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Prevalence and Outcome of Ischemic Stroke among Covid-19 Patients: A Cohort Study

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Abstract

Background: In the early phases of the COVID-19 pandemic, there has been a relatively high prevalence of thrombotic events, mainly among patients with severe COVID-19 but also among mildly symptomatic or asymptomatic patients. Acute Ischemic stroke is serious condition led to disability, may occur in patients with COVID-19 but risk factors, in hospital events, and outcomes are not well studied.

Objective: This study aims to provide the Prevalence, risk factors and Outcomes of Ischemic stroke in COVID-19 patients.

Methodology: This study is an Observational retrospective Hospital based study. It was conducted in a large specialist hospital. It involved 331 patients suspected to have covid-19, Secondary data as collected from the records of the hospital. Data was entered, cleaned, and analyzed using SPSS 25.0 version.

Results: the study show that the most frequent age group is between 51 - 70 years, 73.4% are males, while 26.6% are females, 73.4% confirmed the diagnosis with covid-19, and 11.5 % developed ischemic stroke, the mortality rate reaches 55% of admitted patients, while 45% was discharged. There is a significant correlation between the ischemic stroke with the blood pressure and Diabetes mellitus with P value < 0.05. The other variables show non-significant correlation. The ischemic stroke is not significantly associated with the outcomes.

Conclusion: the intricate relationship between COVID-19 and acute ischemic strokes. Most of the COVID-19 patients who develop acute ischemic stroke have preexisting vascular risk factors. The pathophysiology behind strokes occurring in COVID-19 patients remains not fully understood.

Keywords: COVID-19, Diabetes mellitus; Ischemic stroke

Introduction

Coronavirus disease 2019 (COVID-19) is caused by infection with coronavirus 2 (severe acute respiratory illness) (SARS-CoV-2) [1]. It began in Wuhan, China, in patients with severe pneumonia and acute respiratory distress syndrome, and has since spread to become the first pandemic in over a century [1]. In the early phases of the COVID-19 pandemic, there has been a relatively high prevalence of thrombotic events, mainly among patients with severe COVID-19 but also among mildly symptomatic or asymptomatic patients [2,3].

This seems to be the case also for stroke, even though the overall number of stroke admissions has been reduced during the pandemic, possibly because patients experiencing stroke symptoms did not seek medical attention especially when symptoms were mild, due to the fear of contracting the coronavirus [3,4]. In a retrospective investigation of 214 COVID-19 patients from China, four ischemic strokes were reported (1.86%) [5]. Data on patients who have had a COVID-19-related stroke has revealed several unique characteristics in terms of clinical presentation, neuroimaging results, and outcome. Atypical neurovascular manifestations, such as bilateral carotid artery dissection, posterior reversible encephalopathy syndrome (PRES), and vasculitis, were also described. Cases of encephalopathy or encephalitis with seizures signaling a stroke were especially difficult. Although the pathogenesis and best treatment for ischemic stroke caused by COVID-19 are still unknown, new research suggests that cytokine storm-induced coagulopathy and endotheliopathy may be targetable processes [6].

Majdi A in a single-center analysis of a prospective mandatory database of 2050 patients with confirmed SARS-CoV-2 infection showed 21 patients (1.02%) presented an acute ischemic stroke 21 and 4 (0.2%) suffered an intracranial hemorrhage [7].

Requena M reported that the prevalence of acute stroke in COVID-19 patients was less than 2%, and the majority of them already had established stroke risk factors [8]. In Morassi M Study concluded that both ischemic and hemorrhagic stroke can complicate the course of COVID-19 infection [9]. Acute Ischemic stroke is serious condition led to disability, may occur in patients with COVID-19 but risk factors, in hospital events, and outcomes are not well studied. This study aims to provide the Prevalence, risk factors and Outcomes of Ischemic stroke in COVID-19 patients.

Methodology

Study Design

This study is an Observational retrospective Hospital based cohort study. The work has been reported in line with the STROCSS criteria [10].

