



## Original Article

# Musculoskeletal Symptoms among Family Caregivers of Community-Dwelling Stroke Survivors in Nigeria

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## ABSTRACT

**Introduction:** Caring for stroke survivors may be burdensome with adverse consequences on caregivers' physical health. This study examined the prevalence of musculoskeletal symptoms and associated factors among family caregivers of stroke survivors in Nigeria.**Methods:** A hospital-based cross-sectional study involving 90 stroke caregiver and stroke survivor dyads was conducted. Data on the participants' demographics and post-stroke duration were obtained. Seven-day prevalence of musculoskeletal symptoms among the caregivers and level of stroke survivors' disability were respectively assessed using the Nordic Musculoskeletal Questionnaire and Modified Rankin Scale. Prevalence of musculoskeletal symptoms was presented as percentages while participants' characteristics associated with prevalence of musculoskeletal symptoms were examined using inferential statistics.**Results:** Mean (SD) age of caregivers and stroke survivors was 33.2 (10.7) years and 58.9 (9.7) years respectively. Majority of the caregivers were females (61.1%), and children of the stroke survivors (58.9%). Prevalence of musculoskeletal symptoms was 82.2%. The low back was the most affected body region (72.2%) followed by the upper back (40%) while musculoskeletal symptoms in the wrist was least prevalent (3.3%). Female caregivers, caregivers of female stroke survivors and spousal caregivers had significantly higher prevalence of musculoskeletal symptoms compared to other categories of caregivers. Only 5 (5.6%) caregivers had however received any training on safe care giving methods while only 21 (28.4%) caregivers with musculoskeletal symptoms had received treatment.**Conclusion:** With the high prevalence of musculoskeletal symptoms among family caregivers of stroke survivors, effective preventive strategies including training and education as well as timely access to treatment would be required.**Citation:** Vincent-Onabajo GO, Daniel H, Lawan A, Ali M U, Masta MA, Modu A. Musculoskeletal symptoms among family caregivers of community-dwelling stroke survivors in Nigeria. *J Car Sci* 2018; 7 (2): 59-66. doi:10.15171/jcs.2018.010.

## Introduction

Family caregivers of stroke survivors are recognized as essential members of the stroke rehabilitation team.<sup>1</sup> Following the debilitating consequences of stroke, especially the impairments of body functions, and activity limitations, stroke survivors are often dependent on caregivers, especially family caregivers, for support to carry out activities of daily living<sup>2</sup> with implications on the quality of life of stroke survivors.<sup>3</sup> Due to the vital and indispensable role played by stroke caregivers, several studies have examined the impact of care giving on various constructs such as caregivers' stress,<sup>4,5</sup> strain,<sup>6,7</sup> burden,<sup>8-12</sup> and quality of life (QoL).<sup>8,9,13-16</sup>

In a previous study of QoL of informal caregivers of stroke survivors in Nigeria, the physical domain of QoL was found to be most negatively affected.<sup>16</sup> Although inconsistent with several studies that reported a more profound impact of care giving on the psychological and social functioning and well-being of family caregivers,<sup>8,9,13,14,17-19</sup> the findings by Vincent-Onabajo et al.,<sup>16</sup> appear to be consistent with the well-documented effects of direct patient care, including manual patient handling tasks, on physical health. Prominent among these effects is the occurrence of musculoskeletal symptoms and discomfort which are often observed among rehabilitation professionals that engage in manual

patient handling tasks such as nurses, occupational Therapists and physiotherapists.<sup>20-25</sup> It may however be safe to state that family caregivers of stroke survivors, especially community-dwelling stroke survivors, may be at an even higher risk of experiencing musculoskeletal symptoms compared to rehabilitation professionals when issues of the number of hours put into various caregiving tasks are considered, and the fact that they may not possess safe patient handling skills and gadgets.

It is however troubling that despite the potential risk of musculoskeletal symptoms among caregivers, only few studies have addressed the subject matter<sup>26,27</sup> which only one study involving stroke caregivers focused only on low back pain.<sup>28</sup> The dearth of studies on the prevalence of musculoskeletal symptoms among stroke caregivers becomes even more obvious when the number of earlier mentioned studies on other caregiver constructs is considered. This scarcity of information may have several implications including effective prevention of musculoskeletal symptoms among family caregivers of stroke survivors. This is because availability of information such as prevalence of musculoskeletal symptoms and its risk factors among stroke caregivers would provide an insight into the enormity of the problem which will in turn provide an empirical basis, and impetus for seeking out and providing effective

preventive and therapeutic interventions. Furthermore, information on the prevalence of musculoskeletal symptoms among family caregivers of stroke survivors may further lend credence to the call for 'family-centered approach' in stroke rehabilitation.<sup>29</sup>

In order to address the observed dearth in information, this study was conducted to provide what, to our knowledge, can be considered the first of its kind data on musculoskeletal symptoms among caregivers of stroke survivors in Nigeria. It is important to mention that in Nigeria, the most populous country in Africa, care giving support services and facilities such as adult day care, respite care facilities, stroke support groups and care volunteers are not readily available.<sup>30</sup> Hence, family caregivers in Nigeria are usually solely responsible for informal care giving and this may increase their susceptibility to developing musculoskeletal symptoms. This study therefore examined the prevalence of musculoskeletal symptoms and associated factors among family caregivers of stroke survivors in Nigeria.

