Access to rehabilitation professionals by individuals with stroke one month after hospital discharge from a stroke unit in Brazil is insufficient regardless of the pandemic

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Objective: To compare access to rehabilitation professionals by individuals with stroke one month after hospital discharge from a stroke unit in Brazil, before and during the COVID-19 pandemic. *Materials and methods:* This longitudinal and prospective study included individuals aged 20 years or older without previous disabilities admitted into a stroke unit due to a first stroke. Individuals were divided into two groups: before (G1) and during (G2) the COVID-19 pandemic. Groups were matched for age, sex, education level, socioeconomic status, and stroke severity. One month after hospital discharge, individuals were contacted via telephone to collect data regarding their access to rehabilitation services based on the number of referred rehabilitation professionals. Then, between-group comparisons were conducted (α = 5%). *Results:* The access to rehabilitation professionals was similar between groups. Rehabilitation professionals accessed included medical doctors, occupational therapists, physical therapists, and speech therapists. The first consultation after hospital discharge was mainly provided by public services. Despite the pandemic, telehealth was not frequent in any period evaluated. In both groups, the number of accessed professionals (G1 = 110 and G2 = 90) was significantly lower than the number of referrals (G1 = 212 and G2 = 194; $p < 0.001$). *Conclusions:* Access to rehabilitation professionals was similar between groups. However, the number of accessed rehabilitation professionals was lower than that of referred ones during both periods. This finding indicates a compromised comprehensiveness of care for individuals with stroke, regardless of the pandemic.

Keywords: stroke—rehabilitation—access to rehabilitation—public health—COVID-19

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Introduction

Stroke is one of the main causes of mortality and disability worldwide.[1] Most individuals with stroke have impaired performances in activities of daily living, leisure, work, and return to community.[1,2] Thus, clinical guidelines recommend post-stroke rehabilitation during hospitalization and after hospital discharge.[3,4] Moreover, functional recovery abilities and quality of life require the early identification of individuals affected by stroke and their access to rehabilitation professionals immediately after hospital discharge.[5] Therefore, access to rehabilitation professionals should be quickly available.

Despite concentrating about 70% of all stroke cases worldwide, low- and middle income countries have a poor infrastructure for stroke care.[6] Still, studies investigating access to rehabilitation professionals by individuals with stroke in low- and middle-income countries are scarce.[4] Although these countries faced barriers to maintaining access to rehabilitation professionals during the Coronavirus Disease 2019 (COVID-19) pandemic, information on access to rehabilitation professionals by individuals with stroke during the pandemic is unknown.[7] The COVID-19 pandemic was devastating, but it allowed analysis and favored improvements in health services.[8] Therefore, understanding the extent of access to rehabilitation professionals by individuals with stroke during the pandemic may highlight areas to improve healthcare.

Due to its high incidence and prevalence, stroke remains a health emergency during the pandemic.[9] Studies on the impact of the COVID-19 pandemic on post-stroke care indicated a reduction in hospital admissions of individuals with mild stroke and an increase in moderate and severe cases.[10]

Considering the care of individuals with stroke after hospital discharge, studies suggested that the pandemic hampered access to rehabilitation professionals.[11,12] However, these studies were narrative and did not objectively and quantitatively evaluate access.[11,12] In addition, these studies were conducted in high-income countries, possibly not reflecting the reality of low- and middle-income countries.

Finally, studies were not found comparing access to rehabilitation professionals by individuals with stroke before and during the pandemic. This knowledge is essential to promote continuity of care for this population in different health contexts. Therefore, this study aimed to compare access to rehabilitation professionals by individuals with stroke one month after hospital discharge from a stroke unit in Brazil, before and during the COVID-19 pandemic.

Material and methods

Study design

This longitudinal and prospective study was conducted in a metropolitan city in Brazil and approved by the institutional research ethics committee (#CAAE:26431319.6.0000.5149). The study is part of a bigger project investigating factors related to the health, functionality, quality of life, and access to the rehabilitation of individuals after hospital discharge from a stroke unit. All participants signed the consent form.

