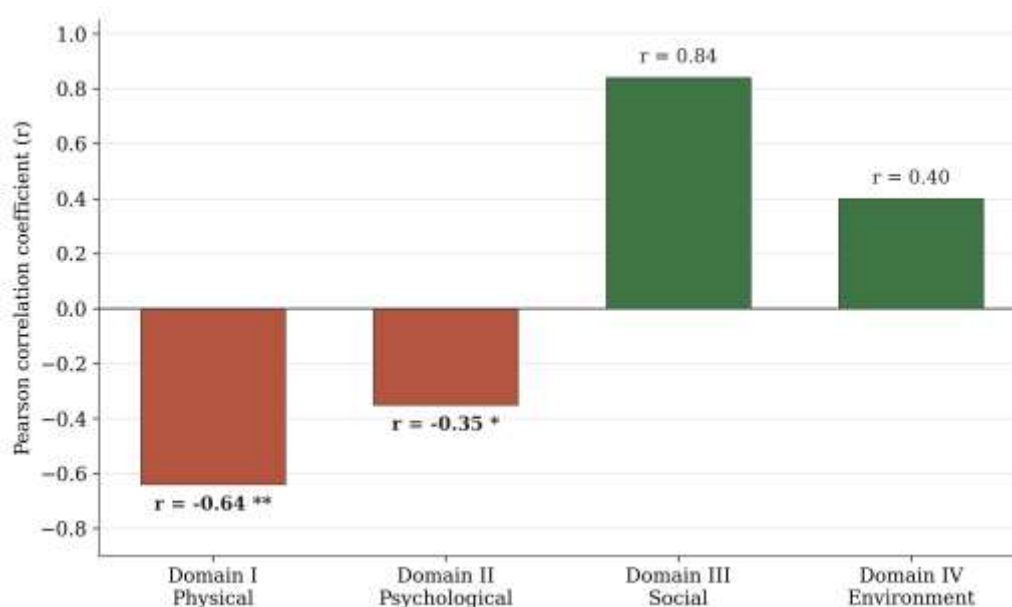


Figure 5. Pearson correlation coefficients (r) between functional impairment (FIM) and the WHOQOL-BREF domains in survivors with a lower social network (Group A, n = 36). **p < 0.01; *p < 0.05.

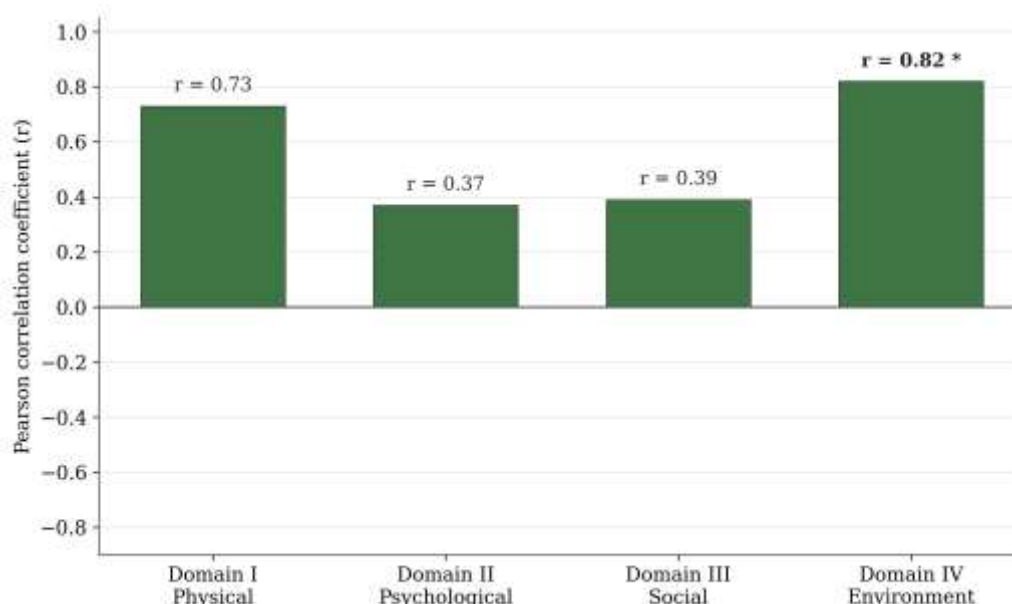


Figure 6. Pearson correlation coefficients (r) between functional impairment (FIM) and the WHOQOL-BREF domains in survivors with a higher social network (Group B, n = 21). *p < 0.05.