## Materials and methods

This study was a cross-sectional survey which was conducted at physiotherapy outpatient facilities of three government hospitals in Maiduguri. Maiduguri is the capital of Borno State, one of the 19 states in Northern Nigeria.

At the time of the study, a total of one hundred and sixty stroke survivors were registered for physiotherapy appointments at the three hospitals. Family caregivers that accompanied the stroke survivors and the respective stroke survivors for physiotherapy appointments were considered for recruitment into the study. Ninety stroke caregiver and stroke survivor dyads however met the study's eligibility criteria and were recruited using consecutive sampling technique. Participants (caregivers and stroke survivors) were eligible if they were at least 18 years of old, and expressed willingness to participate in the study. Additionally, caregivers that were not older than 60 years, and stroke survivors who had suffered stroke for at least 1 month and lived at home were eligible to participate in the study. The 60 years age limit for caregivers was utilized because of the adverse effect of aging on the musculoskeletal system.<sup>31</sup>

Nordic Musculoskeletal Questionnaire (NMQ)<sup>32</sup> questionnaire were used to assess the prevalence of musculoskeletal symptoms and pattern of prevalence by body parts. The NMQ is a widely used tool for assessing musculoskeletal symptoms among different populations including healthcare professionals involved in stroke rehabilitation, such as nurses and physiotherapists<sup>21,23</sup> who carry out tasks similar to those of family caregivers of stroke survivors. Sensitivity and specificity of the NMQ has been reported to range between 66 and 92%, and 71 and 88%, respectively,<sup>33</sup> while a comparison of its validity with clinical history yielded an acceptable disagreement rate that ranged from 0 to 20%.<sup>32</sup> Due to the wide variation in duration of care giving based on the highly variable post-stroke duration of the stroke survivors in the study, the prevalence of musculoskeletal

symptoms was limited to 7 days prior to the caregivers' participation in the study. Caregivers were thus requested to provide information on their musculoskeletal symptoms which was operationalized as 'experience of ache, pain, discomfort, or any injury in any part of their body in the last 7 days'. The caregivers were further informed that the musculoskeletal symptoms to be reported were those with onset during the course of care giving and the caregivers were requested to provide information on the time of onset of musculoskeletal symptoms. The caregivers were also requested to provide responses to other items in the NMQ such as whether they experienced musculoskeletal symptoms 7 days prior to the interview (7-day prevalence) in different body regions namely the neck, shoulder, elbow, wrist/hand, upper back, lower back, hips/thighs/buttocks, knees, and ankle/feet. There were also questions on the caregivers' receipt of training on prevention of musculoskeletal symptoms while caring for stroke survivors; treatment received for musculoskeletal symptoms by caregivers experiencing the disorders and the specific type of treatment received. A last question enquired if musculoskeletal symptoms had affected their care giving activities with 'yes' or 'no' response options. Copies of the questionnaire were distributed to the caregivers and completed questionnaires were returned the same day at the study sites throughout the study period.

The Modified Rankin Scale (mRS) was a researcher-administered tool to evaluate the level of disability among the stroke survivors. The mRS assesses global disability on a scale of 0 to 5, with '0' being 'no disability' while '5' represents 'severe disability'.<sup>34</sup> The mRS is a valid, reliable, and widely used tool in stroke studies.<sup>34</sup>

Concurrent validity of the mRS with other disability measures such as the Barthel Index and Motor-Functional Independence Measure is excellent with  $r = -0.89$ .<sup>35</sup> Interrater reliability of the scale is kappa = 0.56 while a test-retest reliability as high as kappa = 0.95 has been reported.<sup>35</sup> Due to the limited number of participants that scored '0 - no symptoms' (2 participants) and '1 - no significant disability' (10 participants), the mRS scores were collapsed into two category for the purpose of statistical analyses. Scores of 0 to 2 were categorised as 'no disability' while the score of 3 to 5 was classified as 'disability' in line with the categorization utilized by Hankey et al.<sup>36</sup>

Researcher-designed data forms were used to record information on each caregiver's age, gender, educational level, employment status, and relationship with stroke survivor. Respective stroke survivors' data namely gender, age, and post-stroke duration were also recorded on the data forms. These data were provided via self-report by the caregivers and the care recipients as appropriate. The study was approved by the Research and Ethical Committee of the University of Maiduguri Teaching Hospital, Maiduguri, Nigeria. Written informed consent was obtained from the caregivers and their care recipients prior to their participation in the study.

Family caregivers and the care recipients (stroke survivors), were recruited during the care recipient's

physiotherapy appointments at the study sites. Data collection was carried out by the second author from March to June 2015.

