POST-STROKE FATIGUE IN YOUNG ADULTS AFTER ISCHEMIC STROKE: A SCOPING REVIEW

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Abstract: *Post-stroke fatigue (PSF) could have a negative impact on the rehabilitation potential, quality of life, and work capacity of younger ischemic stroke patients. The available quantitative and qualitative research on the prevalence, predictors, and interventions associated with PSF have not explicitly focused on young adults. This scoping review aimed to summarise the available evidence on PSF in young adults after ischemic stroke (prevalence, predictors, and consequences, assessment tools, as well as interventions to reduce fatigue in young stroke survivors). The following methodological procedures were used for this scoping review: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and the Joanna Briggs Institute updated methodological guidance. A total of 3483 studies were identified through a bibliographic search in the Ovid MEDLINE, PubMed, Scopus, ProQuest Central, APA PsycINFO, SocINDEX, and CINAHL Plus databases. Ten studies that met the inclusion criteria were included in the scoping review. Only four studies explicitly addressed PSF in young adults after ischemic stroke. The prevalence of fatigue among young adults who had suffered an ischemic stroke ranged from 41.0% to 57.8%. Seven studies found a significant association between PSF, depression, and anxiety. Fatigue in young stroke survivors significantly affects their return to work and it is an independent predictor of poor quality of life. The number of research studies on fatigue in young adults after ischemic stroke is small and they mainly focus on fatigue as a predictor of quality of life after stroke. There is a need for further studies that address the phenomenon of fatigue after ischemic stroke and validate the effectiveness of interventions to reduce fatigue in young stroke survivors.*

Keywords: *post-stroke fatigue, young adults, stroke, review*

INTRODUCTION

Post-stroke fatigue (PSF) is a frequent, distressing, and often long-lasting condition observed in ischemic stroke (IS) patients (Maaijwee et al., 2015), even in those who suffered a mild stroke (Vitturi et al., 2021; Young et al., 2013). The prevalence, predictors, consequences, and interventions for PSF have been the subject of growing research efforts over the last decades (Aarnes et al., 2020; Barbour et al., 2012; Alghamdi et al., 2021; Cumming et al., 2016; Wu et al., 2015).

The most recent meta-analyses (Alghamdi et al., 2021; Cumming et al., 2016) have reported varied results, including differences in the prevalence of PSF according to the time of its assessment (< 6 vs ≥ 6 months after stroke onset), stroke type (ischaemic vs haemorrhagic/subarachnoid haemorrhage), and geographical location of the study (East Asia vs Europe). During the first six months after stroke, patients reported a lower prevalence PSF (36%) in comparison with those who were assessed later (56%, Alghamdi et al., 2021). In addition, patients who had suffered haemorrhagic stroke had almost double prevalence of PSF compared to those who had suffered ischemic stroke. Studies conducted in Asia reported lower estimates of PSF prevalence than those conducted in Europe (Alghamdi et al., 2021).

PSF is typically measured using self-reported questionnaires (e.g., Fatigue Severity Scale, Multidimensional Fatigue Inventory). The selection of the appropriate tool to measure PSF has also been described as a factor that contributes to variability in the reported prevalence of PSF in different studies (Alghamdi et al., 2021).

Being a multidimensional phenomenon (Becker et al., 2015), PSF has a complex aetiology with many contributing factors: demographic, clinical (neurological impairment, pain, sleep disorders), emotional (depression, anxiety), as well as cognitive and social (Aarnes et al., 2020; Duncan et al., 2012; Hoang et al., 2012; Delva et al., 2017).

PSF is often associated with depressive symptoms (Pihlaja et al., 2014) and anxiety (Elf et al., 2016). After IS, however, a clear consensus on direct associations between mood and fatigue has not yet been established (Duncan et al., 2012). The role of age as a factor contributing to PSF has not been established, with some authors (Paciaroni et al., 2019; Nadarajah and Goh, 2015) reporting ambiguous or controversial evidence regarding the relationship between PSF and age (i.e., positive vs negative correlations between age and PSF). However, Lerdal (2013) reported increased risk and rates of PSF in both younger and older patients after IS and suggested that the relationship between PSF and age may follow a U-shaped curve, with the highest rates of PSF in younger (< 60 years) and older (> 75 years) patients.

Background

There is extensive evidence that a high prevalence of PSF has a negative impact on rehabilitation potential, neurological recovery, quality of life (QoL), and work capacity, leading to psychological and economic implications, particularly in younger patients (Zhan et al., 2022). The management of PSF in younger stroke survivors is very important because PSF affects the socioeconomic aspects of their lives, their physical condition and cognition, daily life (parenting), as well as early return to work or ability to continue working (Pihlaja et al., 2014; Nadarajah and Goh, 2015; Lerdal, 2013; Balasooriya-Smeekens et al., 2016; Feigin et al., 2017). A better understanding of PSF in young patients is fundamental for effective rehabilitation and self-management programmes to ensure adequate support for their PSF.

