

Survey of the clinical practices of physiotherapists for the management of post-stroke fatigue

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Abstract. – OBJECTIVE: Post-stroke fatigue (PSF) is a common condition among stroke survivors. However, evidence supporting the effective clinical management of PSF is insufficient. Our objectives were to examine the clinical practices of physiotherapists for the management of PSF and evaluate their clinical knowledge and confidence in managing PSF.

SUBJECTS AND METHODS: We conducted a cross-sectional study using an online survey of the sociodemographic profiles of participating physiotherapists, their current clinical practices, clinical knowledge, confidence in their clinical management of PSF, and the types and intensity of the exercises used in the management of PSF.

RESULTS: A total of 160 physiotherapists completed the survey: 86 (53.8%) were women, 148 (92.5%) were Saudi nationals, 126 (78.7%) were employed by the Ministry of Health, and 34 (21.3%) worked in the private sector. The majority (60%) of physiotherapists did not routinely assess their patients for the presence of fatigue. Likewise, 93 (58.1%) did not provide any PSF-related educational material to their patients; however, 67 (41.9%) did provide these materials. The preferred exercises of the physiotherapists for their patients were bed and chair exercises (59.5%), followed by functional training (51.4%), and resistance training (23.1%).

CONCLUSIONS: Our results suggest that while physiotherapists practicing in Saudi Arabia have a sound theoretical understanding of PSF management, their knowledge does not necessarily translate into practice. Interventions used to treat PSF include bed and chair exercises, functional training, and resistance training.

Key Words:

Stroke, Fatigue, Physiotherapist.

to occur independently of post-stroke depression, persists for a long time, has a wide range of negative effects on patients' quality of life (QoL), and is associated with a poor clinical response³. There are multiple underlying causes of PSF, such as physical impairment, sleep disorders, medications, and depression⁴. Co-workers and families of stroke survivors, and even medical practitioners, often have a poor understanding of the characteristics, features, management, and impact of PSF on QoL⁵. Recent studies³ show that managing and preventing PSF ranks among the top 10 research priorities for stroke survivors and healthcare practitioners.

Although PSF has drawn the attention of researchers and healthcare professionals worldwide, standardized assessment scales and treatment protocols for PSF management are lacking, especially in Saudi Arabia^{2,6,7}. The management of PSF is part of the stroke rehabilitation program, a goal-oriented, patient-centered approach aimed at helping individuals with various stroke-related disabilities regain functional independence. The success of stroke rehabilitation partially depends on collaboration among the members of the multi-professional team⁸. Physiotherapy is an essential aspect of rehabilitation for stroke survivors because it contributes to their improvements in physical ability and movement⁹.

The recognition of PSF as a significant complication of stroke is recent, and awareness and clinical knowledge of PSF among physiotherapists, caregivers, and healthcare practitioners need enhancement¹⁰. Saudi Arabia recognizes the need for physiotherapy practice, as evidenced by an increasing number of bachelor's and master's degrees in physiotherapy, and in 1980, it established the country's first physiotherapy program. The bachelor program lasts four years, with the fifth year consisting of an internship, which is spent in hospitals with rehabilitation centers or physiotherapy departments. Currently, 16 universities

Introduction

Post-stroke fatigue (PSF) is one of the most prevalent secondary conditions affecting approximately half of all stroke survivors^{1,2}. It is known

offer undergraduate physiotherapy programs, but only two offer postgraduate physiotherapy programs. According to the study by Alshehri et al¹¹, there is recognition that physiotherapists play an important role in interdisciplinary teams, as they minimize residual disability and impairments, thereby improving the quality of life (QoL) of patients¹². However, physiotherapists in Saudi Arabia are currently not prepared by their educational programs to assess, evaluate, interpret, and use the medical literature¹².

