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Depression and Anxiety in Patients with Stroke and their Caregivers: A Literature Review

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Abstract
Stroke poses various forms of burden on those who suffer from it. It can lead to not only physical and cognitive disabilities but also psychological conditions, including stress, depression, and anxiety. These psychological and physical burdens resulting from stroke may also predict its recurrence, therefore, caregivers play an important role in taking care of patients and preventing exposure to risk factors. Literature has focused on the effects of stroke on patients, and there has been limited research on its effects on caregivers. Thus, this literature review aims to explore the link between patients' physical and psychological health post-stroke and its influence on caregivers' psychological health. It also outlines the effects of caregivers' psychological health on patients' health outcomes and recovery. Research shows the interdependent link between these factors, such that caregivers with poor psychological health may pose psychological stress on their patients and vice versa. Current intervention methods to improve patient-caregiver psychological health were discussed, and findings on their treatment outcomes were mixed.

Keywords: Depression, Anxiety, Stroke, Stroke Patients, Caregivers, Well-Being, Prevalence, Cognitive Behavioral Therapy, Mindfulness-Based Stress Reduction, Mindfulness-Based Cognitive Therapy

1. Introduction

Neurological diseases, including dementia, Alzheimer's, and strokes, are prevalent in a large portion of the world's population. The growth and aging of our population contribute to the increasing cases of stroke, and of the 15 million annual cases of stroke, 5 million are faced with permanent disability (World Health Organization, n.d.). Stroke risk is associated with various preventable behavioral and environmental factors (Feigin et al., 2024). For instance, high BMI, diets with high-sugar beverages and red meat, and low physical activity were factors associated with a global increase in the rate of life-year loss due to stroke-related disability from 1990 to 2021 (Feigin et al., 2024).

Family caregivers play an important role in their patients' recovery. Patients' psychological health poses implications on the risk of stroke recurrence, thus, caregivers' supervision plays a crucial role in maintaining patients' physical health and well-being after discharge, which could reduce rates of recurrence. However, caregivers may suffer from sudden life changes as a result of the stroke incident, such as adjusting to new responsibilities and having their routine and social life interrupted. This disruption, ranging from sleep disturbances to reduced social life, may lead to worsened quality of life and mental health conditions such as anxiety and depression. Therefore, caregivers' mental and physical health needs should be looked after to mitigate their and their loved ones' health outcomes. This literature review aims to outline the implications between caregivers' psychological well-being and stroke patients' physical and mental health and current interventions.

2. Prevalence and Onset of Post-Stroke Depression and Anxiety

2.1. In Patients

There is a difference between the geographical distribution of stroke burdens worldwide (Feigin et al., 2024). In this analysis, stroke burden refers to the prevalence, deaths, age-standardized incidence, and DALY rates, which indicates the total life-year loss due to premature death and disability (World Health Organization, n.d.). Countries in the middle, high-middle, and low-middle SDI regions were observed to have the most stroke burden, including East and Central Asia and Sub-Saharan (Feigin et al., 2024). High-income countries such as North America, Australasia, and Latin America reported a lower stroke burden. There was a decrease in PAF-population attributable fraction, which refers to the proportion of stroke-related life-year loss as a result of exposure to risk factors (World Health Organization, n.d.), such as diets low in vegetables/fiber, environmental pollution, and smoking overall. Despite this, observed increases in stroke-DALY rates of LICs reflect their ineffective prevention strategies, whereas decreases in DALY rates of HICs reflect their successful prevention strategies (Feigin et al., 2024).

Among around 5 million acute ischemic stroke patients in the U.S. from 2003 to 2017, around 163,226 experienced depression, and 258,782 experienced generalized anxiety disorder (Patel et al., 2023). Compared to anxiety, depression was more prevalent among these patients. An analysis of data of 4,079 stroke patients in Glasgow, United Kingdom, found 24% of patients with possible to definite abnormal depression and 29% with possible to definite abnormal anxiety, and these proportions are similar for the 1,247 patients with transient ischemic attack or minor stroke (Broomfield et al., 2014). Within 36 countries in West/South Asia and Africa, the prevalence ranges from 30.43% to 50.24% for post-stroke depression and around 10% and 44.19% for post-stroke anxiety as measured by semi-structured interviews and questionnaires, respectively (Mahadevan et al., 2021).