To the best of our knowledge, there are no comprehensive reviews focusing on PSF in young IS patients. The available quantitative and qualitative research syntheses related to the prevalence, predictors, and interventions associated with PSF (Aarnes et al., 2020; Alghamdi et al., 2021; Cumming et al., 2016; Wu et al., 2015) have not explicitly targeted PSF in young adults. We aimed to fill this gap by conducting a scoping review (ScR) addressing PSF in young adults after IS.

METHODS

The following methodological procedures were used for this ScR: the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) ScR checklist (Page et al., 2021) and the Joanna Briggs Institute updated methodological guidance (Peters et al., 2021). The review process comprised of the following steps: formulation of research questions, definition of inclusion and exclusion criteria, determination of the search and study selection strategy, data extraction, data analyses, and subsequent interpretation.

The research questions focused on these areas: (1) prevalence of fatigue, (2) predictors and consequences of fatigue, (3) assessment tools, and (4) interventions to reduce fatigue. Inclusion and exclusion criteria were specified in advance for the selection of studies. The following relevant keywords along with their synonyms were identified: “ischemic stroke”/ “fatigue”/ “young adult”.

A reference librarian was consulted throughout the search process. The Ovid MEDLINE, PubMed, Scopus, ProQuest Central, APA PsycINFO, SocINDEX, and CINAHL Plus databases were used. The search terms were applied to article titles, abstracts, keywords, and Medical Subject Headings (MeSH) terms (see Appendix 1 for further details). The search was restricted to studies that were published in English between 1946 and December Week 4, 2022.

Three independent researchers (DB, RZ, and EG) systematically screened studies according to the PRISMA flow diagram (Fig. 1).

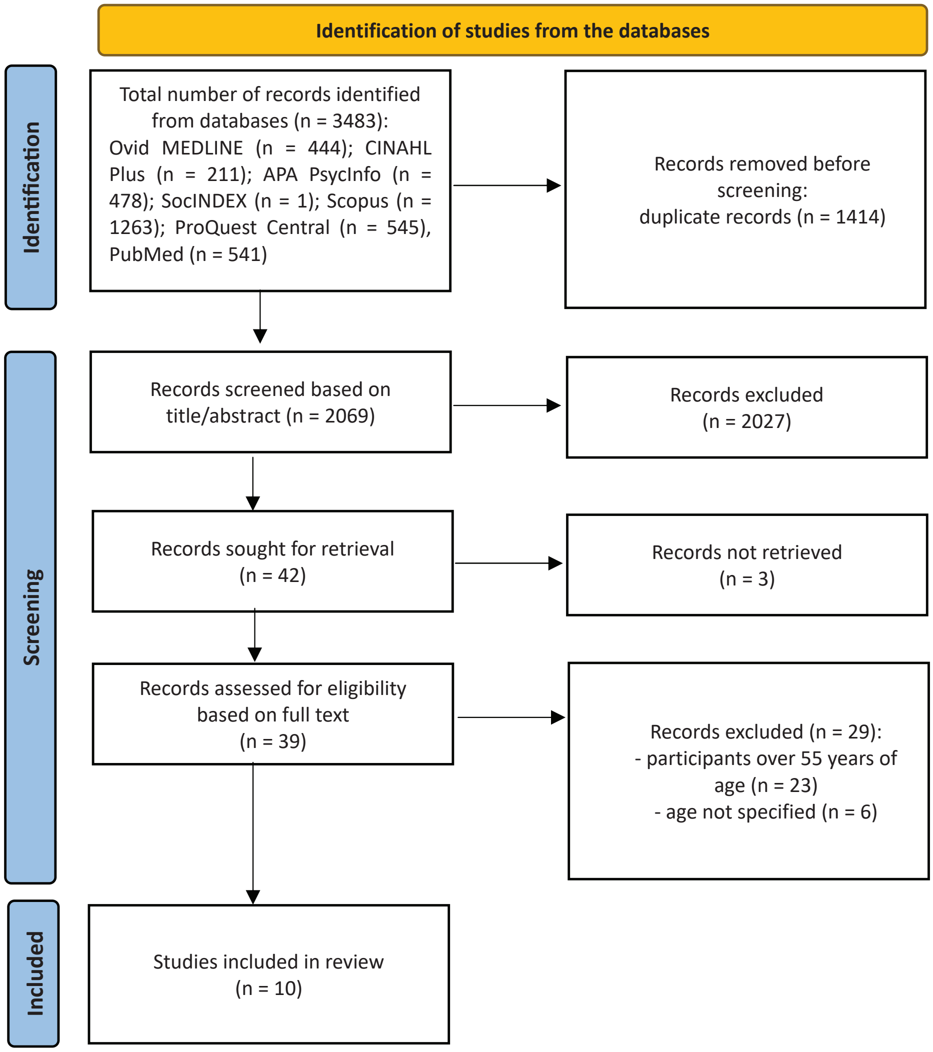

Figure 1. *PRISMA flow diagram outlining the study selection strategy*

The free web and mobile application Rayyan (http://rayyan.qcri.org) was used to sort through the studies and remove duplicates. Inclusion criteria were determined according to the Participants, Concept and Context (PCC) format (Table 1).