Patients in Saudi Arabia cannot directly access a physiotherapist without a referral from a physician, unlike patients in the United Kingdom and the United States¹¹. In the absence of more specific professional guidelines for standards of care, physical therapists in Saudi Arabia follow the codes of conduct of regulatory/licensing/registration authorities, such as the Saudi Health Commission¹¹. For example, if a stroke survivor or any other patient is admitted to an inpatient care unit, the doctor performs a medical assessment to determine whether the patient needs physiotherapy. After the assessment, a written referral is sent to the physiotherapy clinic. When a patient visits the doctor's outpatient clinic, the doctor will conduct a medical screening and determine whether the patient needs physiotherapy. The patient begins physiotherapy after the referral is written, and the patient can be assessed, diagnosed, and treated with the use of care plans that are implemented by physical therapists¹¹. It is important to identify gaps in knowledge and practical skills among healthcare professionals before endorsing evidence-based practice steps/cycles or developing interventions^{11,13}. Therefore, the aim of this study was to evaluate the knowledge and clinical confidence of physiotherapists regarding PSF management, as well as current PSF-related clinical practices among physiotherapists in Saudi Arabia.

Subjects and Methods

Study Design

This cross-sectional observational study utilized an online survey to collect information from the participants regarding their knowledge of PSF and their PSF-related clinical practices.

Participants

Physiotherapists practicing in Saudi Arabia, irrespective of their nationality, were asked to

complete the online survey. All physiotherapists, including those in clinical and academic settings with at least one year of experience supervising the rehabilitation of stroke survivors, were invited to participate in the study. Physiotherapy interns, students, and technicians were not eligible to participate in the study.

Survey

The online survey questionnaire consisted of 24 items, including a mix of multiple-choice items, Likert-scale type statements, and yes-or-no questions. The questionnaire was used to collect additional information related to participants' current clinical practices for the management of PSF, their sociodemographic profile (nationality, highest educational attainment, current job status, job title, years of experience as a physiotherapist, and the number of years they have worked with stroke survivors), level of confidence in their PSF management, knowledge of PSF, and use of current PSF clinical assessment methods.

Questions regarding current clinical practices covered the type, frequency, and intensity of the exercises performed. These questions were derived from Donnelly et al¹⁴, who studied cancer-related fatigue. The sources of questions related to knowledge were obtained from clinical studies of patients with PSF¹⁵⁻¹⁸. The survey was sent to a group of 10 physiotherapists and rehabilitation Ph.D. candidates from Saudi Arabia at the University of Nottingham, who were asked to provide feedback on the questionnaire's items. Based on the feedback received, some items were rephrased, and the revised questionnaire was used for the online survey at www.onlinesurveys.ac.uk (formerly Bristol Online Surveys), a reliable and widely used online academic survey platform. The questionnaire, which was launched on September 19, 2019, and closed on December 30, 2019, is available in the Supplementary materials.

Ethics Approval

Ethics approval for the study was obtained from the Faculty of Medicine and Health Sciences Ethics Committee of the University of Nottingham (Ethics approval No: 373-1908) and from the local Ethics Committee of the Saudi Physical Therapy Association. As this was an online survey, participation in the study was considered to imply consent to participate; hence, no separate informed consent form was used. The study complies with the Declaration of Helsinki.

Statistical Analysis

We used IBM SPSS 25 software (IBM Corp., Armonk, NY, USA) to analyze the descriptive statistics, frequency analysis, and inferential statistics. The physiotherapists' knowledge of PSF was assessed through the online survey. As suggested by George and Mallory¹⁹ in 2011, Cronbach's alpha was used to measure the internal consistency of the items for each dimension. Parametric tests (*t*-test and ANOVA) were used to compare differences between two or more independent groups, such as qualifications and current employment. The Mann-Whitney U test was used to compare two groups, and the Kruskal-Wallis ANOVA test was used to compare more than two groups. A *p*-value < 0.05 was considered statistically significant, and correlation analysis (*r*) was used to measure the strength and direction of the relationships between variables²⁰. Sample-size calculations were not performed because no registry of physiotherapists was available in Saudi Arabia at the time this study was conducted.

