Kachhadiya *et al.*
Bulletin of Faculty of Physical Therapy (2024) 29:73
https://doi.org/10.1186/s43161-024-00240-4

Bulletin of Faculty of Physical Therapy

ORIGINAL RESEARCH ARTICLE Open Access

Effectiveness of website-based education program on activities of daily living and fear of falls among sub-acute stroke survivors: a pilot study in South Gujarat Region of India

Roshni G. Kachhadiya[1], Vivek H. Ramanandi[1*], Rumana Khatun A. Pathan[1] and Hemanshi N. Vekariya[1]

Abstract

Background Stroke survivors and their caregivers have numerous and diverse educational needs, many of which are unmet because of inadequate training from healthcare professionals. As stroke recovery and rehabilitation can continue for years post-stroke, it is critical that stroke survivors are provided with and have access to a range of support options and evidence-based information. Website-based education programs (WEP) have been adopted in recent years to manage health problems. The present pilot study aims to evaluate the effect of WEP on activities of daily living (ADLs) and the fear of falls among sub-acute stroke survivors.

Methods A total of 16 eligible post-stroke survivors were recruited from multiple study settings across Surat City of Gujarat state in western India and were randomly assigned using a lottery method to either the experimental group ($n=8$) receiving WEP or the control group ($n=8$) receiving conventional physiotherapy for 4 weeks. Outcome measures were the Indian Stroke Scale (ISS), Modified Barthel Index (MBI), and Falls Efficacy Scale-International (FES-I).

Results Both groups showed statistically significant improvements in all outcomes but the experimental group showed more significant improvements in ADLs and fear of falls among sub-acute stroke survivors ($p<0.05$).

Conclusion WEP for sub-acute stroke survivors is an effective intervention. It improves the performance of ADLs for stroke survivors and helps in better fall management indicating that web-based education programs shall be implemented on a regular basis to improve patient care.

Keywords Caregiver, Education, Rehabilitation, Stroke, Website, Falls, Activity of daily living

Background

Stroke is a major neurological disorder having an annual global incidence of 12.2 million and such higher prevalence leading to the current existence of nearly more than 101 million stroke survivors [1]. Stroke not only is the second-leading cause of death and the third-leading cause of disability, but also stands as a significant contributor affecting the physical, intellectual, and psychosocial dimensions of living among sub-acute stroke survivors [2]. Approximately 60% of stroke survivors face dependency in their activities of daily living (ADLs) due to a greater proportion of mobility deficits (i.e., nearly 75%) in the acute stage, and approximately 30% of survivors are significantly inactive during sub-acute and chronic stages after the stroke [3]. Mobility deficits also increase the risk of falls among stroke survivors, especially while walking (i.e., as high as 73%) after returning home from rehabilitation during sub-acute stroke [4]. Approximately one in

*Correspondence:
Vivek H. Ramanandi
vivekramanandi@gmail.com
[1] Department of Neurological Physiotherapy, SPB Physiotherapy College, Surat, Gujarat, India

four stroke cases is a recurrent case that poses a higher risk of death, prevention strategies such as the acquisition of knowledge of risk factors and lifestyle modification are crucial to avoid such risk [5].

Uncertainty and confusion while adjusting to the altered daily living skills after a stroke may lead to difficulties for both the stroke survivors and their caregivers. It is reported that, during such a crucial phase of transition to a new lifestyle, a large group of stroke survivors required help with learning of skills required for mobility and ADLs [6]. Simultaneously, caregivers must quickly learn how they can assist stroke survivors with a variety of impairments and concurrently adapt to changes in their own lives because of providing care to them. For these reasons, both stroke survivors and caregivers must be provided with information regarding the stroke (such as causes, signs and symptoms, management of stroke, and recovery from stroke). In one of the previous studies, caregivers identified their primary educational needs about handling and caring techniques, physical care, and exercises to be performed by patients [7]. It can be said that there are numerous and diverse educational needs of stroke survivors and their caregivers, many of which are unmet [8]. Participants from Western countries have been largely studied but no study has studied the participants of India.