Participants

This study invited individuals admitted to a stroke unit in a metropolitan city in Brazil[13] from September 2019 to February 2021. The stroke unit is part of a public hospital that provides care for about 1.1 million inhabitants and attends an average of 700 stroke cases annually, similar to other stroke units in Brazil.[14–17]

The study included individuals admitted with first stroke confirmed by neuroimaging, aged 20 years or older. Exclusion criteria considered previous disabilities (Barthel Index ([18,19] with scores ≤ 17) and cognitive declines (Cognition Hetero-Anamnesis List ([20]) with scores > 1).

The sample size was calculated using G-Power software version 3.1.9.4 (Franz Faul, Kiel, Germany) based on a moderate effect size (d = 0.50), an $\alpha = 5\%$, a $\beta = 80\%$; 64 individuals per group were required.

Procedures

At hospital discharge, sociodemographic (age, sex, education level, and socioeconomic status), clinical-functional data (stroke severity, level of disability, and functional dependency), the number and the type of rehabilitation professionals referred were extracted from electronic medical records. Socioeconomic status was determined using the Brazilian Association of Research Companies classification system. In this system, the purchasing power of the Brazilian population is classified into five classes (A, B, C, D, and E), with individuals in class A having the highest purchasing power and individuals in class E having the lowest.[21] Stroke severity was assessed using the National Institutes of Health Stroke Scale (NIHSS). NIHSS classifies neurological deficits as none to severe, according to 11 items of neurological examination.[22] Moreover, the Modified Rankin Scale (MRS) and the Modified Barthel Index were used to assess the level of disability (no symptoms/no significant disability [0 – 1], slight to moderate disability [2 – 3], or moderately severe to severe disability [4 – 5]) and functional dependence (independent, slight to moderate dependency, or total or severe dependence), respectively.[23,24]

Participants were divided into two groups: before (G1) (hospital discharge between September 2019 and February 2020) and during (G2) the COVID-19 pandemic (hospital discharge between April 2020 and February 2021). Participants in both groups were matched for age, sex, education level, socioeconomic status, and stroke severity. In Brazil, the first case of COVID-19 was registered on February 26th, 2020, with a national health emergency declared on March 20th.[25] In the city where the study was

conducted, the first COVID-19 case was registered on March 16th; health service changes and social isolation were gradually adopted from March 18th[26]. Therefore, March was considered a transition period and data of hospital discharge at this month were excluded. By February 2021, when participant inclusion ended, Brazil had recorded over ten million cases of COVID-19 and 254,221 deaths.[27]

One month after hospital discharge, participants and their families or caregivers were contacted via telephone to collect information on their access to rehabilitation professionals, considering referrals by the multidisciplinary team of the stroke unit at hospital discharge. Information on access to rehabilitation professionals was classified according to the International Classification of Service Organization in Rehabilitation.[28] It included the following items: number and type of rehabilitation professionals accessed (medical doctors, occupational therapists, physical therapists, speech therapists, psychologists, and social workers), ownership of accessed professionals (public or private), number of rehabilitation professionals in the first consultation after hospital discharge (1 and > 1), service delivery modality, (in-person home-based, in-person outpatient, direct transfers to inpatient rehabilitation hospitals, and telehealth), and days from hospital discharge to access to rehabilitation.

Statistical analyses

Initially, data distribution was verified using Kolmogorov-Smirnov tests. Descriptive statistics were used to characterize the sample and access to rehabilitation professionals based on data distribution. Mann Whitney-U, Chi-square, and independent t-tests analyzed differences between groups regarding matching and access to rehabilitation professionals (number and type of rehabilitation professionals referred, number and type of rehabilitation professionals accessed, ownership of accessed professionals, number of rehabilitation professionals in the first consultation after hospital discharge, service delivery modality, and days from hospital discharge to access to rehabilitation). Wilcoxon tests compared the number of referred and accessed rehabilitation professionals of both groups.