Table 1. *Inclusion criteria based on the PCC format*

	Inclusion criteria based on the PCC format
a)	Participants (target population): Studies involving young adult patients diagnosed with IS were included. However, relevant studies with a sample of individuals with other types of strokes (haemorrhagic or transient ischemic attack - TIA) were considered if they constituted a dominant proportion of the population (greater than 60%).
b)	Concept (key concept): Fatigue was the central theme; studies on mental and muscular fatigue, chronic fatigue syndrome, exhaustion, flaccidity, weakness, asthenia, or lethargy were also considered.
c)	Context: For young adult patients after IS, an age range of 18 to 55 years was applied since recent studies on stroke define young adults as those between the ages of 18 and 55 years (Shipley et al., 2020; Yahya et al., 2020). Therefore, only studies with post-IS patients under 55 years of age were included in this ScR.

Study protocols, discussion papers, reviews, conference abstracts, books, reports, dissertations, expert opinions, and studies on perspectives other than those of patients were excluded. In addition, grey literature and studies involving patients over 55 years of age at the time of IS were also removed.

Data extraction and analysis were performed by two independent researchers (EG, DB). The full text of the selected studies were analysed for final inclusion in the ScR. A third independent researcher (RZ) was invited to assess the studies for which consensus on inclusion could not be reached. Any further disagreements were resolved by consensus of all researchers. At the end of the selection process, quantitative, qualitative, and mixed studies published in English were included in the analysis. Descriptive data extracted from each study included the author(s)/year/country, aim, design, number of respondents, age of respondents at the time of the study, details of data collection (limited to fatigue), and post-stroke assessment period. These data were abstracted into a MS Word spreadsheet prepared specifically for the present study. In addition, data synthesis was conducted based on the research questions. The data were analysed and classified in terms of relevance to the research themes. For this purpose, the summative content analysis method was used.

RESULTS

The initial search yielded 3483 studies. After removing duplicates and performing a detailed screening of the studies, a total of ten studies that met the inclusion criteria were included in the ScR (Fig. 1). A short description of each included study is shown in Table 2.

Table 2. *Characteristics of the studies included in the scoping review on PSF in young adults after ischemic stroke*

Author(s), country	**Aim**	**Design**	**Sample**	**Age of participants** (years: range, mean ± SD)	**Data collection**	**Follow-up**	**Main results**
Bruijn et al. (2015), The Netherlands	To evaluate the factors that affect QoL after IS in young adults	Prospective cohort study	IS: 170 CG: 61	18-49 46.3 ± 7.1	FAS, WHOQOL-BREF 26, HADS	4.9 ± 2.7 years (mean ± SD) 1-11 years (range)	Prevalence of fatigue: 57.8% The presence of excessive fatigue (FAS > 22) was associated with lower scores for all QoL domains (p ≤ 0.003), but not for the general health domain (p = 0.010). The presence of excessive fatigue was correlated with the presence of depression and anxiety disorder.
Claros-Salinas et al. (2010), Germany	To assess fatigue-related diurnal variations of cognitive performance in patients with IS and MS	Cohort study	IS: 22 MS: 20 CG: 76	IS: 24-59 45.7 ± 8.3 MS: 20-53 39.7 ± 9.4 CG: 20-60 37.2 ± 11	VAS fatigue, cognitive performance evaluated by the subtests alertness, Go/NoGo (for assessing selective attention) and divided attention of a computerised test battery.	14.9 months (mean) 17.6 months (SD)	Objective measures of cognitive performance revealed poorer performance for both groups of patients than for controls (MS: 5.1, IS: 4.5, CG: 4.2; p = 0.07).