Results

A total of 160 physiotherapists completed the survey. Their sociodemographic characteristics are presented in Table I. More than half of the physiotherapists (55.6%) held a graduate degree, and 27.5% held a master's degree. Among the 160 participants that completed the survey, 65 (40.6%) were employed by the Ministry of Health (MoH) and 34 (21.3%) were working in the private sector with the remainder of participants working in other sectors. Most of the physiotherapists (88.8%) were full-time employees, and the remainder of them was employed on a part-time basis. A significant majority of the physiotherapists (85.1%) were specialists and 27.5% of participants were senior specialists. Among the participating physiotherapists, 13.1% were working in both in-patient acute-care and outpatient

units and 11.3% were assigned to the inpatient rehabilitation unit. The geographical distribution of the physiotherapists shows that 34.4% of them were from the central region, 23.8% were from the northern region, 16.3% were from the western region, 15.6% were from the eastern region, and 10% were from the southern region of Saudi Arabia. The physiotherapists' mean \pm standard deviation (SD) number of years of clinical practice was 7.90 ± 6.36 years, and the mean number of years they had provided care to stroke survivors was 4.77 ± 5.08 years.

Participants' Confidence in Their Knowledge, Clinical Practices, and Awareness of PSF

A 5-point Likert scale was used to assess the participants' level of agreement with statements pertaining to their PSF-related confidence, knowledge, clinical practices, and management. The mean values of the responses to some of the statements were close to neutral, and their responses to the remaining statements leaned towards agreement (for example, confidence in practices related to PSF management). Among the 160 participating physiotherapists, 54.4% agreed that they could treat patients with PSF based on their current knowledge and 41.3% agreed that they had sufficient knowledge of PSF. However, only 5% strongly agreed that they included PSF in their routine assessments most of the time and 26.9% agreed with this statement (Table II). No significant differences were found in the participants' level of confidence based on gender, job type, or level of education (*p* > 0.05, for all) (Table III).

Knowledge of PSF Management

Participants' knowledge of PSF was evaluated across four domains (PSF, factors associated with PSF, the pathophysiology of PSF, and treatment methods for PSF). Their responses to statements on the 5-point Likert scale show that 48.1% agreed with the statement, "PSF is the subjective lack of physical and/or mental energy that interferes with usual and desired activities," 45% agreed with the statement, "PSF is significantly related to a low health-related QoL," and 42.5% agreed with the statement, "PSF mainly describes endurance level." These responses varied within the domain of factors associated with PSF, with participants agreeing with half of the statements and being neutral towards the remaining statements. However, the overall

Table I. Baseline characteristics of the physiotherapists.

Variable	Frequency (n)	Percentage (%)
Gender		
Female	86	53.8
Male	74	46.3
Nationality		
Saudi	148	92.5
Other	12	7.5

Table II. Physiotherapists' confidence in their knowledge, clinical practices, and awareness of post-stroke fatigue.

Likert-scale statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean (SD)
	%					
I have sufficient knowledge about post-stroke fatigue.	9.40	15.00	27.50	41.30	6.90	3.21 (1.08)
I can treat patients with post-stroke fatigue based on my current knowledge about it.	6.90	11.90	20.00	54.40	6.90	3.43 (1.02)
I include post-stroke fatigue in my routine assessments most of the time.	11.30	33.10	23.80	26.90	5.00	2.81 (1.12)
Post-stroke fatigue is an important issue for physiotherapists.	3.10	6.30	20.00	36.30	34.40	3.92 (1.04)
I ask my stroke survivor patients directly about fatigue after stroke most of the time.	5.60	20.60	21.90	32.50	19.40	3.39 (1.18)
My stroke survivor patients often tell me that they are concerned about fatigue following stroke.	6.90	13.80	26.30	36.90	16.30	3.42 (1.12)
Overall						3.36 (0.82)

SD: standard deviation.

mean value (3.41) indicated that the physiotherapists generally agreed with all the statements regarding their knowledge of PSF. As with their confidence levels, no significant difference in knowledge regarding PSF was found based on participants' gender, job type, or level of education (Table IV). Furthermore, a significant positive correlation was found between participants' confidence in their clinical practices and

their knowledge of PSF ($r = 0.461$, $p < 0.001$) (Table V).