Descriptive statistics of mean and standard deviation, frequencies and percentages were used to summarize the demographic and clinical data. Data on global 7-day prevalence of musculoskeletal symptoms, and 7-day prevalence based on specific body regions, previous training on safe care giving, health-seeking behavior, and activity limitations arising from the musculoskeletal symptoms were presented as frequencies and percentages.

Chi square statistics was used to assess the associations between prevalence of musculoskeletal symptoms among the caregivers and demographic characteristics of the caregivers and the stroke survivors. Associations between the prevalence of musculoskeletal symptoms, and post-stroke duration and disability among the stroke survivors were also examined. SPSS version 15 (SPSS Inc., Chicago, IL, USA) was used for data analyses and level of statistical significance was set at 0.05.

## Results

Ninety stroke caregiver and stroke survivor dyads participated in the study. There were 35 male and 55 female caregivers whose ages ranged from 19 to 60 years with a mean (SD) age of 33.2 (10.7) years. Most of the caregivers (58.9%) were children of the stroke survivors while 22 (24.4%) were spouses (Table 1).

**Table 1.** Characteristics of stroke caregiver and stroke survivor dyads (N = 90)

Characteristic	N (%)
<b>Caregiver</b>	
<b>Sex</b>	
Male	35 (38.9)
Female	55 (61.1)
<b>Relationship</b>	
Offspring	53 (58.9)
Spouse	22 (24.4)
Sibling	15 (16.7)
<b>Educational level</b>	
None	20 (22.2)
Primary	10 (11.1)
Secondary	32 (35.6)
Tertiary	28 (31.1)
<b>Employment status</b>	
Employed	30 (33.3)
Unemployed	60 (66.7)
<b>Stroke survivor</b>	
<b>Sex</b>	
Male	56 (62.2)
Female	34 (37.8)
<b>Disability (mRS)</b>	
Yes	76 (84.4)
No	14 (15.6)

mRS – Modified Rankin scale

Mean (SD) age of the stroke survivors was 58.9 (9.7) years (range = 39 to 80 years), and majority were males (62.2%) and had functional disability (84%) depicted by a mRS score that ranged from 3 to 5. Mean (SD) post stroke duration was 15.1 (25.4) months (range = 1-180 months).

Seventy-four caregivers reported that they experienced musculoskeletal symptoms within seven days prior to the study giving a prevalence of 82.2%. Among those who reported musculoskeletal symptoms, majority [68 (91.9%)] experienced onset within 3 months of caregiving, one (1.4%) caregiver reported onset in the 6<sup>th</sup> month of caregiving while five (6.8%) could not recall the exact time of onset.

For 7-day prevalence of musculoskeletal symptoms by body region, the lower back was the most affected (72.2%) followed by the upper back (40%) and the shoulder (24.4%) while the least affected body region was the wrist (3.3%) (Figure 1).

Five (5.6%) caregivers reported receiving training on how to prevent the occurrence of musculoskeletal symptoms while 85 (94.4%) caregivers did not receive any training. Out of those whom reported musculoskeletal symptoms, 21 (28.4%) had sought care. None of the caregivers however reported any adverse effect of the musculoskeletal symptoms on carrying out their care giving roles.

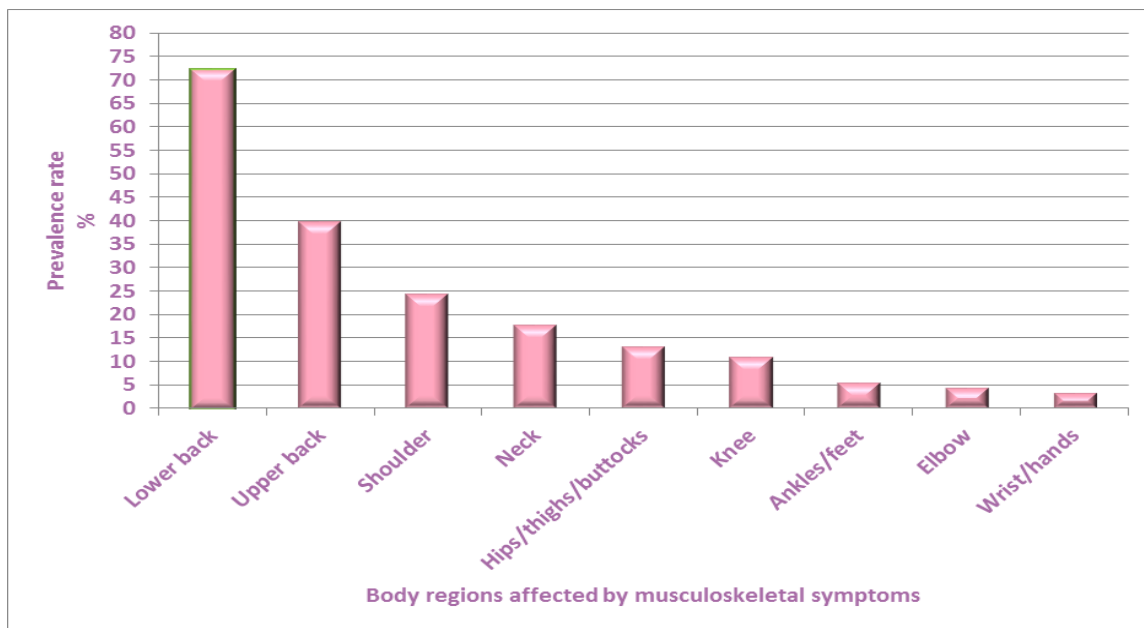
Among the caregivers' demographic characteristics studied, only caregivers' gender and relationship with stroke survivors were significantly associated with prevalence of musculoskeletal symptoms. Prevalence of musculoskeletal symptoms was significantly higher among female caregivers (96.4%) compared to their male counterparts (60%) while among the three relationship categories observed, all (100%) the caregivers who were spouses of the stroke survivors reported musculoskeletal symptoms, compared to the prevalence rate observed in children (80%) and siblings (75.5%) of the stroke survivors (Table 2).

