

Bell Palsy Incidence in Patients with Post-COVID: A Retrospective Study

Tasmiya Afza¹, Vinod K.C. Kumar¹, Shenbaga Sundaram Subramanian², Arul Pragassame³, Sugasri Sureshkumar⁴, Vijayamurugan Eswaramoorthi⁵, Syed Abudaheer Kajamohideen⁶, Mahendran Jayaraman⁶, Shadi Abdelbaset Alkhob⁷, Saad Alfawaz⁸

¹College of Physiotherapy, School of Health Science, Dayananda Sagar University, Bangalore, Karnataka, India, ²Chettinad School of Physiotherapy, Chettinad Hospital and Research Institute (CHRI), Chettinad Academy of Research and Education (CARE), Kelambakkam, Tamil Nadu, India, ³Department of Physiotherapy, RMMCH, Annamalai University, Chidambaram, Tamil Nadu, India, ⁴Faculty of Physiotherapy, Meenakshi Academy of Higher Education & Research, Chennai, Tamil Nadu, India, ⁵Department of Physiotherapy, Faculty of Pharmacy and Health Sciences, Universiti Kuala Lumpur, Royal College of Medicine Perak, Ipoh, Malaysia, ⁶AIMST University, Bedong, Malaysia, ⁷Department of Physical Therapy, Faculty of Applied Medical Science, Jerash University, Jerash, Jordan, ⁸Department of Physical Therapy, Faculty of Medical Rehabilitation Sciences, King Abdulaziz University, Jeddah, Saudi Arabia

Abstract

Bell palsy is caused by impaired functioning of the 7th cranial nerve. A disparity in the stable state of the cytokine regulatory axis and a cytokine storm are observed to occur from the binding of the ACE2 to the COVID, and the subsequent functional alterations in the ACE2/AT2R suggest that COVID-19 may use direct or indirect processes to produce neurological symptoms. Increased cases of Bell palsy were reported during the CoV pandemic, so our study aimed to estimate the incidence rate of Bell palsy among COVID-19 patients in South Bangalore, India. Secondary data of patients with Bell palsy were obtained retrospectively from two multispecialty Hospitals in South Bangalore. COVID positive populations were collected between the period of March 2021 and February 2022, and many Bell palsy cases within 3 months of post-Covid period were included. Confirmatory calls were made for patients with Covid Positive who were not diagnosed to discover the occurrence of Bell palsy. A retrospective analysis of Bell palsy cases found 11 incidences between March 2021 and February 2022, when there were 1577 COVID patients in total. According to descriptive statistical analysis, the prevalence of Bell palsy increased by 0.7% during the COVID-19 pandemic. Bell palsy could be considered one of the neurological complications among COVID-19 patients, and appropriate preventative measures should be taken.

Keywords: Bell palsy, COVID-19, facial nerve paralysis, peripheral facial nerve paralysis, SARS-CoV-2, post-COVID

STUDY BACKGROUND

A facial paralysis with an unidentified etiology that is isolated, acute, and peripheral is known as Bell palsy.^[1] There are 11 to 40 cases of Bell palsy per 100,000 people per year.^[2] The seventh cranial nerve dysfunction^[3] causes Bell palsy. A disparity in the stable state of the cytokine regulatory axis and a cytokine storm are observed to occur from the binding of the ACE2 to the COVID, and the subsequent functional alterations in the ACE2/AT2R suggest that COVID-19 may use direct or indirect processes to produce neurological symptoms. Possible explanations for the facial nerve damage are attributed to an immunological reaction brought on by SARS-CoV-2.^[4] Most studies suggested that COVID-19 could even present neurological symptoms, including initial manifestation in

patients who were otherwise asymptomatic or only had a mild infection.^[5] An incidence of neurological manifestations of 36.4% of COVID-19 is reported in a study.^[6] Through various recognized mechanisms, including direct infection injury, hypoxia, ACE 2 receptors, and immunological reactions, CoV can injure nervous tissue.^[1] Milder cases

Address for correspondence: Shenbaga Sundaram Subramanian, Chettinad School of Physiotherapy, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education, Kelambakkam, Tamil Nadu, India.
E-mail: dr.subramanian@care.edu.in

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tended to have more peripheral nervous system signs, such as Guillain-Barré, Cranial Polyneuritis, and Miller-Fisher syndromes, in addition to taste and smell disorders.^[7] CoV patients can develop several otolaryngologic illnesses like Bell palsy. Various case reports and series suggested that PFNP is associated with COVID.^[8] Hence, we suspect a role of coronavirus contributing to the ongoing pandemic's rising incidence of Bell palsy.