Physiotherapists' Sources of Knowledge About PSF

The most common source of PSF-related knowledge was self-study (for example, reading), as reported by 15.6% of the participating physiotherapists, followed by undergraduate education,

Table III. Differences in the physiotherapists' levels of confidence in managing post-stroke fatigue by gender, job type, and level of education.

Variable	Mean	Median	SD	Mann-Whitney	p-value
Gender					
Female	3.32	3.50	0.849	0.494	0.621
Male	3.40	3.58	0.797		
Current employment					
Full-time	3.36	3.50	0.795	0.775	0.439
Part-time	3.37	3.83	1.05		
				Kruskal-Wallis	p-value
Highest level of education					
BSc	3.41	3.66	0.808	2.98	0.393
DPT	3.23	3.83	1.16		
MSc	3.26	3.16	0.731		
PhD	3.46	3.66	0.887		

SD: standard deviation.

Table IV. Differences in the physiotherapists' levels of knowledge related to post-stroke fatigue by gender, job type, and level of education.

Variable	Mean	Median	SD	Mann-Whitney test	p-value
Gender					
Female	3.42	3.51	0.55	0.494	0.621
Male	3.41	3.47	0.51		
Current employment					
Full-time	3.43	3.49	0.49	.775	0.439
Part-time	3.24	3.52	0.77		
				Kruskal-Wallis test	p-value
Highest education level					
BSc	3.41	3.49	0.50	1.33	.769
DPT	3.14	3.54	0.90		
MSc	3.45	3.47	0.44		

SD: standard deviation, BSc: Bachelor of Science, DPT: Doctor of Physical Therapy, MSc: Master of Science.

which was cited by 10.6% of participants. Other sources included continuous medical education events, such as seminars and conferences (9.4%), and a combination of undergraduate education and self-study (6.9%). We also found that 10% of all participants had not heard of PSF, and 11.3% had not learned about PSF from any of the sources mentioned.

Tools for the Management of PSF

Approximately 60% of the participants indicated that they did not use any tools in their routine assessments of stroke survivors. Among those who did use tools (40%), their most frequently used instruments were the Fatigue Assessment Scale (FAS) (17.2%), levels of endurance and functional dependency (15.6%), endurance level only (14.1%), and level of functional dependency (9.4%).

Current Clinical Practices for Treating PSF

More than half of the physiotherapists (54.4%) reported treating PSF in their current clinical practice, and the remaining participants (45.6%) indicated that they did not treat PSF cases (45.6%). The most common treatment methods used were exercise (12.6%) and exercise inclusive of bed mobility and transfer of training (10.3%). The physiotherapists reported 11 types of exercise that they used for PSF management, and most of them (59.5%) stated that they always preferred bed and chair exercises, followed by functional training exercises (51.4%) and resistance training (23.1%). The overall mean value (3.89) indicated that physiotherapists often used exercise to manage PSF (Table VI).

The questionnaire's responses showed that 40.5% of the physiotherapists very often prescribed comfortable or symptom-limited exercise

Table V. Relationship between confidence and knowledge related to clinical practices for managing post-stroke fatigue.

		Confidence to in clinical practices for managing PSF management	Knowledge of clinical practices for managing PSF management
Confidence in clinical practices for PSF management	Correlation coefficient	1.000	0.416
	p-value		< 0.001
Knowledge of clinical practices for PSF management	Correlation coefficient	0.416	1.000

Table VI. Types of exercise used for treating post-stroke fatigue.

Which of the following exercises for treating post-stroke fatigue do you use?						
Types of exercise	Never	Rarely	Sometimes	Very often	Always	Mean (SD)
Bed and chair exercise	0.9%	4.5%	6.3%	28.8%	59.5%	4.41 (0.87)
Functional training exercise	0.0%	4.5%	18.9%	25.2%	51.4%	4.23 (0.91)
Walking	0.0%	6.3%	17.1%	26.1%	50.5%	4.21 (0.95)
Flexibility and stretching exercises	0.0%	4.5%	22.3%	29.5%	43.8%	4.13 (0.91)
Balance training exercise	1.8%	6.3%	20.5%	27.7%	43.8%	2.84 (1.38)
Gradual training exercises	3.6%	7.2%	17.1%	30.6%	41.4%	3.99 (1.10)
Breathing exercises	9.9%	14.4%	15.3%	21.6%	38.7%	3.65 (1.38)
Repetitive task training	0.9%	6.3%	21.6%	37.8%	33.3%	3.96 (0.94)
Aerobic exercise	1.8%	16.1%	25.0%	25.0%	32.1%	3.70 (1.14)
Resistance training	0.9%	13.0%	36.1%	26.9%	23.1%	3.58 (1.01)
Circuit (group) training exercise	22.5%	20.7%	23.4%	17.1%	16.2%	4.41 (1.65)
Overall						3.89 (0.61)