As per Lo SH et al. (2023), self-management refers to a person's active participation in managing the symptoms, medical regimens, and psychosocial sequelae associated with an individual's condition [9]. A previous study by Denham AM et al. (2018) reported the preference of stroke survivors and their caregivers to take help from various online resources and social media for self-care-related queries [10]. Because of the evolution of technology, there has been the emergence of various digital intervention tools, such as apps, games, modules, and videos; that use technology to improve stroke survivors' health and quality of life (QOL) [7, 9]. The adoption of website-based education programs (WEP) including written, animated, graphic, and video content for explanation, education, and training has improved the management of health problems [5, 11]. Educational videos have been shown to provide benefits of visual and auditory information, and have the potential to reach many people while providing consistent messages in a cost-effective manner [12]. The objective of the present study was to evaluate the effect of WEP on activities of daily living (ADLs) and the fear of falls among sub-acute stroke survivors.

Methods

Study design

Pre–post-intervention experimental study design.

Population

Stroke survivors attending various physiotherapy and rehabilitation clinics, and hospitals in Surat, Gujarat (India).

Sampling technique

Sample of convenience.

Selection criteria

The inclusion criteria for participants of this study were:

i. Sub-acute stroke survivors (more than 6 months after stroke)
ii. Age: > 18 years
iii. First occurrence of stroke diagnosed by CT or MRI or diagnostic medical reports by a neurophysician
iv. Mini-mental scale score of > 24 (to ensure cognitive levels appropriately suitable for using mobile or computer devices)
v. Able to use and have own smartphone or computer (patient or caregiver)
vi. Have an access to the internet
vii. Able to read and understand Gujarati or English language
viii. If the patient is unable to use smart phone or internet, but there is a designated caregiver to help, then the patient will be included in the study.

The exclusion criteria were the following:

i. Visual problems such as severe visual field defect and visuo-spatial neglect
ii. Motor planning deficits (e.g., dyspraxia)
iii. Any neurological condition other than stroke, e.g., Parkinson's disease, multiple sclerosis, traumatic brain injury, Alzheimer's disease, etc.

The participants were screened based on inclusion and exclusion criteria and their demographic data were taken by an assessment proforma.

Intervention

Participants in the experimental group received WEP through a website specially designed for the study purpose. WEP included educational videos and relevant information regarding topics on (i). information on stroke, (ii). self-care and activities of daily living, (iii). physical and mental health, (iv). precaution and prevention for stroke survivors in addition to conventional physiotherapy. Participants in the experimental

as well as control group received conventional physiotherapy intervention.

Website description

- Prior to launch, the website was tested for usability by inviting opinions from a panel of experts [i.e., 2 physiotherapists, 1 occupational therapist, 2 neurophysicians, and 1 neurosurgeon], as well as from users [5 survivors with stroke and their caregivers].
- The content and interface of the website were revised or improved according to experts' and users' reviews and suggestions.
- The videos were developed from established literature and content available from (i). home-based exercise training for stroke survivors [13, 14]; (ii). Websites of American Stroke Association [15]; (iii). Website of World Health Organization [16]; (iv). HOPE: a stroke recovery guide [17]; and (v). other educational resources [18, 19].
- Each video (self-care, activities of daily living, physical and mental health, precautions, and prevention) was around 3 to 5 min duration. Other information was provided in graphic or written form (Fig. 1).

Outcome measures

For evaluating functional status, capabilities, and participation in ADLs, the Indian Stroke Scale (ISS) and Modified Barthel Index (MBI) were used. ISS is an outcome measure developed and validated for stroke patients in India, and consists of several outcome domains including mobility, self-care, domestic life, and social participation in daily life functioning. The scale items demonstrated good internal consistency, construct validity, and test–retest reliability [20, 21]. MBI is a universal gold standard measure consisting of 10 questions relating to activities of daily living (feeding, transferring from chair to bed, grooming, toilet use, bathing, mobility, using stairs, dressing, bowel, and bladder control). Each domain was scored separately and the total points range from 0 to 100. The higher the score, the greater the degree of functional independence of the patient. It has shown good reliability and sensitivity to changes in ADL ability [22, 23]. Falls Efficacy Scale-International (FES-I) to measure an individual's concern of falling. It is a 16-item questionnaire, with a score ranging from a minimum of 16 (no concern about falling) to a maximum of 64 (severe concern about falling). It has shown satisfactory internal consistency and test reliability, as well as a moderate/high correlation with the Visual Analog Scale-Fear of Falling, Berg Balance Scale, and Functional Reach Test [24–26] (Fig. 2).