The presence of depression and anxiety in stroke patients might pose worsened health outcomes for them. Compared to those with anxiety and with either symptom, depressed patients were 40% more likely to have functional loss, to go to a care facility post-discharge, and 36% more likely to stay in the hospital for longer than 10 days (Patel et al., 2023). While anxiety did not have a higher prevalence or predict disability or length of hospital stay in these patients, it increased the likelihood of them going to a care facility post-discharge. Patients with comorbidities such as hyperlipidemia and alcohol and drug abuse had a higher prevalence of depression, and those who smoke showed a higher prevalence of anxiety (Patel et al., 2023).

Unlike other medical comorbidities, such as diabetes and a history of stroke, depression and anxiety at 1 month post-stroke did not predict patients' functional outcomes and quality of life after 1 year, regardless of stroke severity and pre-morbid conditions (Donnellan et al., 2010). Regardless, depression was associated with poorer outcomes at both 1-month and 1-year individually (Donnellan et al., 2010). In contrast, Lee et al. (2019) found that anxiety at the acute phase of stroke, despite not being associated with patients' neurological severity or physical disability, was predictive of these outcomes a year after stroke. For instance, those who had anxiety 2 weeks post-stroke, compared to those without it, showed worsened functional outcomes 1 year later. As such, it is suggested that anxiety's presence at the acute phase of a stroke may reflect the initial shock of the event rather than the patient's mental health status as a result of their functional loss, but in the long run, it may develop as the loss becomes more apparent to patients and interfere with their recovery (Lee et al., 2019). Therefore, to reduce the effects of anxiety on patients' functional recovery, it is recommended that anxiety be screened early, as those with severe strokes who take longer to recover may be more prone to developing anxiety, which might slow down their recovery (Lee et al., 2019).

Results for the prevalence of depression and anxiety concerning time points after stroke are mixed. For instance, depression prevalence was found to be 35% at 1-month post-stroke (Donnellan et al., 2010) but 30% at four months and 24% at six months (De Wit et al., 2008). Notably, these studies included samples from hospitals and rehabilitation wards. Therefore, the decreasing rates of prevalence from 35-25% from 1-month to 6-months across studies may be due to patients' recovery from either rehabilitation or, as suggested earlier, from the initial shock of the stroke event. Anxiety prevalence ranges from 22 to 34% at 6 months and one year post-stroke, respectively (Donnellan et al., 2010; De Wit et al., 2008). Overall, both studies reported prevalence rates for depression ranging from 24-35% from 1-6 months, while anxiety ranges from 25-34% from 6-months to 1 year post-stroke. Regardless, the prevalence of both symptoms was comparable at 1-month and 1-year post-stroke (Donnellan et al., 2010) and was also found to be relatively similar across 2, 4, and 6-months post-stroke (De Wit et al., 2008). Patients who have not initially reported symptoms of depression and anxiety may experience symptoms later on. After 1 year, 22% remained depressed among the 35% who reported depression at 1 month, and depression and anxiety were reported in an additional 14% and 11% of those who did not initially report symptoms, respectively (Donnellan et al., 2010). Consistently, De Wit et al. (2008) found an increase in depressive and anxious symptoms after 4 and 6 months among patients who did not initially experience mood changes 2 months after a stroke. Unlike the observed decreases in anxiety severity over time, depression severity seemed to remain unchanged (De Wit et al., 2008). However, the severity of symptoms among patients who were constantly depressed or anxious during 2-6 months post-stroke was significantly worse than that of those who only became anxious or depressed at certain time points (De Wit et al., 2008). Since their sample consisted of patients in rehabilitation wards, the unchanging severity of symptoms and the additional number of patients experiencing these symptoms over time may reflect limitations in the current rehabilitation procedure in helping with recovery, suggesting the need for both early and long-term screening for the potential development of mood disorders (De Wit et al., 2008).

A meta-analysis of studies in 22 countries, comparing 3000 stroke patients and 3000 individuals without a history of stroke, showed that depression and home or workplace psychosocial stress were ones of the 10 most significant risk factors of stroke, besides other medical and behavioral risks such as a history of hypertension, smoking habits, diets low in fruits and fish and high in red meat or fried foods (O'Donnell et al., 2010). While a history of hypertension, smoking, and depression was associated more with one subtype of stroke than another, diet, psychological stress, and physical activity were associated with an increased risk in all types of stroke (ischaemic vs. intracerebral hemorrhagic).