SD: standard deviation.

and 39% used low to moderate aerobic interval training.” Although 30.4% of them sometimes used continuous aerobic exercise of moderate intensity, 28.8% used resistance exercises sometimes or very often, and 32.7% never used high-intensity continuous aerobic exercise. Table VII presents physiotherapists’ preferred frequency of exercise for people with PSF, with 63.4% prescribing exercise more than once a day, 5.4% once a day, and 31.3% twice a week.

Educational materials related to PFS

A total of 67 (41.9%) participants stated that they provided educational materials related to PSF to stroke survivors. Among these physiotherapists, 46.3% typically delivered information verbally, and 19.4% conveyed information both verbally and through leaflets. Approximately three-quarters of the physiotherapists answered “No” to the statement that their organization included PSF in its stroke management protocol,

with the remaining physiotherapists answering “Yes” (Table VIII).

Discussion

This study evaluated the current clinical practices, knowledge, awareness, and confidence levels of physiotherapists related to the assessment and management of PSF. The participants, all of whom practiced in Saudi Arabia, rated themselves on our online survey as confident in managing PSF and related conditions and as having a good grasp of the knowledge needed to treat their patients with PSF. The physiotherapists’ most preferred treatment method for PSF was bed and chair exercises, with most participants choosing to have patients do bed and chair exercises or functional training exercises.

As for the intensity of the exercise, most of the respondents indicated that they always used com-

Table VII. Intensity of exercises for treating post-stroke fatigue.

What level of exercise intensity do you use to minimize the effects of post-stroke fatigue?						
Intensity of exercise	Never	Rarely	Sometimes	Very often	Always	Mean (SD)
Comfortable or symptom-limited exercise	1.8%	1.8%	17.1%	40.5%	38.7%	4.13 (0.88)
Low to moderate aerobic interval training	0.0%	4.5%	27.7%	39.3%	28.6%	3.92 (0.86)
Moderate-intensity continuous aerobic exercise	4.5%	22.3%	30.4%	26.8%	16.1%	3.28 (1.12)
Resistance exercises	1.8%	21.6%	28.8%	28.8%	18.9%	3.41 (1.08)
High-intensity continuous aerobic exercise	32.7%	25.5%	16.4%	15.5%	10.0%	2.45 (1.35)

SD: standard deviation.

Table VIII. Education related to post-stroke fatigue.

	Frequency (n)	Percentage (%)
Information related to post-stroke fatigue was included in the educational materials given to post-stroke survivors		
No	93	58.1
Yes	67	41.9
Information delivery method used		
Electronic	2	3.0
Leaflet	3	4.5
Verbal	31	46.3
All of the above	15	22.4
Information related to post-stroke fatigue was included in the educational materials given to patients' caregivers		
No	95	59.4
Yes	65	40.6
Information delivery method used		
Electronic	2	3.1
Leaflet	5	7.7
Verbal	32	49.2
All of the above	9	13.8
The organization included "post-stroke fatigue" in its stroke management protocol		
No	124	77.5
Yes	36	22.5
The organization included "post-stroke fatigue" in the stroke educational curriculum		
No	126	78.8
Yes	34	21.2
Total	160	100.0

fortable or symptom-limited exercise or low to moderate aerobic interval training. Most participants preferred completing prescribed exercises more than twice a day. However, the participants did not include PSF in their daily routine assessments of their patients who were stroke survivors. Nor did they include messages about the importance of PSF awareness in the educational materials they distributed to patients and caregivers. No significant differences were found between the male and female participants in the ratings of their knowledge and management of PSF.