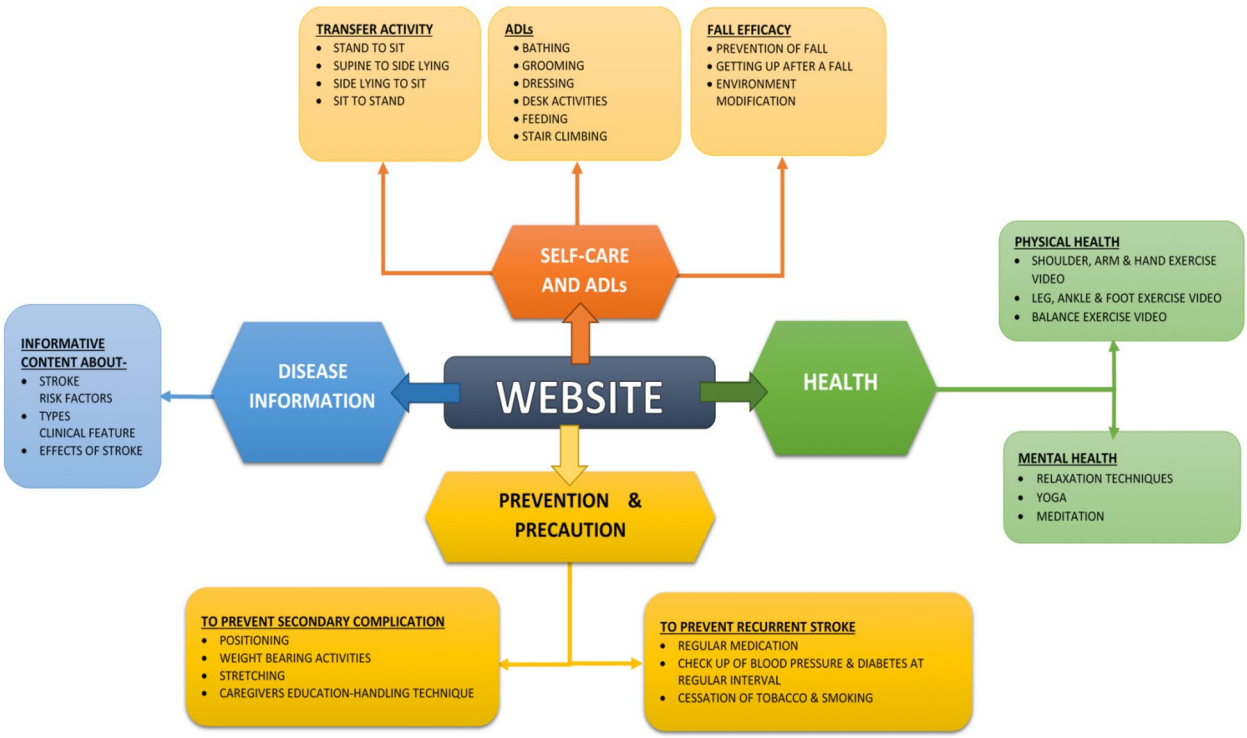

Fig. 1 Domain layout for website design content

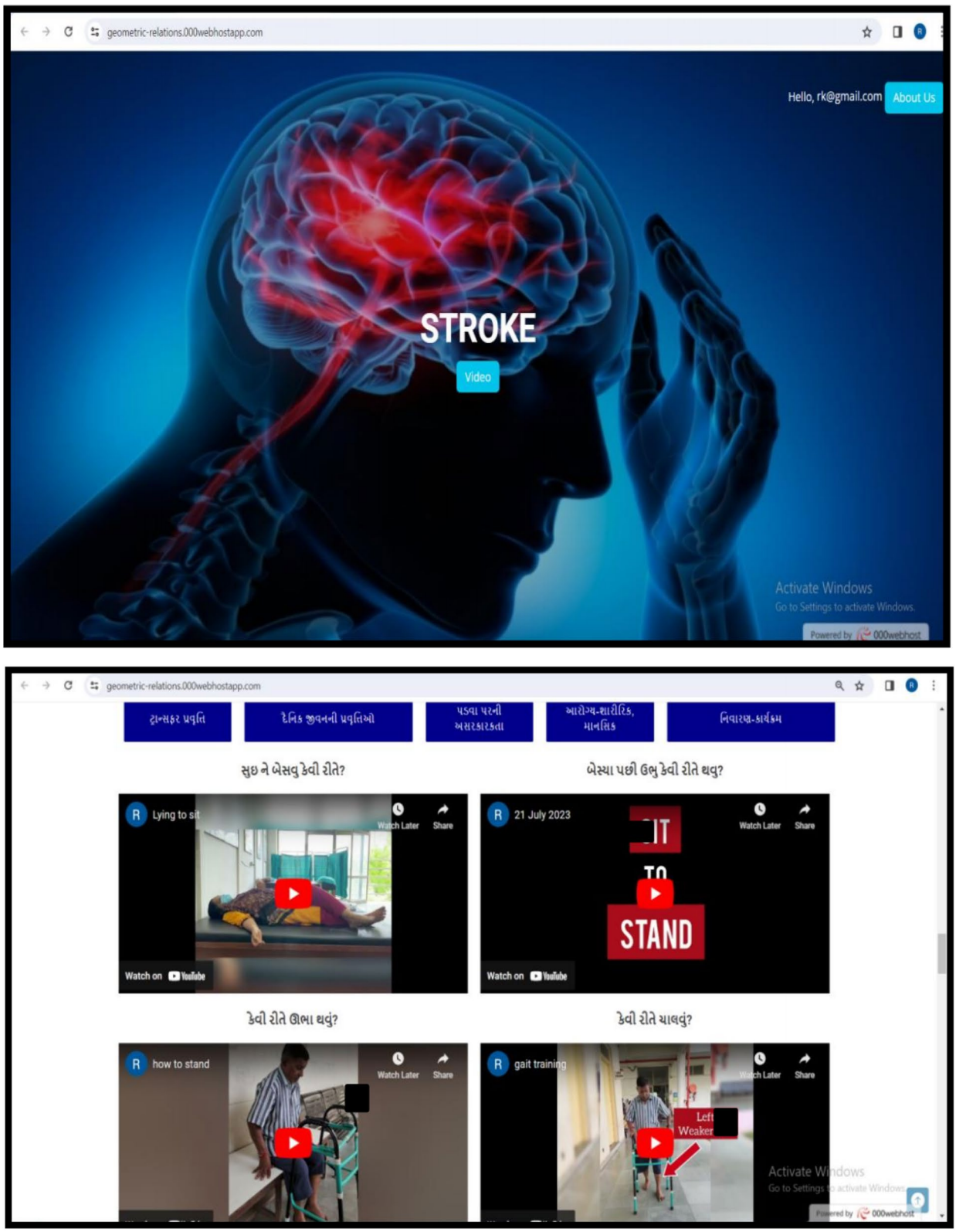

Fig. 2 Website for stroke education program

Study procedure

- Ethical approval for the study was received from the institutional ethics committee.
- Prior to the commencement of the study, the detailed procedure of the study was explained to the participants and a signed informed consent form was taken from them.
- A total of 16 eligible participants were randomly assigned using the lottery method to either the control group ($n=8$) or the experimental group ($n=8$).
- The survivors and caregivers were requested to watch the videos frequently at their convenience during the period of 4 weeks.
- They were provided with a daily record diary to maintain a record of when, for what purpose, and for how long they used the website in their daily record diary.
- A reminder-cum-follow up call was made at every 3-day interval.
- Assessment of outcome measures was done at the initiation and after a 4-week duration.