In terms of associations between prevalence of musculoskeletal symptoms among the caregivers and the demographic and clinical characteristics of the stroke survivors, only sex of the stroke survivors had statistically significant association with prevalence of musculoskeletal symptoms and caregivers of female stroke survivors reported higher prevalence (94.1%) compared to caregivers of male stroke survivors (75%) (Table 2). No other characteristic of the stroke survivors was significantly associated with the prevalence of musculoskeletal symptoms.

## Discussion

Musculoskeletal symptoms often arise from abnormal and awkward postures, repetitive movements and manual patient handling.<sup>37</sup> Due to the likely exposure of family caregivers of stroke survivors to these risk factors of musculoskeletal symptoms particularly because of the dependence of their care recipients on them for activities of daily living, transfers and other types of care, it is important to examine the prevalence of musculoskeletal symptoms among stroke caregivers.

A high 7-day prevalence (82.2%) of musculoskeletal symptoms was observed in this study, higher than the 78%, 12-month prevalence reported among nurses<sup>23</sup> but lower than the 91.3%, 12-month prevalence reported among physiotherapists in Nigeria.<sup>21</sup> While nurses



**Figure 1.** Prevalence of musculoskeletal symptoms by body region among caregivers of stroke survivors

**Table 2.** Associations between prevalence of MSDs among family caregivers and characteristics of family caregivers and stroke survivors

Characteristic	No MSD N (%)	MSD N (%)	$\chi^2$	P
<b>Caregiver</b>				
Sex			19.35	<0.001
Male	14 (40)	21 (60)		
Female	2 (3.6)	53 (96.4)		
Age			4.12	0.13
19-35	13 (23.2)	43 (76.8)		
36-45	3 (14.3)	18 (85.7)		
46-60	0 (0)	13 (100)		
Relationship			6.46	0.04*
Offspring	13 (24.5)	40 (75.5)		
Spouse	0 (0)	22 (100)		
Sibling	3 (20)	12 (80)		
Educational level			3.29	0.85
None	1 (5)	19 (95)		
Primary	2 (20)	8 (80)		
Secondary	6 (18.8)	26 (81.3)		
Tertiary	7 (25)	21 (75)		
Employment status			0.38	0.85
Employed	5 (16.7)	25 (83.3)		
Unemployed	11 (18.3)	49 (81.7)		
<b>Stroke survivor</b>				
Sex			5.29	0.02*
Male	14 (25)	42 (75)		
Female	2 (5.9)	32 (94.1)		
Age			4.40	0.11
<50	2 (14.3)	12 (85.7)		
50-64	12 (25.5)	35 (74.5)		
≥65	2 (6.9)	27 (93.1)		
Post-stroke duration (month)			2.39	0.50
1-6	11 (22.4)	38 (77.6)		
7-12	3 (18.8)	13 (81.3)		
13-24	1 (7.1)	13 (92.9)		
≥25	1 (9.1)	10 (90.9)		
Disability (mRS)			1.32	0.25
Yes	12 (15.8)	64 (84.2)		
No	4 (28.6)	10 (71.4)		

\*Statistically significant



and physiotherapists are healthcare professionals that are trained and prepared for direct patient care and rehabilitation, family caregivers of stroke survivors are often unprepared for caregiving especially given the suddenness of stroke ones. Therefore, a higher prevalence of musculoskeletal symptoms may be expected among family caregivers of stroke survivors.

Conversely, nurses and physiotherapists are involved in the care of many patients with diverse conditions and this may result in a higher prevalence of musculoskeletal symptoms among them. It is however important to note that the difference between the time period of the prevalence studies involving the aforementioned healthcare professionals in Nigeria and the 7-day period reported in this study makes comparison of findings somewhat difficult. Similarly, the unavailability of data on the prevalence of musculoskeletal symptoms among informal caregivers of other categories of persons with disabilities or even the general population in Nigeria precluded more relevant comparisons. This dearth emphasizes the need for future studies that will address the dearth in caregiver, and musculoskeletal symptom literature in the country. A study involving informal caregivers of elderly people with physical disabilities in the United States however reported a 95% 1-month prevalence of musculoskeletal symptoms which exceeds the prevalence rate recorded in the present study.<sup>27</sup>