Maaijwee et al. (2015), The Netherlands	Long-term prevalence of post-stroke fatigue in patients with TIA or IS and its association with functional outcomes	Part of a large cohort study	IS: 325 TIA: 186 CG: 147	18-50 IS: 50.7 ± 10.4 TIA: 48.9 ± 11.3	Fatigue subscale of the Checklist Individual Strength questionnaire, mRS, IADL	9.8 ± 8.4 years (mean ±SD)	Prevalence of fatigue: 41% in patients with IS after a mean FUP and 18.4% in CG patients ($p = 0.0005$). Follow-up duration did not influence the prevalence of fatigue and did not differ between different stroke localisations. Fatigue was associated with poor functional outcome in TIA and IS patients, and impairment in the speed of information processing.
Naess et al. (2005), Norway	To analyse fatigue in young adults with IS	Cohort study	IS: 192 mean 6 years after IS CG: 212	15-49	FSS, mRS, NHP, MMSE, MADRS	6 years (mean) 1.4-12.3 years (range)	Prevalence of fatigue: 51.3% A higher FSS score was independently associated with depression, reduced functional state, and basilar artery infarction through an interaction with the functional state.
Naess et al. (2006), Norway	To evaluate HRQoL among young adults with IS at long-term follow-up and to compare the results with those of controls of the same age and sex and the general Norwegian population	Cohort study	IS: 190 general population (incidence 11.4/100,000 inhabitants): 232 CG: 215	15–49 IS: 47.8 CG: 51.5	FSS, HRQoL, SF-36, mRS, MADRS	6 years (mean) 1.4-12.3 years (range)	Prevalence of fatigue: 52% The patients had significantly lower SF-36 scores in physical functioning, role limitations due to physical disability, health and social functioning compared to controls and the general Norwegian population. Fatigue was independently associated with low scores on all SF-36 subscales, except role limitation due to emotional problems. Clinically significant reduction of HRQoL was associated with functional dependence, unemployment, being unmarried, depression, and fatigue.
Naess et al. (2008), Norway	To evaluate the QoL among young patients with IS at long-term follow-up by comparing them with MS patients with a secondary progressive course	Cohort study	IS: 232 MS: 366 CG: 216	15-49 IS: 47.8 MS: 44.5 CG: 51.5	NHP-I, energy level	6 years (mean) 1.4–12.3 years (range)	MS patients scored significantly higher than controls on all NHP sub scores ($p < 0.001$). IS patients scored significantly higher than controls on energy level ($p = 0.005$), emotional reaction ($p = 0.002$), social isolation ($p = 0.002$), and physical mobility ($p < 0.001$). Fatigue (higher score on energy level) was more severe among MS patients ($p = 0.012$).

Naess et al. (2013), Norway	To investigate the relationship between post-stroke fatigue and depression and subsequent mortality in young IS patients	Prospective cohort study	IS: 190 mean 6 years after IS	15-49 (at the time of IS) 48 (mean age on FUP)	FSS, MADRS, mRS, BI, SSS, MMSE	12.4 years (mean) 18 years (mean total FUP time since the index stroke)	Both fatigue and depression were associated with subsequent long-term mortality, irrespective of stroke severity.
Rohner et al. (2020), Switzerland	To compare HRQoL in young adults who have had paediatric acute IS with a healthy CG	Cross-sectional study	IS: 33 median 22 years (20-26 years) CG: 71 median 23 (21-25 years)	≤ 18 ≤ 2 after IS	WEIMuS, HRQoL, SSQoLS, BDI, FrSBe, PSOM	11 years (median) 8.6-15.8 years (range)	HRQoL, depression, or fatigability did not differ between the patients and the CG.
Samuelsson et al. (2021), Sweden	To investigate to what extent cognition is associated with employment whilst controlling for sociodemographic, clinical, and mental background factors	Cross-sectional cohort study	IS: 142	18-55 43.0 ± 9.3	SF-36 vitality subscale, NIHSS, Saltin–Grimby Physical Activity Level Scale, SIS, BNIS, Star Cancellation Test, HADS-A, HADS-D	7 years	At seven years after stroke, 112 (79%) had part-time jobs or full-time work and 30 (21%) had full-time disability pension or sick leave. Compared to those with full-time disability pension or sick leave, participants with current employment demonstrated significantly better performance with respect to general cognitive functioning and processing speed and significantly lower self-ratings for cognitive difficulties, physical limitations, fatigue, and depressed mood.
Zedlitz et al. (2011), The Netherlands	To evaluate the effect of the treatment protocol on the reduction of post-stroke fatigue (COGRAT)	Case study	1 woman	45	Borgs rating of perceived exertion, COGRAT	2 years after IS	After COGRAT activity, the woman reported a subjectively positive effect of COGRAT on improving energy and reducing fatigue.