2.2. In Caregivers

Factors associated with the first stroke event might also predict the recurrence of stroke. For instance, a study showed that 30.7% of 358 ischaemic stroke patients had one or more recurrent strokes over the 2-year post-stroke period (Zhuo et al., 2020). Compared to first stroke patients, those who experienced recurrence were older, smokers, diabetic, had moderate to severe depression, higher stroke severity, and certain medical conditions including hypertension. A meta-analysis of 4648 stroke patients reported 537 recurrences (Wu et al., 2019). They showed a prevalence rate of post-stroke depression (PSD) ranging between 15.9% and 40.5% and that those with PSD had a 48% higher risk of recurrence than those without PSD. The study also reported the association to be stronger within the 2-year follow-up period, which suggests that the risk of developing recurrence in depressed patients is higher after the acute phase of the initial stroke (Wu et al., 2019). Thus, caregivers play important roles in supporting patients with comorbidities, whether they appear before or after the stroke event, which may reduce recurrence rates.

However, patterns of results in cases of depression and anxiety among caregivers indicate a lack of attention to caregivers' mental health needs. A meta-analysis including 1756 caregivers of stroke patients reported a prevalence of 40.2% for depression, which is 2 times higher than the general population, and 21.4% for anxiety (Loh et al., 2017). Among a sample of 45 carers of stroke patients recently discharged from rehabilitation or hospital, 51% were anxious at 1-month post-discharge, and 78.3% of them remained anxious after 3 months (Greenwood & Mackenzie, 2010). Notably, they reported that while carer depression scores reduced significantly from one to three months, their anxiety scores did not show a significant difference, indicating its prevalence in the acute phase and endurance. This pattern differed from that reported in a previous study (De Wit et al., 2008), where anxiety decreased over time. Similarly, about 78% and 64% of caregivers who were initially anxious and depressed remained so after 3 months (De Wit et al., 2008); these symptoms may not reduce over time and remain high up to 6 months after the stroke event in caregivers of stroke patients (Chow et al., 2007).

3. Factors contributing to caregiver's well-being

3.1. Care-duration

Caregivers play an important role in supporting patients who have survived stroke, especially those who faced physical and cognitive impairments and hence have higher dependency on caregivers. Caregiving tasks may demand several hours of the caregiver's day, ranging anywhere from 5.87 hours (Grant et al., 2013) to >8 hours per day (Zhao et al., 2021). Most caregivers in the reviewed studies are female and spouses of the patients (Zhao et al., 2021; Yuliana et al., 2023; Greenwood & Mackenzie, 2010; Atteih et al., 2015). Along with other factors, the duration of care per day is a factor contributing to higher caregiver depression, anxiety, and burden (Zhao et al., 2021; He et al., 2023; Woodford et al., 2018; Villa-García et al., 2024; Hu et al., 2018). Caregiver burden is defined as the extent to which caregiving negatively impacts caregivers' physical and mental health, social life, and financial status (Zarit et al., 1986). Zarit et al. (1980) have developed a scale for measuring caregiver burden that is used in a variety of studies examining the level of discomfort caregivers experience while enduring the aforementioned impacts of caregiving (He et al., 2023; Hu et al., 2018). He et al. (2023) assessed aspects of patients' post-stroke health and its association with caregiver burden, using the Zarit Burden Interview (ZBI). Among the 966 ischemic stroke patient-caregiver dyads, longer hours of care, higher stroke severity, and depressive symptoms in patients are significantly associated with more caregiver burden. In line with He et al. (2023)'s findings, Hu et al. (2018) found that higher symptoms of depression and anxiety in caregivers were associated with higher caregiver burden. About 43.9% and 53.9% of their sample of 117 caregivers reported symptoms of anxiety and depression, respectively, and around 68.4% reported caregiver burden.

A qualitative study showed that for caregivers having mild symptoms of depression and anxiety, having less time to spare was reported as exhausting, causing unhappiness and a sense of confinement (Woodford et al., 2018), even among those having taken up the caregiving role for up to 22 years. Caregiving intensity correlates with higher levels of patients' dependency; for instance, Villa-García et al. (2024) showed that mild to moderate levels of dependency were linked to 21 to 40 hours of care/week, respectively. The dependent variables were 1) caregiver burden (assessed using the "Care-related Quality of Life" scale, measuring 7 dimensions of caregivers' mental, physical, financial, social, and life-activity outcomes, fulfillment, and social support) and 2) caregiver well-being (using the CarerQoL-VAS). The independent variables were caregivers' characteristics (e.g., age, gender, socioeconomic, employment status); care-receivers' characteristics (including dependency, severity of stroke, and quality of life); and aspects of caregiving intensity. Results suggest that while 75-80% of caregivers were fulfilled with caregiving tasks at 6 months after stroke regardless of levels of dependency, caregiving-related mental, physical, financial, daily-activities, and relational problems increased with a higher level of dependency. Additionally, being a female and having to provide constant supervision (their sample averaged 30.7 care hours/week) were also associated with higher caregiver burden, regardless of levels of dependency. Importantly, they found a correlation between patients' anxiety and depression (i.e: 1 of the 5 dimensions of patient's quality of life measured by the EuroQoL-5D-5L scale) and caregivers' low levels of happiness, and they suggested the need for interventions supporting women who spend more time caring for patients with poor mental health. Depression in caregivers was linked to caregiver burden. Higher caregiver burden and more depressive/anxious symptoms in patients were related to lower scores on caregiver happiness (Villa-García et al., 2024).