Monitoring tool

Google Analytics (Fig. 3) was used to monitor access to the website and usage by the participants. It gave us rich insights into the website traffic, we could access a graph showing the number of users who visited the website, the event count per user, and their average engagement time on the website [27]. This was used to make sure that participants were regularly visiting and utilizing the educational content through the website. Additional reminder calls were made to facilitate the usage of the WEP for such participants.

Statistical analysis

Statistical analysis was carried out using JAMOVI version 2.4.11 [28]. Normality was assessed by the Shapiro–Wilk test. As data was not distributed normally, the Wilcoxon signed rank test and Mann–Whitney *U* test was used for within-group and between-group comparisons of outcome values respectively.

Results

Baseline characteristics

The mean age of participants in the control and experimental group were 59.1 ± 9.11 years and 52.9 ± 10.8 years respectively. Most of the participants were male in both groups. Detailed characteristics of participants are shown in Table 1.

As shown in Table 2, both the groups showed statistically significant improvements in scores of all the outcome measures when a within-group comparison of means was done using a paired *t*-test ($p \leq 0.05$). When a between-group comparison of differences in means was done using an independent *t*-test, the experimental group showed statistically significant differences in ISS ($p \leq 0.001$), MBI ($p \leq 0.001$), and FES-I ($p=0.003$). It indicates there is a significant effect of WEP on ADLs and fear of falls among sub-acute stroke survivors.

Discussion

The purpose of this pilot study was to compare the effects of WEP given along with conventional physiotherapy and conventional physiotherapy alone on ADLs and concerns regarding falls among sub-acute stroke survivors.

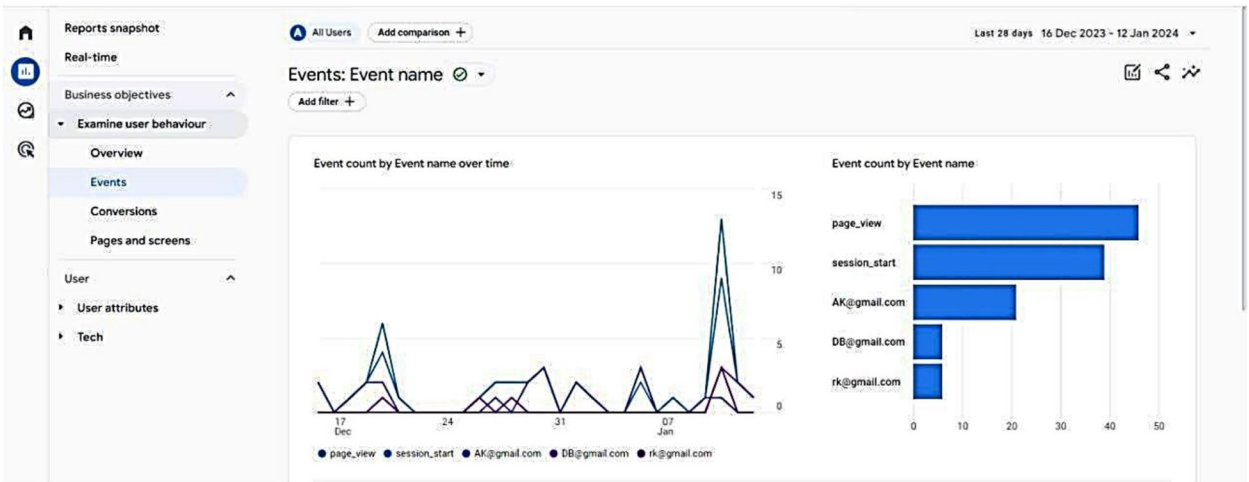

Fig. 3 Google Analytics tool for monitoring access and utilization by participants

Table 1 Demographic characteristics of participants ($n=16$)

Characteristic		Experimental group ($n=8$)		Control group ($n=8$)	
Frequency (n)	Frequency (%)	Frequency (n)	Frequency (%)		
Gender	Male	7	87.5	6	75
	Female	1	12.5	2	25
Hemiparetic side	Right	3	37.5	5	62.5
	Left	5	62.5	3	37.5
Type of stroke	Ischemic	5	62.5	4	50.0
	Hemorrhagic	3	37.5	4	50.0

Table 2 Pre- and post-intervention comparison of means for outcomes ($n=16$)