For prevalence by body regions, the low back predominated in line with studies involving nurses,<sup>23,25</sup> physiotherapists<sup>21,24</sup> and informal caregivers of adults with disabilities.<sup>27</sup> However the 72.2% 7-day prevalence of low back musculoskeletal symptoms in this present study supersedes the 12-month prevalence rates of 44%<sup>23</sup> and 69.8%<sup>21</sup> respectively reported in studies conducted among nurses and physiotherapists in Nigeria. The rate of affection of the low back in this study is also higher than rates reported among nurses<sup>25,38</sup> and physiotherapists<sup>24,39</sup> in Western and Asian countries. While there are no existing data on low back pain among caregivers in Nigeria, a study conducted in Turkey showed that 82.8% of stroke caregivers experienced low back pain<sup>28</sup> while another study reported a 76% one month prevalence of low back pain among informal caregivers of elderly individuals in the United States.<sup>27</sup> The findings of these caregiver studies and the present study, although reporting prevalence at different time points, indicate a higher prevalence of low back pain among caregivers compared to nurses and physiotherapists. In general, care giving activities associated with manual patient handling such as lifting, transfers, and assistance with activities of daily living often places strain on the low back, especially when these activities are carried out using awkward postures.<sup>37,38,40</sup>

The higher prevalence rate of musculoskeletal symptoms among caregivers in this study compared to rates reported in individual studies of healthcare professionals such as nurses and physiotherapists

could be attributable to several factors. First, family caregivers of stroke survivors often engage in activities such as accompanying the stroke survivors for medical and rehabilitation appointments, running errands for the stroke survivors, manual handling, and assisting with prescribed home exercise programs for the incapacitated stroke survivors.<sup>2,41</sup> For instance, all the caregivers in this study accompanied their care recipients for physiotherapy outpatient appointments. It is therefore plausible to aver that stroke caregivers perform a combination of roles by carrying out the activities of multiple professionals or workers such as the nurse, physiotherapist, house keeper and chaperon all in one. Second, a lack of training and education on safe care giving practices may increase the risk of musculoskeletal symptoms among stroke caregivers. The findings of this study for instance showed that 94.4% of the caregivers never received any form of training or education on how to safely care for stroke survivors. A previous study conducted in China similarly reported a lack of professional training and education for stroke caregivers.<sup>42</sup> A third and important explanation could be the emotional angle from which caregivers view their roles. A spouse, child or sibling of a stroke survivor will likely do the utmost to care for their loved ones at the expense of any health risk associated with caregiving activities. Hence, caregivers tend to place the needs of their care recipients above their own seemingly less serious health issues. The poor health care seeking behavior observed among the caregivers in this study could also be regarded as a reflection of self-neglect and insufficient appreciation of the potentially grave and often long lasting consequences of musculoskeletal symptoms.

Going by the aforementioned issues regarding the emotional considerations that are often associated with family care giving, it is not surprising that all the caregivers reported that the musculoskeletal symptoms they experienced did not affect their care giving activities. The implication of this finding is that the caregivers continued with their care giving activities in spite of their symptoms which could further aggravate the symptoms. Culturally in Nigeria, care giving activities are carried out sacrificially and especially by family caregivers,<sup>15,16</sup> and engaging in such activities is deemed to be altruistic and would be accompanied by blessings as rewards.<sup>43,44</sup> Hence, the tendency is for caregivers to persist in carrying out care giving activities despite the effect of such activities on their own health and well-being except perhaps when the effect is debilitating. The prevalence of musculoskeletal symptoms was found to be significantly higher among female caregivers, spousal caregivers and caregivers of female stroke survivors. The case of spousal caregivers was however quite remarkable as the entire group experienced musculoskeletal symptoms. It can be expected that spousal caregivers would engage in care giving activities at a higher

intensity than other groups of caregivers due to the deep emotional attachment associated with conjugal relationships, and thus may experience more profound negative consequences than other categories of caregivers. While spousal caregivers appear to be in the majority in stroke studies conducted in Western countries,<sup>45-47</sup> children of stroke survivors predominated in previous stroke caregiver studies conducted in Nigeria<sup>15,16</sup> as they did in this study. The high prevalence of musculoskeletal symptoms among female caregivers compared to their male counterparts in this study could suggest that females were more involved and bore more caregiving burden and this is consistent with the traditional caregiving role that is often linked with the female gender.<sup>15,30,48</sup> Reasons for the observed significantly higher prevalence of musculoskeletal symptoms among family caregivers of female stroke survivors are open to conjectures including the likelihood of higher levels of disability among female stroke survivors. However, there was no statistically significant association between level of stroke survivors' disability and the prevalence of musculoskeletal symptoms among their family caregivers in the study. This lack of significant association can be regarded as an unexpected finding especially as a number of studies have shown that various stroke outcomes, including those outcomes that directly affect informal stroke caregivers, are significantly associated with post-stroke disability.<sup>28, 49,50</sup>