A 1-year longitudinal study suggests that the type of factors contributing to caregiver burden might change over time (Rigby et al., 2009). They have used two different scales to assess the caregiver burden (i.e, the Relatives Stress Scale (RSS) and the Bakas Caregiving Outcomes Scale (BCOS)). Results showed that during the acute period post-stroke (7 days), patient demographics such as older age and male gender might predict increased burden; however, over time, other factors regarding patients' functional disability and poor mental health may be more important in predicting increased burden. Notably, their results also showed that patients' cognitive function and dependency (measured with the Barthel Index) significantly improved over the 12-months period. While a higher burden on the RSS is associated with a patient's functional impairments, the higher burden on the BCOS is associated with older age and male gender. The difference between the correlations observed on the RSS and the BCOS reflects the differing contributing factors on caregiver burden when assessed on different scales.

3.2. Social support

The lack of certainty as a result of the deficiency in social and health support was also one of the main themes of difficulty that led to distress, anger, and sadness among caregivers of stroke patients (Woodford et al., 2018). In this qualitative study, two participants who received written informational leaflets reported the information provided to be often generalized, making it hard to identify which applies to them. Social support has been found to contribute to fewer symptoms of depression in stroke patients, which is associated with fewer mental and physical health deficits in their respective caregivers (He et al., 2023; Sit et al., 2004). Social support may come in various forms, including emotional, tangible, and informational support (Sit et al., 2004). 83% of their sample of 102 Cantonese/Mandarin-speaking caregivers of stroke patients have experienced deficits in physical health during the first three months after taking up the caregiving role. They found that those who received more tangible (e.g., help with chores and provision of necessary materials) and social companionship and perceived their patients as less dependent showed better psychological health. This finding, to an extent, corresponds to Wade et al. (1986)'s finding, suggesting that support with physical caregiving tasks alone may not be sufficient to reduce caregivers' psychological stress. Similarly, Villa-García et al. (2024) reported that most caregivers were fulfilled with the caregiving tasks regardless of the patient's dependency, but the problems with psychological stress increased with more dependency. Therefore, their results suggest the role of social companionship and support in mitigating caregivers' stress.

The types of support most lacking were tangible and informational support, despite them having attended educational workshops. They suggested that since information is often provided by health professionals, it is less suitable for the caregiving job, which occurs daily and may require more in-depth details of what to do in a specific situation, rather than general knowledge (Sit et al., 2004). They also found that lower education is linked to less informational support and attributed this to the potential miscomprehension of the information that is often provided in written form. This may further highlight the need for adequate availability of resources to support caregivers, particularly within home settings. Caregivers' perspective of their support sources is much higher than the actual sources available to them; and as for professional health-related service, this deficiency is reflected in their need for resources that would support caregiving at home, and if these are already available, they should be more personalized and intend to target both patients and caregivers (He et al., 2023; Woodford et al., 2018; Sit et al., 2004).

3.3. Demographics- gender, age, education, and financial status

Effects of demographic discrepancies on the extent of caregiver burden were also found. Female caregivers tend to experience more burden than male caregivers (Villa-García et al., 2024). Depression and anxiety were more likely found in females and Caucasians than in males and Asians (Patel et al., 2023). Consistently, there was an increased prevalence of depression in female and Caucasian caregivers who care for female stroke patients (Loh et al., 2017). Data for anxiety was not generated due to a lack of studies on these moderators, suggesting the need for research in this area. The heightened prevalence of anxiety in stroke patients has been linked to socioeconomic and demographic characteristics such as younger age, female gender, and living in less supported areas (Broomfield et al., 2015). On the other hand, although Hu et al. (2018) found significantly higher symptoms of depression and anxiety in female than male caregivers, this gender factor contributed to the variations in depression and anxiety to a lesser extent when considered with other factors such as care duration, educational level, and medical payment methods. Along with being caregivers of patients with stroke in comparison to patients with other neurological diseases, less education is also predictive of depression and anxiety at 6 months post-stroke (Chow et al., 2007)