BDI, Beck Depression Inventory; BI, Barthel Index; BNIS, Barrow Neurological Institute Screen; CG, control group; COGRAT, Cognitive and Grades Activity Training; FAS, Fatigue Assessment Scale; FrSBe, Frontal Systems Behaviour Scale; FSS, Fatigue Severity Scale; FUP, follow-up; HADS, Hospital Anxiety and Depression Scale; HRQoL, health-related quality of life; IADL, Instrumental Activities of Daily Living; IS, ischemic stroke; MADRS, Montgomery-Asberg Depression Rating Scale; MMSE, Mini-Mental State Examination; mRS, modified Rankin Scale; MS, multiple sclerosis; NHP-I, Nottingham Health Profile Part I; NIHSS, National Institutes of Health Stroke Scale; PSOM, Paediatric Stroke Outcome Measure; QoL, quality of life; SD, standard deviation; SF-36, Short Form 36; SIS, Stroke Impact Scale; SSQoLS, Stroke-Specific Quality of Life Scale; SSS, Scandinavian Stroke Scale; TIA, transient ischemic attack; VAS, Visual Analogue Scale; WEIMuS, Würzburger Erschöpfungsinventar bei Multipler Sklerose; WHOQOL-BREF 26, World Health Organization Quality of Life scale

In the studies analysed, the mean age of patients at the time of IS ranged from 40.1 to 47.8 years. In four studies (Naess et al., 2006; Naess et al., 2008; Naess and Nyland, 2009; Naess et al., 2005), the lower age limit was 15 years. In a German study (Claros-Salinas et al., 2010), the lower age limit was 24 years, while in one qualitative study (Zedlitz et al., 2011), the age of woman was 45. In the remaining studies, the lower age limit was set at 18 years (Maaijwee et al., 2015; Samuelsson et al., 2021; Bruijn et al., 2015; Rohner et al., 2020). The prevalence of PSF after IS ranged from 41% (Maaijwee et al., 2015) to 57.8% (Bruijn et al., 2015; see Table 2). In seven studies, PSF was assessed using a fatigue-specific tool, while in three studies, PSF was evaluated using health-related QoL (HRQoL) tools. The tools used to assess PSF focused on the physical and psychological domains of PSF.

The relationship between stroke location, functional status, and fatigue was reported only in one study (Naess et al., 2008; Table 2) Young patients with hemispheric infarctions experienced PSF regardless of the degree of independence in activities of daily living. In most studies, psychological factors were associated with PSF, particularly the relationship between PSF and depression (Table 2). A significant relationship between PSF and depression or anxiety was found in seven studies (Table 2). Stronger correlations were found between PSF and depression than between PSF and anxiety (Table 2).

A decrease in QoL was found to be the most significant consequence of PSF (Naess et al., 2008; Bruijn et al., 2015; Rohner et al., 2020; Naess et al., 2006). Young adults who reported fatigue after IS had significantly lower QoL scores in physical functioning and daily activities (Naess et al., 2008). The association between PSF and physical health, independent of the presence of depressive symptoms or anxiety, was also confirmed in a Dutch study (Maaijwee et al., 2015). On the contrary, Bruijn et al. (2015) found that excessive PSF was mainly related to psychological functioning, social relationships, and environment, while no changes were observed in physical health. Higher self-rated cognition was associated with lower levels of subjectively perceived PSF (Samuelsson et al., 2021). Subjectively perceived cognitive fatigue impaired cognitive performance depending on the time of day (Claros-Salinas et al., 2010). Cognitive fatigue is defined as a psychobiological state that occurs following an extended period of self-regulated activity, which leads to a decline in the performance of reasoned cognitive processing tasks over a period of time (McMorris et al., 2018).

In the studies analysed, no specific intervention to reduce PSF was tested. As part of the ScR, we identified only one case study that evaluated the results of a 12-week Cognitive and Graded Activity Training (COGRAT) programme to reduce fatigue in a young woman (Zedlitz et al., 2011).

DISCUSSION

The results of our ScR showed a relatively high prevalence of PSF in young patients based on an extended time interval of the PSF assessment, ranging from 14.9 months (Claros-Salinas et al., 2010) to 18 years after IS (Naess et al., 2013; Table 2). Only four studies explicitly addressed PSF in young adults after IS (Bruijn et al., 2015; Maaijwee et al., 2015; Naess et al., 2005; Naess et al., 2006). Other studies assessed PSF by monitoring QoL (Naess et al., 2006; Rohner et al., 2020), focused on identifying predictors of QoL (Claros-Salinas et al., 2010), or compared cognitive ability and occupation in young adults with physical recovery (Samuelsson et al., 2021). In one study, PSF was assessed as one of the domains of QoL ("reduced energy level") (Naess et al., 2008). In addition, one of the analysed studies evaluated the effect of a specific treatment protocol for fatigue after stroke (COGRAT) in a single patient (Zedlitz et al., 2011).

The prevalence of PSF was explicitly reported only in four studies (Bruijn et al., 2015; Maaijwee et al., 2015; Naess et al., 2005; Naess et al., 2006), with PSF occurring in approximately half of all young IS patients. Variability in the occurrence of PSF was found and it has been suggested that it could be due to heterogeneity in time and methods of PSF assessment.