Outcome measures	Group	Within-group comparison of means			Between-group comparison of differences of means	
Mean ± SD		p-value	Mean ± SD	p-value		
Pre-intervention	Post-intervention					
ISS	Control	53 ± 26.9	58.4 ± 28.0	≥ 0.05	5.4 ± 7.5	< 0.001*
	Experimental	26.6 ± 18.8	53.8 ± 17.9	< 0.001*	27.2 ± 14.1	
MBI	Control	81.8 ± 20.2	85.9 ± 17.4	0.011*	4.1 ± 6.3	< 0.001*
	Experimental	59.8 ± 22.1	75.8 ± 21.7	< 0.001*	16 ± 10.4	
FES-I	Control	42.9 ± 7.81	41.1 ± 9.23	0.036*	1.8 ± 4.5	< 0.001*
	Experimental	55.4 ± 5.40	45.5 ± 5.71	0.002*	9.9 ± 4.3	

ISS Indian Stroke Scale, *MBI* Modified Barthel Index, *FES-I* Fall Efficacy Scale-International, *CI* confidence interval

*Statistically significant difference at $p < 0.05$

Findings are suggestive that both control and experimental groups show statistically significant within-group improvement in MBI and FES-I but the control group did not show significant within-group improvement in ISS ($p < 0.05$). Statistically significant differences between control and experimental groups in changes in ISS, MBI, and FES-I were reported ($p < 0.05$).

An educative website was specially developed to promote repetitive learning about self-management skills at any place and time convenient for the participants; it was designed especially to impart knowledge about stroke, concerns regarding falls, and to improve quality of life. Development of the website was done in Gujarati using literature support, expert opinions, and patients' responses regarding the utility and comprehensibility of the content. It included text content, pictorial presentations, and videos for the education of stroke survivors as well as their caregivers.

As there is no study available concentrating on education for stroke survivors and their caregivers using the website-based program in India, the findings of this pilot study can pave the way for a wider study. Particularly, this study included participants from Gujarat, therefore the website was developed in Gujarati language.

The findings of the study support the use of WEP in stroke survivors by statistically significant improvements in all outcomes. The findings may be attributed to the fact that graphic/video education is more interactive, interesting, and hence able to re-enforce what has been learned or taught during clinic consultation thereby increasing the use of multi-media medium rather than the traditional paper, pamphlets, or writing medium. Further, the videos can be paused, stopped, and rewound as and when needed. As reported by Maisarah Z et al. (2019), the visual demonstration using the video presentation could be understood more easily rather than the reading material [13]. A systematic review by Fredericks S, Martorella G, and Catallo C (2015) showed strong evidence of web-based educational and self-management interventions, significantly improving health outcomes of patients with chronic illnesses, including their self-efficacy, self-management, health-related quality of life, social participation, and depression [11]. Kim JI, Lee S, and Kim J (2013) and Lo SH et al. (2023) concluded that web-based interventions can potentially reach more varied and broad populations than face-to-face interventions can, as the former is available anytime to those with internet access [5, 9].

The favorable outcomes in ability to function independently as suggested by ISS and MBI scores were noted in the experimental group who received WEP. These can be attributed to factors such as increased family support, early initiation of rehabilitation, the ability to self-manage in their home environment, providing flexibility of location and time [13, 14].

Reduction in the fear of falls suggested by FES-I scores indicates that the adapting strategies to safely self-manage tasks of ADL and performance of balance activities using website-based video training were important adjuncts to the conventional physiotherapy interventions aimed at the same. Denny MC et al. (2017) suggested that video-based educational intervention can improve stroke literacy and self-efficacy in managing daily life activities thereby increasing self-confidence and life satisfaction [8]. Taylor DM et al. (2009) concluded that video-based telerehabilitation intervention significantly improves balance, balance confidence, and walking ability in stroke survivors [29].

The strength of this study is this is the first local study that introduced WEP including videos as a form of educational material for stroke survivors and their caregivers. The main advantages of the WEP are they are practical, relatively inexpensive, and after once being produced multiple people can access such content at the same time without a need for healthcare professionals to be present. This increases the cost-effectiveness of the WEP and increases applicability across a wider geographical spectrum.