4. Implications of caregivers' mental health on their patients' psychological health and recovery

Regarding the relationship between caregiver and patient health outcomes, a study reported that patients' and caregivers' depression and anxiety were interdependently predictive of aspects of both their own and their partner's quality of life (QoL) (Yuliana et al., 2023). Their study used the DASS-42 Questionnaire to measure depression, anxiety, and stress symptoms, and the "WHODAS 2.0 Indonesian Version" to measure patients' stroke-related disability. They hypothesized that these variables may pose direct and independent decreases in patients' and their caregivers' mental, physical, and overall QoL. Anxiety symptoms in caregivers and their patients are found to correlate with lower scores in all three aspects of their own and their partner's QoL. In other words, lower overall mental and physical QoL in caregivers may be linked to their own and their patients' high anxiety symptoms. Interestingly, depression symptoms in caregivers do not predict their own poor mental QoL, however, it predicts both their partner's poor physical and mental QoL. Similarly, Atteih et al.'s (2015)'s study has shown the interdependence relationship between caregiver and patient's depression and anxiety symptoms. This further emphasizes the influence of caregivers' well-being on their patients' physical and psychological health. The severity of the patient's disability was also negatively correlated with both the physical and mental aspects of their own QoL, but only negatively impacted the caregiver's mental QoL (Yuliana et al., 2023). Additionally, the stress levels of caregivers are only negatively associated with their patients' mental QoL and not with the patients' overall or physical QoL.

Similarly, a 2-year longitudinal study assessed how depressed moods (not clinical mood disorders) in caregivers were impacted by patient factors, including the patient's disability, level of social activities, and depression, and the caregivers' perception of recovery (Wade et al., 1986). They used the "Wakefield Self-assessment Depression Inventory" to measure depression and the Barthel Index, Frenchay activities index, and the Hodkinson mental scale to measure aspects of patients' mental state. Depressed caregivers were more likely to perceive less recovery. Increased anxiety and irritability were the most commonly reported mood changes at 6 months post-stroke. Despite findings on elevated caregiver depression and anxiety with higher stroke severity and level of dependence (Zhao et al., 2021; Villa-García et al., 2024), Wade et al. (1986) found that the links between caregivers' depression and different aspects of the patient's health state disappeared after 2 years, despite being present in the first year post-stroke. Thus, they suggested that the initial mood changes at the earlier stage post-stroke (from 6 months) and the association of depression with patient health outcomes at 1 year post-stroke may be attributed to the shock that accompanies a major life event rather than the nature of the long-term caregiving role (Wade et al., 1986). They further suggested that since depression was present in caregivers of independent patients, increased physical help with the caregiving tasks may not reduce caregivers' stress as stress might mitigate with time. Thus, other forms of support they have received from support groups could have helped. Similarly, Hu et al. (2018) suggests that the association between anxiety and depression and caregiver burden was higher in the personal rather than the responsibility domain, suggesting that the lack of knowledge could have led to longer care time and limited support, which may result in personal and social problems rather than problems with the responsibilities associated with caring. Thus, Wade et al. (1986) suggested that patient-related physical disability factors only partially accounted for the likelihood of depression in caregivers, and other factors should be further investigated. On the contrary, another longitudinal study found that at 1-year post-stroke, the main predictors of caregiver's psychological health were their own well-being and physical health (Franzén-Dahlin et al., 2007), not that of the patient.

To an extent, the above findings similarly suggest the importance of caregiver well-being at the acute phase after the stroke, in which caregivers might experience unexpected shock that poses detrimental psychological stress, regardless of patient factors. This could be addressed in future research aiming at caregivers' coping mechanisms in the face of major stressful events such as strokes, which could mitigate their stress. For instance, Grant et al. (2013) found that depression in patients and caregivers is higher among patients with more impairments, and this relationship is influenced by the caregivers' emotional reactions to the situation. After having ruled out the direct effect of impairments on patients' depression, higher caregivers' depression is still associated with higher patients' depression That is, they found more patient disability to correlate with more depressive symptoms, but the strength of this relationship is influenced by the caregivers' reaction, in which negative reactions were associated with higher depressive symptoms in patients, regardless of impairments (Grant et al., 2013). Caregivers' life satisfaction and depressive symptoms account for about 40.50% of the relationship between the number of post-stroke impairments and patients' depression. Similarly, the negative effects of patient disability on caregivers' mental

QoL are significantly mediated by caregivers' depressive symptoms (Yuliana et al., 2023). They further showed that the effects of stroke-related disability on patients' QoL may also be indirectly mediated by their own depression, anxiety, and stress symptoms. These psychological problems of patients can interdependently mediate the negative effects of their disability on both their own and their caregivers' mental and physical QoL (Yuliana et al., 2023). Though neither study design allows for causal effects, the results may be interpreted in the same manner, suggesting the potential mediation effects of caregivers' well-being on their patients' health outcomes.