All statistical analyses were conducted with the SPSS for Windows (Version 17.0, SPSS Inc., Chicago, Illinois, USA) with a significance level of 5%.

Results

In this study, 384 individuals eligible were evaluated at hospital admission. Of those, 221 were evaluated one month after hospital discharge, 77 before and 144 during the pandemic. Four G1 participants could not be matched for sociodemographic and clinical-functional data. Thus, data from 146 participants (73 per group) were included and analyzed (Figure 1).

Groups were correctly matched for age, sex, education level, socioeconomic status, and stroke severity (Table 1). Additionally, groups exhibited similar levels of disability ($p = 0.19$) and functional dependency ($p = 0.32$), as shown in Table 1.

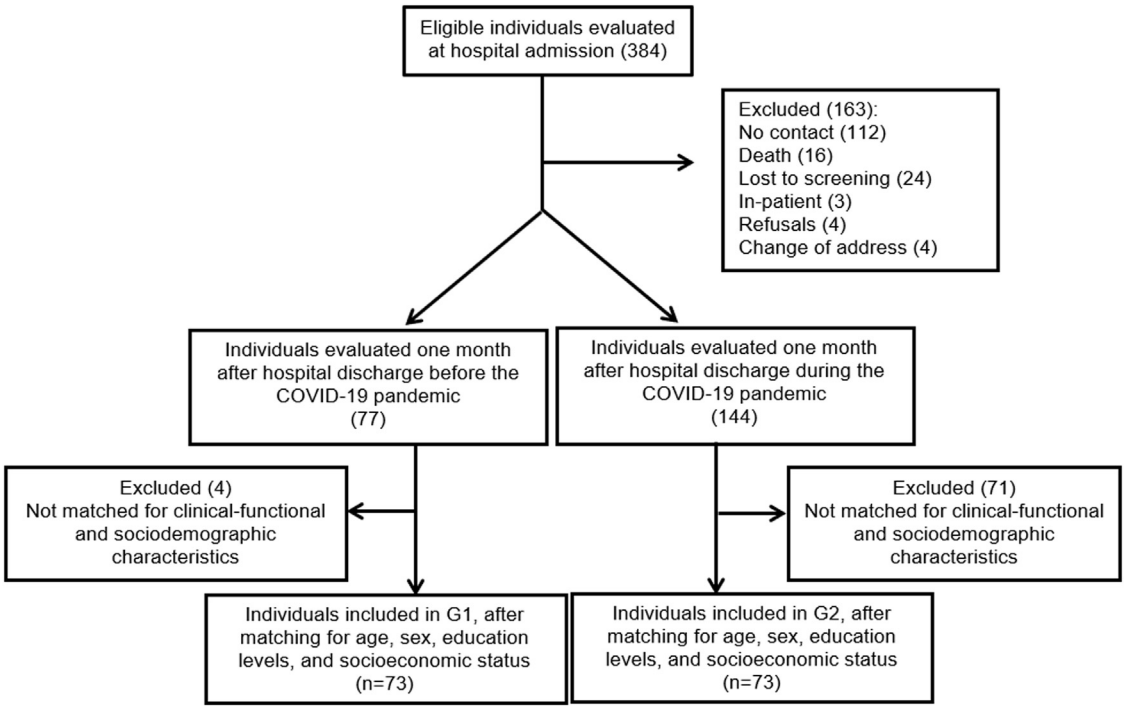

Figure 1. *Flow of participants*

Table 1. *Participants' characteristics and comparisons between the groups before and during the COVID-19 pandemic (n=146)*