The high prevalence of musculoskeletal symptoms among the caregivers in this study coupled with the almost complete lack of training and information on how to safely care for stroke survivors indicate the urgent need for necessary interventions. In line with stroke clinical guidelines, training and education of stroke caregivers should be routinely incorporated into stroke rehabilitation. In Nigeria, rehabilitation professionals like physiotherapists are qualified and well positioned to provide stroke caregivers with educational and training programs that will aid in preventing musculoskeletal symptoms. Future experimental studies on effective preventive strategies for musculoskeletal symptoms would however be required especially because the efficacy of interventions available in the literature either appear to lack sufficient evidence<sup>51</sup> or require further confirmation.<sup>52</sup> Prospective cohort studies on the time course of occurrence of musculoskeletal symptoms among stroke caregivers would also be required in order to understand the incidence of the symptoms in relation to time after stroke while the relationship between prevalence of musculoskeletal symptoms and time spent by caregivers on care giving activities should also be explored.

The contribution of the stroke survivors' body weight to the prevalence of musculoskeletal symptoms in their caregivers was not assessed because the appropriate instrumentation to assess body weight for non-ambulatory stroke survivors

was not available. This is an important limitation of the study because family caregivers of stroke survivors are often exposed to risk factors of musculoskeletal symptoms including manual patient handling tasks such as supporting, lifting and transferring of their care recipients. This study also did not obtain information on specific caregiving activities and time spent on such activities which may contribute to musculoskeletal symptoms among caregivers. Therefore, future longitudinal studies on the impact of specific caregiving activities on musculoskeletal symptoms among family caregivers of stroke survivors would be required for identifying effective means of preventing musculoskeletal symptoms in this category of persons. Finally, the cross-sectional and hospital-based design of the study and the small size of its sample limit the external validity of findings.

## Conclusion

The results of this study showed that musculoskeletal symptoms are highly prevalent among family caregivers of stroke survivors in Nigeria, with the low back being the most affected body region. The findings of the study also indicate that musculoskeletal symptoms are important but seldom addressed health challenges among the caregivers. Strategies for proper training and education of caregivers, especially spousal caregivers, female caregivers, and caregivers of female stroke survivors, on means of preventing musculoskeletal symptoms in the course of caring for stroke survivors are urgently required and should be part of routine stroke rehabilitation services.

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## Ethical issues

None to be declared.

## Conflict of interest

The authors declare no conflict of interest in this study.

## References

1. Duncan PW, Zorowitz R, Bates B, Choi JY, Glasberg JJ, Graham GD, et al. Management of adult stroke rehabilitation care: a clinical practice guideline. *Stroke*. 2005; 36 (9): e100-43. doi: 10.1161/01.STR. 0000180861.54180.FF.
2. Tsouna-Hadjis E, Vemmos KN, Zakopoulos N, Stamatielopoulos S. First-stroke recovery process: the role of family social support. *Arch Phys Med Rehabil* 2000; 81 (7): 881-7. doi: 10.1053/apmr.2000.4435.
3. Vincent-Onabajo GO, Muhammad MM, Usman Ali M, Ali Masta M, Aliyu HN. Social support after stroke:

- influence of source of support on stroke survivors' health-related quality of life. *Int Neuropsychiatr Dis J* 2016; 5 (1): 1-9. doi:10.9734/INDJ/2016/20240
4. Draper B, Bowring G, Thompson C, Van Heyst J, Conroy P, Thompson J. Stress in caregivers of aphasic stroke patients: a randomized controlled trial. *Clin Rehabil* 2007; 21 (2): 122-30. doi:10.1177/0269215506071251.
  5. Ain QU, Dar NZ, Ahmad A, Munzar S, Yousafzai AW. Caregiver stress in stroke survivor: data from a tertiary care hospital -a cross sectional survey. *BMC Psychol* 2014; 2 (1): 49. doi: 10.1186/s40359-014-0049-9.
  6. Ilse IB, Feys H, de Wit L, Putman K, de Weerd W. Stroke caregivers' strain: prevalence and determinants in the first six months after stroke. *Disabil Rehabil* 2008; 30 (7): 523-30. doi: 10.1080/09638280701355645.
  7. Hassan S, Visagie S, Mji G. Strain experienced by caregivers of stroke survivors in the Western Cape. *SA Journal of Physiotherapy* 2011; 67 (2): 4-8. doi: 10.4102/sajp.v67i2.39.
  8. Morimoto T, Schreiner AS, Asano H. Caregiver burden and health-related quality of life among Japanese stroke caregivers. *Age Ageing* 2003; 32 (2): 218-23.
  9. McCullagh E, Brigstocke G, Donaldson N, Kalra L. Determinants of caregiving burden and quality of life in caregivers of stroke patients. *Stroke* 2005; 36 (10): 2181-6. doi: 10.1161/01.STR.0000181755.23914.53.
  10. Carod-Artal FJ, Ferreira Coral L, Trizotto DS, Menezes Moreira C. Burden and perceived health status among caregivers of stroke patients. *Cerebrovasc Dis* 2009; 28 (5): 472-80. doi: 10.1159/000236525.
  11. Denno MS, Gillard PJ, Graham GD, DiBonaventura MD, Goren A, Varon SF, et al. Anxiety and depression associated with caregiver burden in caregivers of stroke survivors with spasticity. *Arch Phys Med Rehabil* 2013; 94 (9): 1731-6. doi: 10.1016/j.apmr.2013.03.014.
  12. Roopchand-Martin S, Creary-Yan S. Level of caregiver burden in Jamaican stroke caregivers and relationship between selected sociodemographic variables. *West Indian Med J* 2014; 63 (6): 605-9. doi: 10.772 7/wimj.2013.060.
  13. Jonsson AC, Lindgren I, Hallström B, Norrving B, Lindgren A. Determinants of quality of life in stroke survivors and their informal caregivers. *Stroke* 2005; 36 (4): 803-8. doi: 10.1161/01.STR.0000160873.32791.20.
  14. Khalid T, Kausar R. Depression and quality of life among caregivers of people affected by stroke. *Asia Pacific Disability Rehabilitation Journal* 2008; 19 (2):103-10.
  15. Akosile CO, Okoye EC, Nwankwo MJ, Akosile CO, Mbada CE. Quality of life and its correlates in caregivers of stroke survivors from a Nigerian population. *Qual Life Res* 2011; 20 (9): 1379-84. doi: 10.1007/s11136-011-9876-9.
  16. Vincent-Onabajo G, Ali A, Hamzat T. Quality of life of Nigerian informal caregivers of community-dwelling stroke survivors. *Scand J Caring Sci* 2013; 27 (4): 977-82. doi: 10.1111/scs.12017.
  17. Visser-Meily A, Post M, van de Port I, Maas C, Forstberg-Warleyby G, Lindeman E. Psychosocial functioning of spouses of patients with stroke from initial inpatient rehabilitation to 3 years poststroke course and relations with coping strategies. *Stroke* 2009; 40 (1): 1399-404. doi: 10.1161/STROKEAHA.108.516682.
  18. Pellerin C, Rochette A, Racine E. Social participation of relatives post-stroke: the role of rehabilitation and related ethical issues. *Disabil Rehabil* 2011; 33 (13-14): 1055-64. doi: 10.3109/09638288.2010.524272.
  19. Haley WE, Roth DL, Hovater M, Clay OJ. Long-term impact of stroke on family caregiver well-being: a population-based case-control study. *Neurology* 2015; 84 (13): 1323-9. doi: 10.1212/WNL.0000000000001418.
  20. Rockefeller K. Using technology to promote safe patient handling and rehabilitation. *Rehabil Nurs* 2008; 33 (1): 3-9.
  21. Adegoke BO, Akodu AK, Oyeyemi AL. Work-related musculoskeletal disorders among Nigerian physiotherapists. *BMC Musculoskelet Disord* 2008; 9:112. doi: 10.1186/1471-2474-9-112.
  22. Darragh AR, Huddleston W, King P. Work-related musculoskeletal injuries and disorders among occupational and physical therapists. *Am J Occup Ther* 2009; 63 (3): 351-62.
  23. Tinubu BM, Mbada CE, Oyeyemi AL, Fabunmi AA. Work-related musculoskeletal disorders among nurses in Ibadan, South-west Nigeria: a cross-sectional survey. *BMC Musculoskelet Disord* 2010; 11: 12. doi: 10.1186/1471-2474-11-12.
  24. Nordin NA, Leonard JH, Thye NC. Work-related injuries among physiotherapists in public hospitals: a Southeast Asian picture. *Clinics (Sao Paulo)* 2011; 66 (3): 373-8.
  25. Attar SM. Frequency and risk factors of musculoskeletal pain in nurses at a tertiary centre in Jeddah, Saudi Arabia: a cross sectional study. *BMC Res Notes* 2014; 7: 61. doi: 10.1186/1756-0500-7-61.
  26. Sharan D, Ajeesh PS, Rameshkumar R, Manjula M. Musculoskeletal disorders in caregivers of children with cerebral palsy following a multilevel surgery. *Work* 2012; 41 (Suppl 1): 1891-5. doi: 10.3233/WOR-2012-0403-1891.
  27. Darragh AR, Sommerich CM, Lavender SA, Tanner KJ, Vogel K, Campo M. Musculoskeletal discomfort, physical demand, and caregiving activities in informal caregivers. *J Appl Gerontol* 2015; 34 (6):734-60. doi: 10.1177/0733464813496464.
  28. Yalcinkaya EY, Ones K, Ayna AB, Turkyilmaz AK, Erden N. Low back pain prevalence and characteristics in caregivers of stroke patients: a pilot study. *Top Stroke Rehabil* 2010; 17 (5): 389-93. doi: 10.1310/tsr1705-389.
  29. Visser-Meily A, Post M, Gorter JW, Berlekom SB, Van Den Bos T, Lindeman E. Rehabilitation of stroke patients needs a family-centred approach. *Disabil Rehabil* 2006; 28 (24): 1557-61. doi: 10.1080/09638280600648215.
  30. Okoye UO. Family caregivers for ageing parents in Nigeria: gender differences, cultural imperatives and the role of education. *International Journal of Education and Ageing* 2012; 2 (2): 139-54.
  31. Freemont AJ, Hoyland JA. Morphology, mechanisms and pathology of musculoskeletal ageing. *J Pathol* 2007; 211 (2): 252-9. doi: 10.1002/path.2097.
  32. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sorensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Appl Ergon* 1987; 18 (3): 233-7.
  33. Ohlsson K, Attewell RG, Johnsson B, Ahlm A, Skerving S. An assessment of neck and upper extremity disorders by questionnaire and clinical examination. *Ergonomics* 1994; 37 (5): 891-7
  34. van Swieten JC, Koudstaal PJ, Visser MC, Schouten HJ, van Gijn J. Interobserver agreement for the assessment of handicap in stroke patients. *Stroke* 1988; 19 (5): 604-7.
  35. Banks JL, Marotta CA. Outcomes validity and reliability of the modified Rankin scale: implications for stroke clinical trials: a literature review and synthesis. *Stroke*