Higher symptoms of anxiety and depression in caregivers are also associated with a higher risk of patient mortality 6 months post-stroke; there was a higher percentage of patient deaths in the group with more anxious and depressed caregivers than s non-anxious and non-depressed groups (Zhao et al., 2021). This study also assessed a few factors associated with higher anxiety and depression symptoms in caregivers; these include older caregiver age, more patient dependency, longer care duration, and self-finance vs. medical insurance. During the rehabilitation phase, depressed patients showed fewer improvements in their motor and cognition activities, as measured by the Functional Independence Measure, compared to non-depressed patients. Depressed patients also stayed in rehabilitation for longer. Despite this, the non-significant differences between function gains among the two groups at discharge indicate that depression might reduce the efficiency of recovery, but depressed patients might still be able to recover with longer rehabilitation time. In other words, although depressed patients showed smaller improvements during rehabilitation compared to non-depressed patients, the longer rehabilitation duration resulted in almost equivalent improvements at discharge. Another study showed that 12.8% of their sample of 179 caregivers experienced high strain 6 weeks after stroke (Oosterveer et al., 2014). Lower patient's life satisfaction and more anxiety symptoms were associated with higher caregivers' strain, and this association is stronger among caregivers of patients receiving inpatient rehabilitation compared to no or outpatient rehabilitation. This was suggested to be due to the high level of functional dependency experienced by patients who needed inpatient rehabilitation.

On the contrary, a study of 75 caregiver-patient dyads reported that 24% and 18% of caregivers showed symptoms of anxiety and depression, while 36% of patients showed symptoms of anxiety, and 44% displayed "clinically significant" depression (Balhara et al., 2012). However, the study observed no association between caregivers and patients' anxiety and depression symptoms, and the only predictor of caregiver anxiety was their gender. Notably, they excluded patients who had stroke-related language and cognitive limitations, as measured by the Mini-Mental Status Examination (MMSE). This was done to ensure full participation in the experiment. However, the variable measuring a patient's level of functional dependency or impairments may be important in the association between patients and caregivers' psychological health. As mentioned in other studies, multiple other factors might contribute to this relationship. Moreover, the study was conducted one week after hospitalization, and the duration of caregiving has been shorter compared to other studies that have found effects, therefore, caregivers might not have yet experienced physical and mental challenges. However, this study implies the importance of early screening of anxiety and depression among caregivers.

5. Current Intervention

Considering the potential interdependent links between caregivers' and patients' mental health and their health outcomes, interventions and support should aim at improving aspects of both of their mental health. Since caregivers' sources of support vary depending on their needs, it is suggested that care interventions target different sources of support within the caregivers' social network to effectively address all their needs (Sit et al., 2004). For instance, any need for health-related information should be addressed by health professionals, and daily caregiving tasks like helping patients move should be addressed by family or friends.

5.1. Social support

In comparison to non-depressed patients, those with more depressive symptoms received less social support (He et al., 2023). This heightened depressive symptoms in patients, along with higher stroke severity, longer duration of care, and lower caregiver's perceived social support, were significantly associated with higher caregiver burden (He et al., 2023). Social support was found to alleviate caregiver burden despite the negative impacts of patients' physical deficits and depressive symptoms (He et al., 2023). With the current findings that anxiety, unlike depression, might not reduce over time in some caregivers, it was suggested that interventions used to treat depression should not be assumed to be effective for anxiety, too (Greenwood & Mackenzie, 2010). At 6 months post-stroke, caregivers' dissatisfaction with the quality of care received is associated with heightened depression and anxiety symptoms, and the prevalence of these symptoms was equivalent in caregivers and patients (Atteih et al., 2015). Since this link was found to be significant in various studies, interventions should aim at providing more support, in various kinds, for caregivers.