Characteristics	G1 (n=73)	G2 (n=73)	p-value
Age (years), median±IQR, (range: mim-max)	61±15 (31-100)	61±13 (35-93)	0.89
Sex, n men (%)	37 (51)	38 (52)	0.87
Education levels (years of schooling), n (%)			
Illiterate	4 (5)	6 (8)	0.53
1 to 4 years	33 (45)	34 (46)	
5 to 7 years	12 (17)	10 (14)	
≥8 years	24 (33)	23 (32)	
Socioeconomic status †,(A-E), n (%)			0.86
A	0 (0)	0 (0)	
B	14 (19)	11 (15)	
C	38 (52)	45 (62)	
D	21 (29)	17 (23)	
E	0 (0)	0 (0)	
Stroke Severity, (NIHSS scores: 0-42), n (%)			0.93
None/ minor (0 to 4)	38 (52)	39 (53)	
Moderate (5 to 15)	24 (33)	26 (36)	
Moderate to severe/ severe (16 to 42)	10 (14)	8 (11)	
Not available	1 (1)	0 (0)	
Level of disability (MRS scores: 0-5), n (%)			0.19
No symptoms/ no significant disability (0 or 1)	19 (26)	12(16)	
Slight to moderate disability (2 or 3)	23 (32)	21(29)	
Moderately severe to severe disability (4 or 5)	31 (42)	40 (55)	0.32
Functional dependence (MBI scores: 0-100), n (%)			
Independent (100)	2 (2)	4(5)	
Slight to moderate dependency (61 to 99)	38 (52)	28 (39)	
Total or severe dependency (≤60)	30 (42)	41 (56)	
Not available	3 (4)	0 (0)	

IQR: interquartile range, †Brazilian Association of Research Companies, NIHSS: National Institutes of Health Stroke Scale, MRS: Modified Rankin Scale, MBI: Modified Barthel Index, G1: Before the COVID-19 pandemic, G2: During the COVID-19 pandemic.

Regarding referral, all participants were referred by the multidisciplinary team of the stroke unit at least one rehabilitation professional. Both groups received about two to three referrals (G1 = 50 and G2 = 54) (Figure 2).

In both groups, most participants were referred to medical doctors (G1 = 73, G2 = 67), occupational therapists (G1 = 69 and G2 = 68), and physical therapists (G1 = 40, G2 = 42). Conversely, less than half of the participants in both groups were referred to speech therapists (G1 = 21, G2 = 14), psychologists (G1 = 6, G2 = 1), and social workers (G1 = 3, G2 = 2).

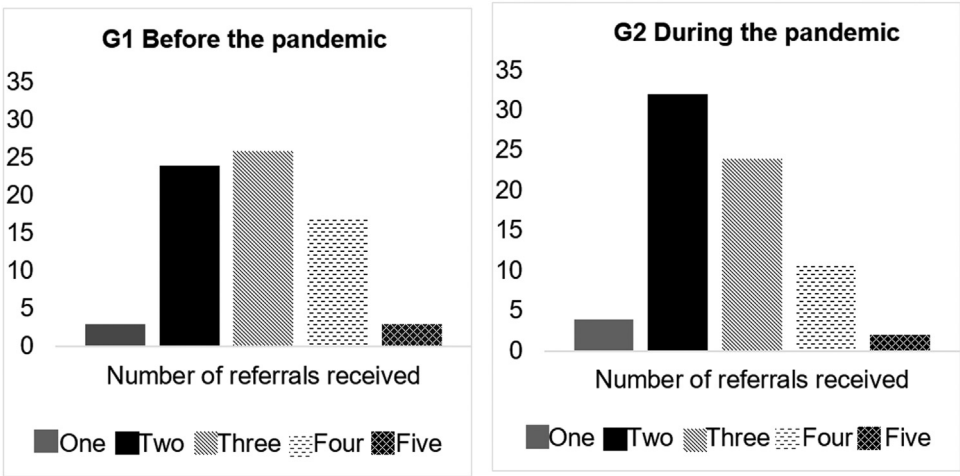

Figure 2. *Number of referrals received before (G1) and during (G2) the COVID-19 pandemic*