- 2007; 38 (3): 1091-6. doi: 10.1161/01.STR.00002 58 355.23810.c6.
36. Hankey GJ, Spiesser J, Hakimi Z, Bego G, Carita P, Gabriel S. Rate, degree, and predictors of recovery from disability following ischemic stroke. *Neurology* 2007; 68 (19): 1583-7. doi: 10.1212/01.wnl.0000260967.77422.97.
  37. Waters TR, Rockefeller K. Safe patient handling for rehabilitation professionals. *Rehabil Nurs* 2010; 35 (5): 216-22.
  38. Yip Y. A study of work stress, patient handling activities and the risk of low back pain among nurses in Hong Kong. *J Adv Nurs* 2001; 36 (6): 794-804.
  39. Cromie JE, Robertson VJ, Best MO. Work-related musculoskeletal disorders in physical therapists: prevalence, severity, risks, and responses. *Phys Ther* 2000; 80 (4): 336-51.
  40. West DJ, Gardner D. Occupational injuries of physiotherapists in North and Central Queensland. *Aust J Physiother* 2001; 47 (3): 179-86.
  41. Adeniyi AF, Zandam HU. Association between demographic characteristics and compliance of stroke patients to prescribed unsupervised home exercise programmes. *Nigerian Journal of Medical Rehabilitation* 2012; 14 (1 and 2): 20-4.
  42. Sit JW, Wong TK, Clinton M, Li LS, Fong YM. Stroke care in the home: the impact of social support on the general health of family caregivers. *J Clin Nurs* 2004; 13 (7): 816-24. doi: 10.1111/j.1365-2702.2004.00943.x.
  43. Sijuade PO. Elderly care by family members: abandonment, abuse and neglect. *The Social Sciences* 2008; 3 (8): 542-7.
  44. Akpan-Idiok PA, Anarado AN. Caregivers' perceptions of benefits of caregiving to advanced cancer patients attending university of Calabar teaching hospital, Calabar, Nigeria. *International Journal of Cancer Research* 2014; 10: 54-64. doi: 10.3923/ijcr.2014.54.64.
  45. Han B, Haley WE. Family caregiving for patients with stroke. Review and analysis. *Stroke* 1999; 30 (7): 1478-85.
  46. Haley WE, Allen JY, Grant JS, Clay OJ, Perkins M, Roth DL. Problems and benefits reported by stroke family caregivers: results from a prospective epidemiological study. *Stroke* 2009; 40 (6): 2129-33. doi: 10.1161 /STR OKEAHA.108.545269.
  47. King RB, Ainsworth CR, Ronen M, Hartke RJ. Stroke caregivers: pressing problems reported during the first months of caregiving. *J Neurosci Nurs* 2010; 42 (6): 302-11.
  48. Prince M, Dementia Research Group. Care arrangements for people with dementia in developing countries. *Int J Geriatr Psychiatry* 2004; 19 (2): 170-7. doi: 10.1002 /gps.1046.
  49. Vincent-Onabajo GT, Lawan AK, Oyeyemi AY, Hamzat TK. Functional self-efficacy and its determinants in Nigerian stroke survivors. *Top Stroke Rehabil* 2012; 19 (5): 411-6. doi: 10.1310/tsr1905-411.
  50. Peters GO, Buni SG, Oyeyemi AY, Hamzat TK. Determinants of return to work among Nigerian stroke survivors. *Disabil Rehabil* 2013; 35 (6): 455-9. doi: 10.3109/09638288.2012.697251.
  51. Heslin M, Forster A, Healey A, Patel A. A systematic review of the economic evidence for interventions for family carers of stroke patients. *Clin Rehabil* 2016; 30 (2): 119-33. doi: 10.1177/0269215515575334.
  52. Taghizadeh A, Parvaneh S, Ghahari S, Dadkhah A, Taheri T, Shirinbayan P. Effects of transfer training on musculoskeletal pain in the caregiver of a stroke patient: a case report. *Iranian Rehabilitation Journal* 2015; 13 (2): 80-4.