METHODS

The study included PCR confirmed COVID-19 patients diagnosed with Bell palsy within 3 months of being COVID Positive^[9] and patients with a history of Bell palsy that recurred after being diagnosed with COVID-19 among Indian population of South Bangalore. On the other hand COVID negative patients, patients with Bell palsy without a history of COVID, stroke, Ramsay-Hunt Syndrome,^[10] brain tumor,^[10] Guillain-Barre syndrome,^[10] HIV infection,^[10] patients who underwent dental surgery or facial procedure,^[10] injury or trauma^[10] were excluded. The sample size was calculated; it was found

to be 1267. Ethical clearance was obtained from Institutional Ethics Committee (IEC), and the study was registered in CTRI (CTRI/2022/07/044352). Required permission was obtained from hospital; patients' data, including baseline data, contact number, and information regarding COVID positive and Bell palsy was extracted. Secondary data from records satisfying the eligibility requirements were obtained from two multispecialty hospitals in South Bangalore. COVID positive populations were collected between the period of March 2021 and February 2022, and the number of Bell palsy cases within 3 months of post-COVID was observed.^[9] Confirmatory calls were made for patients tested as COVID positive who were not diagnosed to discover the occurrence of Bell palsy. Data analysis was performed using SPSS (version 24). Descriptive statistics were performed to find the incidence rate of Bell palsy in post-COVID patients, gender-wise distribution. The incidence of Bell palsy in post-COVID patients according to age groups was calculated using the chi-square test. A comparison of the mean for age-wise distribution and distribution of post-COVID according to age groups and gender was made using an independent *t*-test [Figure 1].