Information regarding patients' health status might be useful in reducing caregivers' uncertainty regarding patients' health condition, which might result in higher stress. Patients and caregivers who have received a single 2-hour information and training session showed significantly more satisfaction compared to those receiving the standard rehabilitation program, with the information provided on knowledge of stroke, resources to support adaptation post-discharge, contact with health professionals to resolve questions, and caregiver training (Aguirrezabal et al., 2013). Interestingly, their levels of satisfaction only became distinct concerning the level of support patients received after discharge from the rehabilitation unit, as they were equally less satisfied with the therapy(speech and physiotherapy) received during rehabilitation. This finding emphasized the importance of not only providing patients and caregivers with knowledge of health conditions but also making sure they understand the information provided (Aguirrezabal et al., 2013).

Health literacy in patients has been linked to more recovery, less depressive symptoms, and social participation in mildly disabled stroke patients up to a year post-stroke (Flink et al., 2023). Health literacy may refer to the availability, understanding, and use of information and resources that promote better health (World Health Organization, 2024). This benefit with health literacy was significant regardless of participants' level of education (Flink et al., 2023). Therefore, health literacy may be beneficial in promoting positive health outcomes in a variety of individuals, for instance, those of lower educational backgrounds (Flink et al., 2023). Notably, this study was conducted in a sample of patients from Sweden, within which 62% had sufficient health literacy, and 48% attended university, thus, the result may not be generalizable to countries with lower health literacy.

A systematic review of social factors preventing patients' adherence to medication found that low health literacy was a barrier to treatment adherence in ischemic stroke patients (Ruksakulpiwat et al., 2023). Stroke patients who self-administered stroke prevention medication might be reluctant to continue taking medication because of the lack of information on its effectiveness due to lack of consultation time and the ability to understand the information provided by doctors during the acute phase after stroke (Viprey et al., 2020). Patients may consider stroke a one-time incident, hence, medication is regarded as a cure of present symptoms rather than a prevention of future recurrence (Viprey et al., 2020). Hence, they might be more reluctant to take medication as the side effects outweigh the preventative benefits (Viprey et al., 2020). The lack of confidence in knowledge could also result in a reluctance to inform doctors of problems with adherence and, eventually, a discontinuation of treatment (Viprey et al., 2020). Therefore, improving patients' health literacy might also act as a form of empowerment, allowing patients to be more confident in their communication with professionals about their problems with treatment (Viprey et al., 2020). An understanding of patients' perceptions by health professionals would also address their inaccurate perception of the disease and treatment (Viprey et al., 2020).

In contrast, a meta-analysis on the use of eHealth interventions to improve health literacy and stroke recurrence found no sufficient evidence to support its effectiveness, although significant improvements in health-related QoL and healthy behaviors were found (Vu et al., 2025). They suggested that patients might have already obtained basic knowledge about stroke within healthcare programs; thus, additional information provided by these applications is not necessary, while remote and frequent reminders to take medications or contact health professionals were efficient in promoting medication adherence (Vu et al., 2025).

5.2. Cognitive Behavioral Therapy for treating post-stroke depression:

As for the use of clinical treatments such as cognitive behavioral therapy for treating depression in stroke patients, results have been mixed. Among the Korean population of stroke patients, CBT was found to be effective in reducing symptoms of depression and anxiety and in improving self-efficacy and rehabilitation motivation (Choi & Kim, 2024). Although the intervention consisted of 20 sessions, about 30 minutes of each 1-hour session was dedicated to general occupational therapy (OT). Findings suggest the integration of occupational therapy with CBT to be effective in reducing depression and anxiety in stroke patients (Choi & Kim, 2024; Kootker et al., 2012). As the focus of this type of “augmented” CBT was to help patients achieve goal-oriented and fulfilling activities, this integrated and individualized intervention aimed to facilitate their ability to both mentally and physically obtain their goals (Kootker et al., 2012). A meta-analysis of 20 studies and 17 934 patients (hospital, rehabilitation, and population-based) assessing predictors of post-stroke depression (PSD) at various time points after stroke (ranging from discharge to 5 year) showed that loss of physical ability and decreased cognitive function were factors most commonly associated with PSD (Hackett & Anderson, 2005). Thus, it could be argued that although depression onset might vary at different time points after stroke, the aforementioned predictors might be consistent in predicting the prevalence of depression, thus, interventions aiming at both these psychological and physical functional recovery might be beneficial to improve patients’ health after stroke.