Study Area

It was conducted in one of the biggest specialized hospitals, providing services to a large portion of the population. The Covid-19 center was established in May 2020, as subdivision of the critical care area which covered by 6 ICU consultants and Almost 40 resident doctors with different specialties varying from ER, Critical care, Internal medicine and nephrology in addition to dialysis unit covered by senior consultants. It consists of a triage containing 3 beds and Respiratory zone for the suspected cases using WHO criteria and HRCT chest. Also, the Covid-19 Center containing outpatient clinic, which was established in late December 2020 providing services for patients who were found accidentally positive during routine travelling check, having a mild symptom or discharged from the hospital after recovery from COVID-19.

Study Population

Patients admitted with COVID-19 in the Hospital, including adult patients above 18 years old, and patients who developed stroke before infection with Covid-19 disease was excluded.

Sample Size

The sampling was through a total coverage for all covid-19 patients during the study period, which reveal 331 patients.

Data Collection and Analysis

Secondary data as collected from the records of the hospital. Data was entered, cleaned, and analyzed using SPSS 25.0. Descriptive statistics in term of frequency tables with percentages and graphs. Means and standard deviations were presented with relevant graphic representation for quantitative data. Bi-variable analysis to determine the associations between the outcome variables and the other relevant influencing factors with Chi square test (for categorical variables) and t-test for (quantitative variables) statistical tests. P value of 0.05 or less is considered statistically significant.

Results

This section will view the results for 331 patients suspected to have covid-19, to assess the prevalence and associated factors with ischemic stroke.

In (Table 1) It show that the mean age is 65.17 ± 13.08 , the most frequent age group is between 51 - 70 years 73.4% are males, while 26.6% are females, 73.4% confirmed the diagnosis with covid-19, and 11.5 % developed ischemic stroke.

		Frequency	Percent
Age:	< 30 years	3	0.9
	30 - 50 years	50	15.1
	51 - 70 years	165	49.8
	> 70 years	113	34.1
Gender	Female	88	26.6
	Male	243	73.4
Diagnosis with Covid-19	Negative	88	26.6
	Positive	243	73.4
Ischemic stroke	Yes	28	11.5
	No	215	88.5

Table 1: Shows the sociodemographic, and diagnosis among the study population.

(Figure 1) shows the percentage of outcomes among the study population. The graph show that the mortality rate reaches 55% of admitted patients, while 45% was discharged.

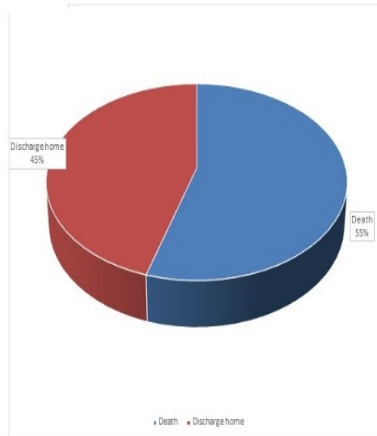


Figure 1: Shows the percentage of outcomes among the study population.

In (Table 2) it shows the correlation between the diagnosis of the Covid-19 positive patients diagnosed with Ischemic stroke and clinical parameters including: Age group, Gender, co-diagnosis with malaria, Past Covid-19 infection, blood pressure, anticoagulation use, and the outcomes. There is a significant correlation with the blood pressure with P value < 0.05. The other variables show non-significant correlation.

		Ischemic stroke		Total	P value
		Positive	Negative		
Age	< 30 years	0	2	2	0.678
	30 - 50 years	4	33	37	
	51 - 70 years	12	111	123	
	> 70 years	12	69	81	
Gender	Female	5	54	59	0.279
	Male	23	161	184	
Malaria	Negative	27	201	228	0.464
	Positive	1	14	15	
Past Covid-19 infection	No	26	212	238	0.103
	Yes	2	3	5	
Prone position	Done	2	29	31	0.272
	Not Done	26	186	212	
Blood pressure	Hypotension	10	38	48	.002*
	Normal	4	103	107	
	Hypertension	14	74	88	
Anticoagulation use	No	1	3	4	0.389
	Yes	27	212	239	
OUTCOME	Death	19	114	133	0.099
	Discharge home	9	101	110	

Table 2: Shows Correlation between the diagnosis with Ischemic stroke and clinical parameters.