PSF can have a significant impact on the lives of young patients and it can act as an independent predictor of poor QoL (Naess et al., 2008; Naess et al., 2006; Bruijn et al., 2015; Rohner et al., 2020). PSF affects physical functioning and limits patients' perceptions of general health, vitality, social functioning, and emotional well-being, without the additional effects of emotional problems. Decreased QoL has also been associated with other attributes such as functional dependence, living outside marriage, and unemployment (Naess et al., 2006). When comparing the QoL of patients with IS and multiple sclerosis (Naess et al., 2008), those with multiple sclerosis generally had a worse perception of their lives. IS patients also scored statistically significantly worse in two other areas, namely pain and sleep disturbances (Naess et al., 2008).

Higher rates of PSF were found in unemployed patients, while employed patients (full- or part-time) reported less PSF and better cognitive functioning (Samuelsson et al., 2021). In addition, a Dutch study (Maaijwee et al., 2015) found an association between PSF and cognitive domains, especially speed, information processing, and working memory.

The intensity of PSF was observed to vary throughout the day. Patients experienced the lowest PSF in the morning; PSF increased at midday and was highest in the afternoon, especially in the attention domain (Claros-Salinas et al., 2010). The presence of PSF was also associated with patients' level of self-ratings. The higher the self-ratings, the lower the subjectively experienced PSF (Samuelsson et al., 2021). This psychological factor can be associated with a relatively frequently identified social characteristic influencing fatigue (i.e.,) the level of involvement of the post-stroke patient in the work process (Naess et al., 2005; Naess et al., 2006; Naess et al., 2013; Zedlitz et al., 2011; Samuelsson et al., 2021). A moderately strong correlation was confirmed between unemployment and PSF (Bruijn et al., 2015).

Many previous studies showed the association between PSF and symptoms of depression and anxiety and found significant risk factors for PSF (Duncan et al., 2012; Hoang et al., 2012; Delva et al., 2017; Pihlaja et al., 2014; Elf et al., 2016). Furthermore, it has been confirmed that PSF and depression are both associated with mortality, regardless of the severity of IS.

The results of our ScR confirmed some of the factors related to PSF that are also observed in young patients. In the general stroke population, female gender, depression, leukoaraiosis, sleep disorders, diabetes mellitus, and anxiety were identified as the most critical risk factors for PSF (Zhang et al., 2021). Six months after IS, PSF was more likely to occur in patients with depression, anxiety, and sleep disorders (Zhang et al., 2021).

Except for one case report (Zedlitz et al., 2011), we did not find any studies evaluating the effect of interventions on PSF. It may be suggested that adequate pain management and addressing sleep problems may help to improve fatigue symptoms (Naess et al., 2008). A novel treatment combining cognitive therapy with COGRAT has been developed to improve fatigue and fatigue-related symptoms (Zhang et al., 2021) and has been influential in IS patients. COGRAT is a training programme involving cognitive strategies that lead to the more efficient use of cognitive resources and thus reduce fatigue. The programme consists of two consecutive phases. The first phase focuses on psychoeducation, including setting goals in therapy and presenting the programme. The second phase focuses on understanding the patient's activities and fatigue patterns. It includes recording daily activities, planning changes, and escalating physical activity, focusing on the patient's physical endurance, muscular strength, and flexibility. However, COGRAT has not yet been tested specifically in young adults after IS.

Strengths and limitations

As far as we know, this ScR is the first review focused on PSF in young stroke patients. The findings of this ScR must be considered in the light of several limitations. First, the tools used to assess PSF in the included studies were generic. Another limitation is the heterogeneity of the included studies. Furthermore, there is a potential overlap of patients from four studies conducted by one author (Naess et al., 2005, 2006, 2008, 2013), however in all mentioned studies, different results and additional findings are presented. This ScR was able to partially answer the research questions, since there is a lack of studies investigating/evaluating interventions to reduce/improve PSF. There is a need for further studies that address the phenomenon of fatigue after IS, as well as studies that can validate the effectiveness of interventions to reduce fatigue in young adults after IS. Reducing fatigue in young adults of working age may help them adjust to everyday life and return to work.

CONCLUSION

PSF is one of the most common complications of IS and it significantly affects the QoL of young patients. PSF occurs in approximately half of all young IS patients. A significant relationship has been found between PSF and symptoms of depression and anxiety. The identification and management of risk factors associated with PSF may help to prevent it, reduce it, and thus improve the QoL of stroke patients. Early diagnosis of PSF and education of patients, family members, and caregivers may contribute to faster recovery of patients after IS. There is an urgent need for further studies investigating treatment options for PSF.