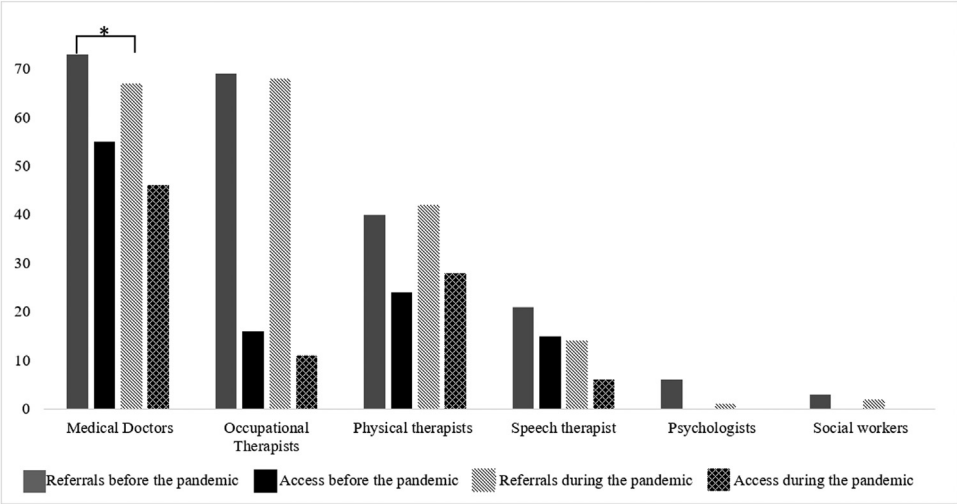

Figure 3. *Number and type of rehabilitation professionals referred and accessed before (G1) and during (G2) the COVID-19 pandemic*

Comparison between groups considering referrals to different rehabilitation professionals showed significant differences only for the medical doctor. As shown in Figure 3, G1 participants had a higher frequency of referrals to medical doctors than G2 (G1 = 73, G2 = 67, $p = 0.03$). For the other rehabilitation professionals, no differences were observed between-group ($0.12 \leq p \leq 1.00$).

The median number of referred and accessed rehabilitation professionals was three and one, respectively, being this difference significant ($p < 0.001$). In both groups, the number of accessed rehabilitation professionals (G1 = 110, G2 = 90) was significantly lower than the number of referred ones (G1 = 212, G2 = 194, $p < 0.001$); however, the number of referrals ($p = 0.09$) and access ($p = 0.31$) was similar for both groups.

No significant differences were found between groups comparing access to any of the rehabilitation professionals: medical doctors (G1: 55/73, G2: 46/67, p = 0.45), occupational therapists (G1: 16/53, G2: 10/58; p = 0.28), physical therapists (G1:24/40, G2: 28/42, p = 0.65), or speech therapists (G1: 15/21, G2: 6/14, p = 0.16). Participants of both groups had no access to psychologists or social workers (Figure 3).

The first consultation after hospital discharge of individuals with access to rehabilitation professionals was mainly provided by public services (G1 = 51, G2 = 51, $p = 1.00$) and by a single professional (G1 = 44, G2 = 46, $p = 0.48$), without differences between groups. The main service delivery modality for both groups was in-person outpatient (G1 = 25, G2 = 27, $p = 0{,}69$). Also, even during the pandemic, telehealth was not frequent (G1 = 0, G2 = 1, $p = 0{,}69$). The median of days from hospital discharge to the first access to rehabilitation was similar between the groups (G1 = 7 ± 14; G2 = 9 ± 14 days; $p = 0.75$) (Table 2).