(Table 3) Correlation between the diagnosis with Ischemic stroke and Comorbidities. (*Significant correlation. DM: Diabetes Mellitus, HTN: Hypertension, IHD: Ischemic heart disease, DVT: Deep Venous Thrombosis, RA: Rheumatoid Arthritis, CKD: Chronic Kidney Disease, HF: Heart Failure.).

		Ischemic stroke		Total	P value
		Positive	Negative		
DM	Yes	18	96	114	.039*
	No	10	119	129	
HTN	Yes	13	108	121	0.43
	No	15	107	122	
IHD	Yes	3	10	13	0.178
	No	25	205	230	
DVT	Yes	0	3	3	0.692
	No	28	212	240	
RA	Yes	0	3	3	0.692
	No	28	212	240	
CKD	Yes	4	17	21	0.21
	No	24	198	222	
HF	Yes	0	1	1	0.885
	No	28	214	242	

Table 3: Correlation between the diagnosis with Ischemic stroke and Comorbidities.

Discussion

This single-center retrospective study reports key demographic and clinical characteristics of patients who develop acute ischemic stroke and concomitant SARS-CoV-2 infection in a specialized Hospital. The observed rate of confirmed cases of acute ischemic stroke in hospitalized patients with COVID-19 of 11.5 % of the cases Majdi A [7]. reported the prevalence of ischemic stroke is about 1.02%, the study of China 1,86%, Requena M [5] reported that it is less than 2%. Other cohort studies have reported that the proportion of patients with acute ischemic stroke may range between 1% and 3% among hospitalized COVID-19 patients receiving thromboprophylaxis [11-13]. Another recent retrospective study by Merkler et al. [14] reported that 0.9% of 3556 hospitalized patients with COVID-19 had an acute ischemic stroke. The findings of this study suggest that most of the COVID-19 patients who develop acute ischemic stroke have preexisting vascular risk factors for large vessel atherosclerosis, small vessel disease, and cardioembolic phenomenon. This proved by the strong association between development of Ischemic stroke with diabetes and increase in blood pressure. These findings agree with the study of Majdi A [7], and may differ from the earlier observations from smaller case series that suggested that patients with SARS-CoV-2 infection who develop acute ischemic stroke were younger and without preexisting cardiovascular risk factors [15-17]. Other studies suggested that, even if SARS-CoV-2 infection was a predisposing factor, the risk was mainly seen in those who were already at risk for acute ischemic stroke due to other vascular risk factors [18-20]. SARS-CoV-2 infection can act as a trigger of conventional stroke causes [21]. Like other viral infections, SARS-CoV-2 infection may increase the risk of stroke [22]. The higher proportion of strokes of cryptogenic nature observed in our study may be explained by the different COVID-19-related stroke pathogeneses described [22]. Cytokine storm, prothrombotic state, antiphospholipid syndrome, myocardial injury, arrhythmias, and endothelial activation and dysfunction have been proposed [22-26].

Conclusion

This study illustrates the intricate relationship between COVID-19 and acute ischemic strokes. Most of the COVID-19 patients who develop acute ischemic stroke have preexisting vascular risk factors. It is important to emphasize that, despite the higher mortality in this study; SARS-CoV-2 infection did not impact the likelihood of developing unfavorable outcomes. The pathophysiology behind strokes occurring in COVID-19 patients remains not fully understood. Therefore, future controlled, prospective international studies with a higher sample size are needed to establish an evidence-based approach to stroke occurring in COVID-19 patients and elaborate more on their outcomes.

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