Table 5. Correlation between functional impairment (FIM) and the WHOQOL-BREF domains within the lower (Group A) and higher (Group B) social-network groups.

Group	Statistic	Domain I	Domain II	Domain III	Domain IV
Group A (n = 36)	r value	-0.64	-0.35	0.84	0.40
	p value	0.00**	0.04*	0.19	0.15
Group B (n = 21)	r value	0.73	0.37	0.39	0.82
	p value	0.08	0.20	0.08	0.05*

Domain I, physical health; Domain II, psychological; Domain III, social relationships; Domain IV, environment. ** Correlation significant at the 0.01 level; * correlation significant at the 0.05 level.

3.5. Age, stroke type and duration

Age was not correlated with functional impairment or HRQoL in the present sample. The literature on the effect of age is mixed: some studies report that younger survivors experience worse HRQoL, possibly reflecting greater difficulty coping psychologically or higher expectations¹⁹, whereas others find no negative influence of age²⁰; functional gains on the FIM have been reported to be lower in survivors over 60 years²⁷. Most previous studies have failed to demonstrate a consistent difference in HRQoL between ischaemic and haemorrhagic stroke^{28–30}, and the side of the lesion appears to have little impact on HRQoL outcomes³¹. In the present study, however, haemorrhagic stroke tended to be associated with lower FIM scores and poorer quality of life, in keeping with reports that survivors of intracerebral haemorrhage have greater initial functional impairment³². The comparatively favourable quality of life observed may partly reflect the longer time since stroke in this sample, consistent with observations that a longer duration is associated with better quality of life³³.

3.6. Implications

The success of stroke rehabilitation depends on its early commencement, once the survivor is medically stable. The findings suggest that survivors may not fully overcome the emotional and psychosocial consequences of stroke even a year later, and that a lack of financial and social support, together with dependence arising from functional impairment, may sustain these consequences. Making health and social services freely accessible to all types of stroke survivor, and strengthening social support during rehabilitation, may help limit the deterioration of quality of life over time. Health policy and rehabilitation strategy should therefore incorporate quality of life and social network as explicit outcomes.

3.7. Limitations

The sample size was modest, and larger studies are needed to confirm these findings. Both ischaemic and haemorrhagic strokes, and a wide range of times since stroke, were included, which may have reduced the uniformity of the sample. A modified version of Fillenbaum's questionnaire was used for convenience, and further validation of tools for assessing social networks in this population is warranted. As a cross-sectional study, the design does not permit causal inference; longitudinal work is needed to clarify how social ties, network structure and function relate to HRQoL and functional impairment over time.

4. CONCLUSION

In adult stroke survivors, greater functional impairment was associated with lower health-related quality of life in the psychological, social-relationships and environmental domains. The relationship was modified by the survivor's social network: in survivors with a higher social network, lower functional impairment was associated with higher quality of life across all domains, whereas in those with a lower social network this beneficial association was confined to the social-relationships and environmental domains. Strengthening social networks and support should be considered an integral component of stroke rehabilitation, and future studies with larger samples and longitudinal designs are recommended to substantiate and extend these findings.

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Author contributions

Anjana S: conceptualisation, methodology, investigation, data collection, formal analysis and writing of the original draft. Farseen Mohammed P: conceptualisation, methodology, supervision and critical revision of the manuscript. Vinu K Varghese: clinical supervision, interpretation of data and critical revision and submission of the manuscript. All authors read and approved the final version of the manuscript.

Conflict of interest

The authors declare that they have no conflict of interest associated with this work.

Ethics statement

The study was approved by the Institutional Ethics Committee of Laxmi Memorial College of Physiotherapy, Mangalore (Approval number:AJEC/REV/77/2019) and was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrolment.

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