Table 2. *Access to rehabilitation professionals one month after hospital discharge and comparisons between the groups before and during the COVID-19 pandemic.*

Variables	G1 (n=57)	G2 (n=55)	p- value
Ownership of accessed professionals, (%)			
Public	51 (89)	51 (93)	1.00
Private	6 (11)	4 (7)	
Number of rehabilitation professionals in the first consultation after hospital discharge, n (%)			0.48
1	44 (77)	46 (84)	
>1	13 (23)	9 (16)	
Mode of service delivery, n (%)			
In-person home-based	14 (24)	12 (22)	0.69
In-person outpatient	25 (44)	27 (49)	
Direct transfers to inpatient rehabilitation hospitals	18 (32)	15 (27)	
Telehealth	0 (0)	1 (2)	
Days from hospital discharge to access to rehabilitation., median (IQR), (range: mim-max)	7 (14) (1-30)	9 (14) (1-30)	0.75

Discussion

We aimed to compare access to rehabilitation professionals by individuals with stroke one month after hospital discharge from a stroke unit in Brazil, before and during the COVID-19 pandemic. The results showed that access to rehabilitation professionals was similar between periods, indicating that the pandemic did not impact access to these professionals. However, access to rehabilitation professionals was below expected levels during both periods, indicating a compromised comprehensiveness of care for individuals with stroke.

Additionally, this study found a 14% reduction in medical doctor referrals during the COVID-19 pandemic. Although not found for individuals with stroke, research on the general population identified many factors associated with decreased referrals during the pandemic, including reduced availability of healthcare professionals, fear of infection when seeking care, and travel restrictions.[29,30] The present study matched individuals with stroke based on sociodemographic and clinical-functional data. Therefore, the similarity between groups possibly explains the comparable number of referrals for most professional categories before and during the pandemic.

This study is the first to compare access to rehabilitation professionals by individuals with stroke before and during the COVID-19 pandemic one month after hospital discharge. Studies showed that the pandemic affected immediate hospital care for individuals with stroke in many countries.[31–33] However, our results suggested that the COVID-19 pandemic did not hamper access to rehabilitation professionals by individuals with stroke after hospital discharge. One possible explanation is that after emergency care, individuals were duly instructed to look for rehabilitation professionals, favoring continued access to professionals similar to before the pandemic. In addition, the pandemic impacted the monitoring and prevention of chronic diseases more intensely.[33] Therefore, rehabilitation restrictions may have been directed at chronic patients, including those in the chronic phase of stroke.

Studies using the general population indicated that the pandemic impaired access to healthcare services.[7,34,35] However, most of these studies were narrative. Only one study, developed in Ethiopia, presented an objective similar to the present study.[36] The study reported reduced records of individuals at risk of cardiovascular diseases undergoing treatment (before = 1,238 and during the pandemic = 15, $p = 0.03$) and increased referrals to emergency care during the pandemic (before = 7,288 and during = 8,668, $p \leq 0.01$).[36] In low- income countries, the lack of medicines and personal protective equipment justifies the lower access to healthcare services by the general population during the pandemic.[7] Contrarily, these factors presented reduced impact in high- and middle- income countries due to a more established health system.[7,36]

In high- income countries, declines in access to rehabilitation during the pandemic were associated with an abrupt increase in unemployment rates.[35,37] In these countries, healthcare provision is private and depends on employer funding.[35,37] In contrast, the present study was conducted in a middle-income country where the health system is public and universal.[13] Therefore, despite the abrupt increase in unemployment rates during the pandemic in Brazil,[38] access to rehabilitation professionals by individuals with stroke after one month of hospital discharge was not affected.

In the present study, occupational therapists were the type of professionals with the highest difference between the number of referrals and access in both periods. In a population-based study developed in Brazil, it was identified that the availability of occupational therapists was the lowest compared to other rehabilitation professionals, such as physical therapists in Brazilian primary health care.[39] In the Brazilian public health system, primary health care is the main care provider for individuals with stroke after hospital discharge.[3] Therefore, the low availability of occupational therapists at this level of healthcare may partly explain the high difference between the number of referrals and access to occupational therapy observed in this study.