The survey's results revealed that the physiotherapists in the study possessed a good grasp of theoretical knowledge about the management of PSF and confidence in their practices for PSF management. A significant positive correlation was observed between participants' confidence in their clinical practices for PSF management and knowledge of PSF. Two similar studies^{21,22} of healthcare professionals reported confidence levels of 5.8 and 7 out of a possible score of 10 for managing PSF, which were lower than their confidence levels for managing fatigue related to other medical conditions.

Another noteworthy finding from the present study is that many of the participating physiotherapists did not include PSF in their daily routine assessment of patients who were stroke survivors. Most of the participants in this study used various measures of fatigue assessment (17.2%) as a PSF assessment tool, followed by functional dependency level (15.6%) and endurance level (14.1%). The wider use of fatigue assessment scales, such as the FAS is most likely related to its reliability and validity²³. The Fatigue Severity Scale (FSS) been used more frequently in observational clinical studies, whereas the FAS has been used more often in interventional studies⁷. Our findings align with the results of earlier studies^{10,21,22}, showing that assessment tools are not routinely used in clinical practice.

Numerous studies^{24,25} have highlighted the relationship between functional and endurance levels of patients with PSF, indicating that physical impairment and functional deficits are significant contributors to PSF. Assessment tools that measure patients' endurance and functional level have not yet been validated as tools for use with patients with PSF. However, the results of several

studies^{26,27} indicate that the current measurement tools for PSF do reflect the impact of PSF, but do not accurately gauge the severity of PSF and its multifaceted features.

An important finding of the present study is that exercise was the most frequently used treatment option for PSF. As for the different types of exercise, 59.5% of the physiotherapists preferred bed and chair exercises, whereas 51.4% preferred functional training exercises. In clinical studies²⁸, both occupational therapists and physiotherapists have referred to various treatments (for example, the role of exercise and multidisciplinary teams) for PSF. Furthermore, the physiotherapists felt that PSF should be considered as a medical condition due to the severity and high variability of its symptoms. The participants also believed that therapists should work together with patients to tailor the treatments to each individual. They have also suggested that further research on the causes and management of PSF would contribute to the development of clearer pathways for interventions²⁸. Another similar questionnaire-based study³ found that “pacing” was the most frequently cited advice given to patients, followed by the use of a diary, and imparting information related to PSF to patients and their caregivers. A 2022 study by Drummond et al²⁹ included suggestions from clinicians, such as the use of diaries, the need for pacing and prioritizing, educating the patient and their caregiver about fatigue, using specific coping strategies, and prescribing gradual exercise. In the present study, most of the physiotherapists (40.5%) indicated that they used “comfortable or symptom-limited exercise” for patients with PSF, followed by “low to moderate aerobic interval training” (39.3%). The existing literature lacks information on the intensity of exercise in managing PSF. Graded activity training (GRAT) is the only option mentioned in relation to intensity, and it depends on the patient’s tolerance²⁹. Zedlitz et al²⁶ also reported a significant clinical change in PSF, namely, an improvement in endurance in the study group with combined GRAT and cognitive therapy. An Australian survey highlighted the use of energy optimization strategies to facilitate self-reflection, thereby allowing potential triggers for fatigue to be identified and helping patients understand how to use energy effectively¹⁰. Patients with PSF have suggested additional interesting ways to manage PSF^{3,27}. Most of them suggested “pacing”, which involves spreading out activities and interspersing them with rest periods, keeping a fatigue

diary, relaxation/meditation, getting adequate rest, setting small personal goals, and following healthcare advice as meaningful approaches to the management of PSF^{3,27}.

More than half of the participants in the present study did not include messages about the importance of PSF awareness in the educational materials provided to stroke survivors and their caregivers. In an Australian survey, 85% of the participating healthcare professionals provided hard copies of educational material about PSF to patients¹⁰. In the present study, 58% (n = 93) did not provide PSF educational materials to stroke survivors, and 59% (n = 95) did not include PSF information in the educational materials for caregivers. According to the Canadian Stroke Best Practice Recommendations for PSF, patient education is often overlooked, and healthcare practitioners must always anticipate the patient’s need for information while treating a stroke survivor and must be prepared to communicate effectively with the patients and their caregivers to mitigate fatigue through assessment, education, and interventions³⁰. Teaching the patient and caregiver is an essential part of physiotherapy and is an important part of the treatment plan³¹.