Initially, the major obstacle related to participants' low adherence, as noticed on telephonic follow-up calls, was faced and reasons were requested from participants or their caregivers through telephonic communication. They responded that participants did not access the website continuously due to casual forgetfulness and the inability of family members or caregivers to provide sufficient time for participants to help or log in. This was then overcome by utilizing the Google Analytics tool to monitor participant access and provide timely reminders.

Certain limitations of this pilot study can be listed as, a limited number of participants in both groups; stroke survivors' or their caregivers' inability to fully understand the content in website/videos properly on their own; and inability to spare time in the daily routine because of restriction of time on patient behalf; the inability of caregiver to show and practice with the patient in cases where the patient is largely dependent on the caregiver.

Conclusions

Website-based education program for sub-acute stroke survivors is an effective intervention when provided along with conventional physiotherapy intervention. It improves the performance of ADLs including self-care, functional activities, and participation for stroke survivors. It reduces fear of falls and helps in better fall management indicating its usefulness as a regular adjunct to improve patient care.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s43161-024-00240-4.

Supplementary Material 1.

Supplementary Material 2.

Acknowledgements
None.

Authors' contributions
Roshni G. Kachhadiya: conceptualization, data curation, investigation, analysis, methodology, administration, writing—original draft and editing. Vivek H. Ramanandi: visualization, conceptualization, methodology, administration, supervision, validation, writing—review and editing. Rumana Khatun A. Pathan: data curation, investigation, methodology, writing—review. Hemanshi N. Vekariya: data curation, investigation, methodology, writing—review.

Funding
None.

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

Declarations

Ethics approval and consent to participate
The study was approved by the Institutional Ethics Committee.

Competing interests
The authors declare that they have no conflicts of interest.

Received: 18 July 2024 Accepted: 8 October 2024
Published online: 15 October 2024

References

1. Feigin VL, Brainin M, Norrving B, Martins S, Sacco RL, Hacke W, Fisher M, Pandian J, Lindsay P. World Stroke Organization (WSO): global stroke fact sheet 2022. Int J Stroke. 2022;17(1):18–29.
2. Kumar A, Khurana D, Pattanaik S, Kumar M, Kaur S, Krishnan NC, Ghai S, Modi M, Nagi M, Chellappa R, Gairolla J, Munjal DK, Kumar P. A mobile application-based post-stroke care strategy for survivors and their caregivers for prevention and management of post-stroke complications - "Stroke Home Care:" Development and feasibility. J Neurosci Rural Pract. 2024;15(2):217–26.
3. E. Wurzinger H, Abzhandadze T, Rafsten L, Sunnerhagen KS. Dependency in activities of daily living during the first year after stroke. Front Neurol. 2021;12:736684.
4. Park S, Tang A, Pollock C, Sakakibara BM. Telerehabilitation for lower extremity recovery poststroke: a systematic review and meta-analysis protocol. BMJ Open. 2022;12(3):e055527.
5. Kim JI, Lee S, Kim JH. Effects of a web-based stroke education program on recurrence prevention behaviors among stroke patients: a pilot study. Health Educ Res. 2013;28(3):488–501.