CBT sessions introduced techniques for the relaxation and reconstruction of patients’ negative and distorted beliefs and educated them on knowledge about stroke and CBT, received feedback from therapists about and reflected on their progress (Choi & Kim, 2024). Their integrated qualitative assessment of patients' therapy experience revealed an increased sense of psychological stability through successful identification and reframing of thoughts during stressful scenarios and recognition of strengths (Choi & Kim, 2024). The learning of communication and problem-solving skills and replacement of negative thoughts about their current post-stroke incapabilities and life changes allowed for more positive thinking, beliefs in current capabilities, rehabilitation motivation, and better communication and stress management (Choi & Kim, 2024).

On the contrary, Lincoln & Flannaghan (2003) found no observed improvement in mood among mildly and moderately depressed patients as a result of the interventions received 1, 3, or 6-months after stroke. These were explained by the potential short duration of the intervention and the study’s selection of patients based on the severity of depressive symptoms rather than the appropriate treatment, which might have excluded severely depressed patients who might have been unable to complete the depression questionnaires (Lincoln & Flannaghan, 2003). Although Kootker et al. (2012)’s study of 61 stroke patients found improvements, they found no group differences between augmented CBT and computerized cognitive training tasks in improving depression, anxiety symptoms, quality of life, and satisfaction with social participation after at least 3 months post-stroke. Both groups equally improved over time, hence, it is suggested that both treatments might be beneficial.

Interestingly, although interventions were targeted at patients, caregivers of those who received CBT showed more improvements in mental health problems and worrying compared to those receiving cognitive tasks in the control group (Kootker et al., 2019). These contradicting outcomes might have been a “Hawthorne” effect due to the home-based aspects of CBT, where caregivers benefitted from having patients committed to completing homework to achieve oriented goals (Kootker et al., 2019). Despite this, caregivers’ practical burden remained unaffected by the intervention, which might be attributed to the functional limitations that patients continue to experience post-stroke (Kootker et al., 2019).

5.3. Other interventions

The effects of other interventions, such as mindfulness-based interventions and patient-caregiver dyads interventions on health outcomes were investigated in a meta-analysis (Tao et al., 2022). Two kinds of mindfulness-based interventions were mentioned: mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT). MBCT is a group training program aiming to allow people to recognize and detach from depressive thoughts, which in turn reduce negative patterns of thinking and relapse (Teasdale et al., 2000). The program encourages awareness of the present moment and avoidance of automatic negative patterns of thinking, which are early signs of relapse of depressing thought patterns, by involving family members or reminders to look out for habitual negative thinking patterns that do not necessarily reflect reality (Teasdale et al., 2000). MBCT, in addition to usual treatment, was found to reduce the risk of depression relapse among patients who recently recovered from depression 60 weeks after initial treatment (Teasdale et al., 2000). Those who previously experienced 3 or more depressive episodes showed half a reduction in relapse rate, whereas those who had 2 episodes did not, which was attributed to the program's ability to interrupt the more frequent patterns of negative thoughts among those with more depressive episodes and hence prevent relapse (Teasdale et al., 2000). Both interventions significantly improved depression (Teasdale et al., 2000), while Kraines et al. (2022) suggested mixed results in terms of their effectiveness in treating depression. Their meta-analysis provided contrasting outcomes for studies using 2 different study designs to assess the effectiveness of MBCT and MBSR on depressed people: while all single-arm trials showed at least 1 positive effect in cognitive functions, only two out of five randomized-controlled trials showed effect.

6. Conclusion

There is a link between the stroke-related physical and psychological health outcomes of patients and the psychological health of their caregivers. Although some of these studies included only a small sample of caregiver-patient dyads, they consistently reported the presence of depression and anxiety in caregivers and the effects of these psychological challenges on their patients. Results also suggest a prevalence of depression and anxiety among stroke patients, and their well-being interdependently affects their caregivers.

Functional disability and cognitive deficiencies were associated with post-stroke-depression among patients. Further, the current literature review also found that caregivers' reaction towards patients' stroke-related disabilities also influence their mental health, such that more negative attitudes lead to more symptoms of depression in patients.

The majority of studies included in this review suggested effective outcomes for uses of interventions such as CBT, promotion of health literacy, and MBCT/MBSR to treat post-stroke depression among stroke patients. Only one study suggested insufficient evidence to support the effectiveness of eHealth application to promote health literacy. One study was included to suggest improvements among caregivers of patients receiving augmented CBT. This study should be interpreted in light of limitations, as only a limited amount of studies were included, the literature review does not cover all research that has been done on the topic. Further research should be done to outline the effectiveness of current intervention methods.

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