In both periods (G1 and G2), the first consultation after hospital discharge was mainly provided by public services. In Brazil, the public and private health systems coexist. However, around 70% of the Brazilian population is dependent on the public health system, considered one of the largest in the world due to its population coverage.[40] Importantly, no charge or co-payment is made for services used in the public health system.

In addition, the most frequent service delivery modality in both periods was outpatient; telehealth was not frequent even during the pandemic. Although the use of telehealth has grown in recent years in Brazil, its use was only regulated at the beginning of the pandemic.[41] Furthermore, even during the pandemic, telehealth provision was lower in public services than private services and aimed to treat mainly individuals with COVID-19 in Brazil.[42] Difficulties to implement telehealth before and during the pandemic included insufficient infrastructure and training for professionals, uncertain guidelines for telehealth provision, lack of insurance for telehealth errors, adherence to data security and confidentiality rules, and criteria for compensating health professionals for providing telehealth services.[41–43] These reasons may justify the low use of telehealth in the present study.

Although the impacts of the COVID-19 pandemic on access to rehabilitation professionals were not observed in the present study, access to rehabilitation was lower than expected in both periods. These results show that even before the pandemic, access to rehabilitation professionals by individuals with stroke after hospital discharge was not adequate, suggesting a weak alignment between the

rehabilitation system and the needs of individuals. Similar results were observed in a study by Labberton et al. (2019) reporting data on access to rehabilitation by individuals with stroke in Australia and Norway[44] The study showed that even before the COVID-19 pandemic, access to rehabilitation after hospital discharge, which is also public in these countries, was inadequate.[44]

These findings indicate that the clinical recommendations for individuals with stroke regarding access to comprehensive care have been partially fulfilled.[45] Immediate treatment at the acute and sub-acute post-stroke stages increases the chances of recovery and reduces the incidence of recurrent stroke. However, many people with stroke face barriers to accessing rehabilitation professionals. Moreover, the wide geographic variation in access may cause socioeconomic impacts worldwide related to mortality and morbidity secondary to stroke.[45] Thus, continued access is recommended for a better functional recovery and less burden from health systems due to complications secondary to stroke or new events.[3,45]

This study has limitations. Data analyzed were from individuals discharged from a single hospital and residents of a metropolitan city. Even before the pandemic, this metropolis stood out for the organization of the health system and efficient management of public health expenses compared to other cities in Brazil.[26] Thus, more studies in stroke units of other regions and countries are needed to understand the impacts of the COVID-19 pandemic on maintaining the care of rehabilitation professionals. In addition, the individuals included in this study were followed up for only one month. Thus, longer follow-up studies are needed on access to rehabilitation professionals by individuals with stroke before and during the pandemic, including acute and chronic recovery phases.

Finally, despite providing important information about access to rehabilitation professionals by individuals with stroke before and during the pandemic one month after hospital discharge, this study did not investigate predictors of access. Therefore, identifying factors associated with lower access to rehabilitation services was hindered during both periods. Further studies are needed to investigate the predictors of access to rehabilitation services by individuals with stroke at different stages of the disease and to identify barriers. This information facilitates understanding the disparities in access by these individuals after hospital discharge and helps develop public policies to improve comprehensive care for this population. Despite these limitations, the results of the present study are innovative since the real impacts of the COVID-19 pandemic on access to rehabilitation professionals are still unclear. Although many studies have addressed this issue, most are narrative. The present study quantified and compared access to rehabilitation professionals with a sample of matched individuals with stroke regarding characteristics that could impact access. Thus, the present results may help understand access to rehabilitation during the COVID-19 pandemic and contribute to developing strategies to improve access to rehabilitation professionals in different health contexts.

Conclusions

One month after hospital discharge from a stroke unit, access to rehabilitation professionals was similar before and during the COVID-19 pandemic. However, access was lower than expected in both periods, indicating insufficient access for individuals with stroke in Brazil, regardless of the pandemic. Therefore, access to rehabilitation needs to be expanded to guarantee care for this population in any health context.

Declaration of Competing Interest

None

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