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Appendix 1

Search terms used as part of the study selection strategy

Ovid MEDLINE(R)

Ischemic stroke/ [MeSH] OR ischemic stroke*[Title/Abstract] OR ischaemic stroke* [Title/Abstract] OR cerebrovascular accident* [Title/Abstract] OR cerebrovascular stroke* [Title/Abstract] (65,305)

Fatigue [MeSH] OR Asthenia/ [MeSH] OR Fatigue, Syndrome Chronic/ [MeSH] OR Mental Fatigue/ [MeSH] OR Muscle Fatigue/ [MeSH] OR fatigue [Title/Abstract] OR tired [Title/Abstract] OR tiredness [Title/Abstract] OR weary [Title/Abstract] OR weariness [Title/Abstract] OR exhausted [Title/Abstract] OR exhaustion [Title/Abstract] OR lassitude [Title/Abstract] OR listlessness [Title/Abstract] OR asthenia [Title/Abstract] OR weakness [Title/Abstract] OR lethargy [Title/Abstract] (202,649)

Young Adult/ [MeSH] OR Middle Aged/ [MeSH] OR young [Title/Abstract] OR young adult* [Title/Abstract] OR adult* [Title/Abstract] OR middle age* [Title/Abstract] OR middle-age* [Title/Abstract] OR working age [Title/Abstract] OR post stroke [Title/Abstract] OR post-stroke [Title/Abstract] OR stroke survivor* [Title/Abstract] OR stroke patient* [Title/Abstract] (6,315,180)

#1 AND #2 AND #3 **(444)**

PubMed

Ischemic stroke/ [MeSH] OR ischemic stroke*[Title/Abstract] OR ischaemic stroke* [Title/Abstract] OR cerebrovascular accident* [Title/Abstract] OR cerebrovascular stroke* [Title/Abstract] (80,098)

Fatigue [MeSH] OR Fatigue, Syndrome Chronic/ [MeSH] OR Mental Fatigue/ [MeSH] OR Muscle Fatigue/ [MeSH] OR fatigue [Title/Abstract] OR tired [Title/Abstract] OR tiredness [Title/Abstract] OR weary [Title/Abstract] OR weariness [Title/Abstract] OR exhausted [Title/Abstract] OR exhaustion [Title/Abstract] OR lassitude [Title/Abstract] OR listlessness [Title/Abstract] OR asthenia [Title/Abstract] OR weakness [Title/Abstract] OR lethargy [Title/Abstract] (235,413)

Young Adult/ [MeSH] OR Middle Aged/ [MeSH] OR young [Title/Abstract] OR young adult* [Title/Abstract] OR adult* [Title/Abstract] OR middle age* [Title/Abstract] OR middle-age* [Title/Abstract] OR working age [Title/Abstract] OR post stroke [Title/Abstract] OR post-stroke [Title/Abstract] OR stroke survivor* [Title/Abstract] OR stroke patient* [Title/Abstract] (6,543,509)

#1 AND #2 AND #3 **(541)**

Scopus

Ischemic stroke*[Title/Abstract] OR ischaemic stroke* [Title/Abstract] OR cerebrovascular accident* [Title/Abstract] OR cerebrovascular stroke* [Title/Abstract] (123,447)

Fatigue [Title/Abstract] OR chronic fatigue syndrome* [Title/Abstract] OR mental fatigue [Title/Abstract] OR muscle fatigue [Title/Abstract]OR fatigue [Title/Abstract] OR tired [Title/Abstract] OR tiredness [Title/Abstract] OR weary [Title/Abstract] OR weariness [Title/Abstract] OR exhausted [Title/Abstract] OR exhaustion [Title/Abstract] OR lassitude [Title/Abstract] OR listlessness [Title/Abstract] OR asthenia [Title/Abstract] OR weakness [Title/Abstract] OR lethargy [Title/Abstract] (647,612)

Young [Title/Abstract] OR young adult* [Title/Abstract] OR adult* [Title/Abstract] OR middle age* [Title/Abstract] OR middle-age* [Title/Abstract] OR working age [Title/Abstract] OR post stroke [Title/Abstract] OR post-stroke [Title/Abstract] OR stroke survivor* [Title/Abstract] OR stroke patient* [Title/Abstract] (3,207,594)

#1 AND #2 AND #3 **(1,263)**

ProQuest Central

Ischemic stroke*[Title/Abstract] OR ischaemic stroke* [Title/Abstract] OR cerebrovascular accident* [Title/Abstract] OR cerebrovascular stroke* [Title/Abstract] (48,881)

Chronic fatigue syndrome* [Title/Abstract] OR mental fatigue [Title/Abstract] OR muscle fatigue [Title/Abstract] OR fatigue [Title/Abstract] OR tired [Title/Abstract] OR tiredness [Title/Abstract] OR weary [Title/Abstract] OR weariness [Title/Abstract] OR exhausted [Title/Abstract] OR exhaustion [Title/Abstract] OR lassitude [Title/Abstract] OR listlessness [Title/Abstract] OR asthenia [Title/Abstract] OR weakness [Title/Abstract] OR lethargy [Title/Abstract] (570,843)