The responses of the physiotherapists revealed that PSF had been neglected in Saudi Arabia because 77.5 % (n = 124) of the participants did not include PSF in stroke management, and 78.8% (n = 126) did not include PSF references in their educational materials on stroke management. None of the previous studies mentions or provides any recommendations based on organizational level. The Medical Research Council framework suggests that complex interventions be designed at different levels and that factors such as the number of groups, settings, and levels targeted be considered in the design and development of interventions^{32,33}. Hence, organizational and educational levels must be considered in future studies to raise awareness of PSF and to improve clinical practices for managing PSF.

This study has strengths and limitations. The use of an online survey provided a wider range of respondents across geographical areas within Saudi Arabia, which would not have been possible otherwise. The online survey also helped to reduce the risk of researcher bias, which would have been present in a qualitative research design. One of the study’s limitations is the missing calculation of the sample size (due to the unavailability of a registry of physiotherapists). However, to minimize bias, the

invitation to participate in the study was sent to both clinical and academic physiotherapists in all of the major geographical areas of Saudi Arabia. Another limitation is that data on the clinical reasoning underlying the physiotherapists' methods of practice were not collected, which could have enhanced our knowledge of PSF. This limitation could be addressed only by employing a qualitative research method; thus, future studies on this topic are essential to clarify our understanding of their reasoning and justification. Third, the study's cross-sectional design limits the researcher's ability to establish causality between the study variables. Fourth, the survey questionnaire does not take into consideration the factors influencing the implementation of evidence on stroke rehabilitation in clinical practice, such as the practice context and service delivery. Fifth, the general limitations of using a survey as a research design are also applicable to this study. It is possible that the physiotherapists who responded to the invitation were more confident and aware of PSF than those who did not respond. Furthermore, we did not investigate the clinical experiences of physiotherapists in managing PSF.

Our study is a step towards understanding deficiencies in the management of PSF, establishing standardized assessment tools, training healthcare practitioners to identify and appropriately treat the condition, and, most importantly, recognizing PSF as a frequently occurring condition among stroke survivors. The findings of the present study and previous research suggest there is a need to design specific educational interventions to raise awareness of PSF among patients, caregivers, and physiotherapists in Saudi Arabia. There is also a need to increase the availability of educational materials related to PSF in all hospital settings.

Conclusions

The participating physiotherapists from Saudi Arabia have theoretical knowledge about PSF but do not reflect such knowledge in their clinical practice. They did not include PSF in their daily assessment of patients or in the educational material they provided to patients and their caregivers. Several interventions, such as bed and chair exercises and functional training exercises, have been used to treat PSF. The physiotherapists had a high level of confidence in their clinical practices for PSF management, which could help them provide

better healthcare services. However, the absence of a consensual framework for PSF management and the diversity of approaches used in communities for PSF management make it challenging for physiotherapists to offer their patients uniform services.

Conflict of Interest

The authors have no competing interests.

Ethics Approval

The study complies with the Declaration of Helsinki. Ethics approval for the study was obtained from the Faculty of Medicine and Health Sciences Ethics Committee of the University of Nottingham (Ethics approval No.: 373-1908) and from the local Ethics Committee of the Saudi Physical Therapy Association.

Informed Consent

As this was an online survey, participation in the study was considered to imply consent to participate; hence, no separate informed consent form was used.

Availability of Data and Materials

The data presented in this study are available on request from the corresponding author.

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Authors' Contributions

Conceptualization, WA; methodology, WA; validation, WA; analysis, WA; investigation, WA; data curation, WA; writing the original draft, WA, KS, and RB; and writing the response to the review and editing, KS and RB. All of the authors reviewed and edited the manuscript; they also approved the final version of the manuscript.

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