6. Lutz BJ, Young ME, Creasy KR, Martz C, Eisenbrandt L, Brunny JN, Cook C. Improving stroke caregiver readiness for transition from inpatient rehabilitation to home. Gerontologist. 2017;57(5):880–9.
7. Sánchez-Huamash CM, Cárcamo-Cavagnaro C. Videos to improve the skills and knowledge of stroke patients' caregivers. Rev Peru Med Exp Salud Publica. 2021;25(38):41–8.
8. Denny MC, Vahidy F, Vu KY, Sharrief AZ, Savitz SI. Video-based educational intervention associated with improved stroke literacy, self-efficacy, and patient satisfaction. PLoS ONE. 2017;12(3):e0171952.
9. Lo SH, Chau JP, Lau AY, Choi KC, Shum EW, Lee VW, Hung SS, Mok VC, Siow EK, Ching JY, Mirchandani K. Virtual multidisciplinary stroke care clinic for community-dwelling stroke survivors: a randomized controlled trial. Stroke. 2023;54(10):2482–90.
10. Denham AM, Halpin S, Twyman L, Guillaumier A, Bonevski B. Prevent 2nd Stroke: a pilot study of an online secondary prevention program for stroke survivors. Aust N Z J Public Health. 2018;42(5):484–90.
11. Fredericks S, Martorella G, Catallo C. A systematic review of web-based educational interventions. Clin Nurs Res. 2015;24(1):91–113.
12. Dahodwala M, Geransar R, Babion J, de Grood J, Sargious P. The impact of the use of video- based educational interventions on patient outcomes in hospital settings: a scoping review. Patient Educ Couns. 2018;101(12):2116–24.
13. Maisarah Z, Nik Nur AMR, Chan ZN, Ahmad TMJ, Reenjaniswari M, saharuddin A, Aziz NA. UKMStrokIT: a web-based educational package tool for longer-term care of stroke patients: a pilot randomized controlled trial. Health and Primary Care, 2019; 3:1–6.
14. Jung SH, Park E, Kim JH, Park BA, Yu JW, Kim AR, Jung TD. Effects of self -rehabilitation video exercises (Save) on functional restorations in patients with subacute stroke. Healthcare. 2021;9(5):565.
15. American stroke association. American stroke association https://www.stroke.org/en. Accessed January 5, 2024
16. Guide for stroke recovery. Guide for stroke recovery – a simple guide to daily living after stroke https://www.strokerecovery.guide. Accessed December 28, 2023
17. American stroke association. HOPE: a stroke recovery guide https://www.stroke.org/-/media/Stroke-Files/life-after-stroke/ASA_HOPE_Stroke_Recovery_Guide_122020.pdf. Accessed 5 Jan 2024
18. Stroke association. Stroke association: home page https://www.stroke.org.uk. Accessed January 5, 2024
19. Brahmachari I. A Practical Guide to Hemiplegia Treatment: Jaypee Brothers Medical Publishers Pvt. Limited; 2015. pp. 139–403.
20. Prakash V, Ganesan M. The Indian Stroke Scale: Development and validation of a scale to measure participation in daily activities among patients with stroke in India. Int J Stroke. 2021;16(7):840–8.
21. Prakash V, Ganesan M. What matters to patients with stroke in India and why: a qualitative study. Disabil Rehabil. 2021;43(18):2585–92.
22. Shah S, Vanclay F, Cooper B. Improving the sensitivity of the Barthel Index for stroke rehabilitation. J Clin Epidemiol. 1989;42(8):703–9.
23. Ohura T, Hase K, Nakajima Y, Nakayama T. Validity and reliability of a performance evaluation tool based on the modified Barthel Index for stroke patients. BMC Med Res Methodol. 2017;17(1):1–8.
24. Yardley L, Beyer N, Hauer K, Kempen G, Piot-Ziegler C, Todd C. Development and initial validation of the Falls Efficacy Scale-International (FES-I). Age Ageing. 2005;34(6):614–9.
25. Morgan MT, Friscia LA, Whitney SL, Furman JM, Sparto PJ. Reliability and validity of the Falls Efficacy Scale-International (FES-I) in individuals with dizziness and imbalance. Otology & neurotology: official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology. 2013;34(6):1104.
26. Abhijeet A, Deshmukh, Nikita Kanoje, Maneesha S, Deshpande, Pushpa Dhote. Validation of Hindi Version of Falls Efficacy Scale-International (FES-I) in Indian elderly of age 60–79 years: a cross-sectional study. 2022;8(8):26–31.
27. Google. Google analytics academy https://analytics.google.com/analytics/academy/course/6. Accessed 13 Jan 2024.
28. Jamovi. Jamovi desktop. 2.4.11 https://www.jamovi.org. Accessed February 1, 2024.
29. Taylor DM, Cameron JI, Walsh L, McEwen S, Kagan A, Streiner DL, Huijbregts MP. Exploring the feasibility of videoconference delivery of a self-management program to rural participants with stroke. Telemed J E Health. 2009;15:646–54.

Publisher's Note