Young [Title/Abstract] OR young adult* [Title/Abstract] OR adult* [Title/Abstract] OR middle age* [Title/Abstract] OR middle-age* [Title/Abstract] OR working age [Title/Abstract] OR post stroke [Title/Abstract] OR post-stroke [Title/Abstract] OR stroke survivor* [Title/Abstract] OR stroke patient* [Title/Abstract] (3,966,555)

#1 AND #2 AND #3 **(545)**

APA PsycINFO

„Cerebrovascular Accidents“ DE OR ischemic stroke*[Title/Abstract] OR ischaemic stroke* [Title/Abstract] OR cerebrovascular accident* [Title/Abstract] OR cerebrovascular stroke* [Title/Abstract] (26,660)

„Fatigue“ DE OR Chronic fatigue syndrome* [Title/Abstract] OR mental fatigue [Title/Abstract] OR muscle fatigue [Title/Abstract] OR fatigue [Title/Abstract] OR tired [Title/Abstract] OR tiredness [Title/Abstract] OR weary [Title/Abstract] OR weariness [Title/Abstract] OR exhausted [Title/Abstract] OR exhaustion [Title/Abstract] OR lassitude [Title/Abstract] OR listlessness [Title/Abstract] OR asthenia [Title/Abstract] OR weakness [Title/Abstract] OR lethargy [Title/Abstract] (68,380)

Young [Title/Abstract] OR young adult* [Title/Abstract] OR adult* [Title/Abstract] OR middle age* [Title/Abstract] OR middle-age* [Title/Abstract] OR working age [Title/Abstract] OR post stroke [Title/Abstract] OR post-stroke [Title/Abstract] OR stroke survivor* [Title/Abstract] OR stroke patient* [Title/Abstract] (665,422)

#1 AND #2 AND #3 **(478)**

SocINDEX with Full Text

Ischemic stroke*[Title/Abstract] OR ischaemic stroke* [Title/Abstract] OR cerebrovascular accident* [Title/Abstract] OR cerebrovascular stroke* [Title/Abstract] (302)

„Chronic Fatigue Syndrome“ DE OR Chronic fatigue syndrome* [Title/Abstract] OR mental fatigue [Title/Abstract] OR muscle fatigue [Title/Abstract] OR fatigue [Title/Abstract] OR tired [Title/Abstract] OR tiredness [Title/Abstract] OR weary [Title/Abstract] OR weariness [Title/Abstract] OR exhausted [Title/Abstract] OR exhaustion [Title/Abstract] OR lassitude [Title/Abstract] OR listlessness [Title/Abstract] OR asthenia [Title/Abstract] OR weakness [Title/Abstract] OR lethargy [Title/Abstract] (14,896)

Young [Title/Abstract] OR young adult* [Title/Abstract] OR adult* [Title/Abstract] OR middle age* [Title/Abstract] OR middle-age* [Title/Abstract] OR working age [Title/Abstract] OR post stroke [Title/Abstract] OR post-stroke [Title/Abstract] OR stroke survivor* [Title/Abstract] OR stroke patient* [Title/Abstract] (172,116)

#1 AND #2 AND #3 **(1)**

CINAHL Plus with Full Text

MH „Ischemic stroke“ OR ischemic stroke*[Title/Abstract] OR ischaemic stroke* [Title/Abstract] OR cerebrovascular accident* [Title/Abstract] OR cerebrovascular stroke* [Title/Abstract] (25,473)

MH „Fatigue“ OR MH „Asthenia“ OR MH „Fatigue, Syndrome Chronic“ OR MH „Mental Fatigue“ OR MH „Muscle Fatigue“ OR fatigue [Title/Abstract] OR tired [Title/Abstract] OR tiredness [Title/Abstract] OR weary [Title/Abstract] OR weariness [Title/Abstract] OR exhausted [Title/Abstract] OR exhaustion [Title/Abstract] OR lassitude [Title/Abstract] OR listlessness [Title/Abstract] OR asthenia [Title/Abstract] OR weakness [Title/Abstract] OR lethargy [Title/Abstract] (90,224)

MH „Young Adult“ OR MH „Middle Aged“ OR young [Title/Abstract] OR young adult* [Title/Abstract] OR adult* [Title/Abstract] OR middle age* [Title/Abstract] OR middle-age* [Title/Abstract] OR working age [Title/Abstract] OR post stroke [Title/Abstract] OR post-stroke [Title/Abstract] OR stroke survivor* [Title/Abstract] OR stroke patient* [Title/Abstract] (1,666,081)

#1 AND #2 AND #3 **(211)**

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