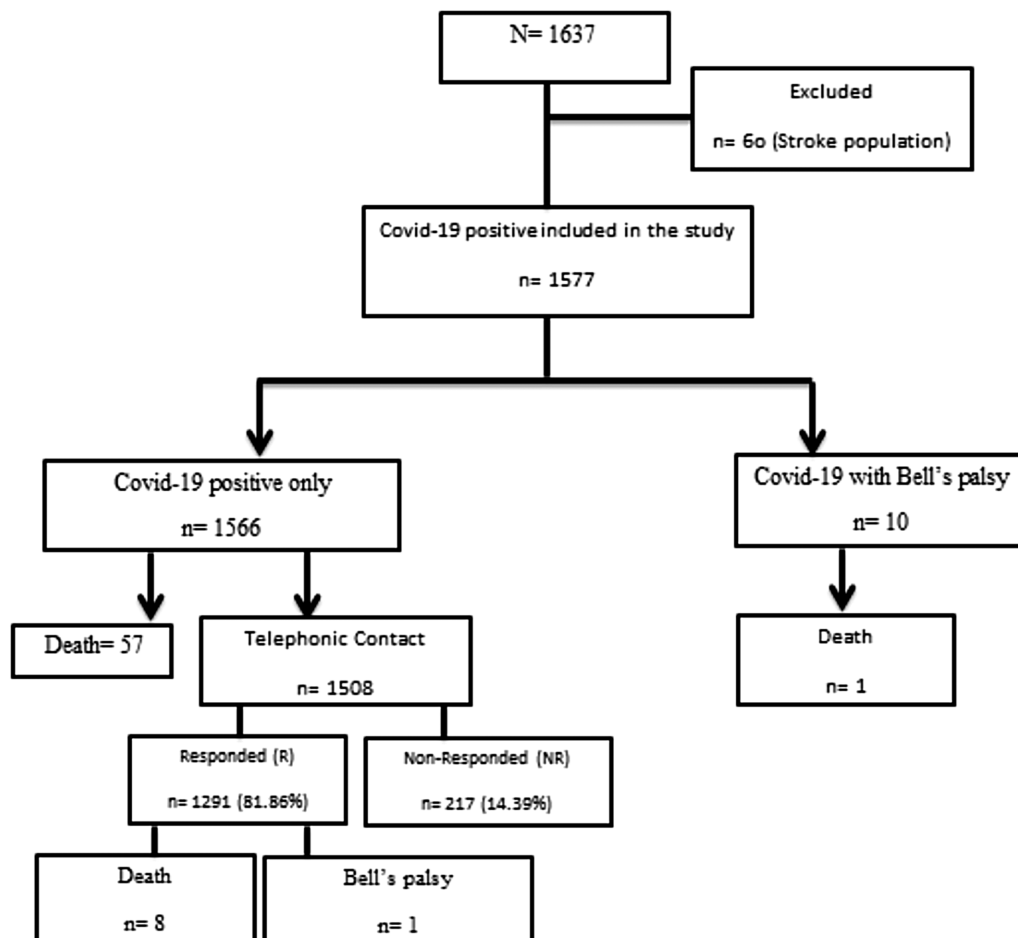


Figure 1: Flow chart.

The incidence rate will be calculated using the following formula,

$$\text{Incidence} = \frac{\text{Number of Bell palsy patients with a history of COVID - 19 infection}}{\text{Total number of Covid positive patients over a specific period of time}} \times 100$$

$$\text{Incidence} = \frac{11}{1577} \times 100 = 0.7\%$$

RESULTS

A total of 1637 participants diagnosed with COVID were included in the research. Sixty were diagnosed with post-COVID stroke and excluded from screening. The research comprised 1577 patients who satisfied the trial's eligibility requirements. Study findings showed that Bell palsy can develop during the COVID-19 clinical trial with a considerable increase in the incidence of Bell palsy from 0.04%^[2] to 0.7% in the population of South Bangalore, India.

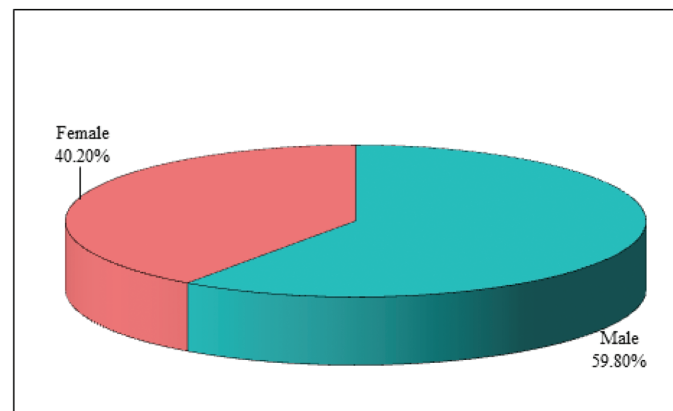
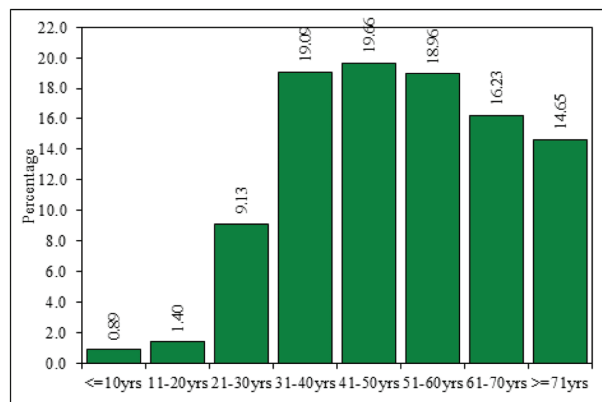
Study findings revealed a slight right-sided Bell palsy domination with nine cases of right-sided Bell palsy and two cases of left-sided Bell palsy (right = 81.81%, left = 18.2%). There is no side preference or gender preference in Idiopathic facial palsy. There were eight males (0.85%) and three females (0.47%) with no significant gender discrepancy ($P=0.38$) in Bell palsy cases. We discovered 66 deaths among COVID patients, representing 4.2%, as well as one death of a post-COVID patient having Bell palsy with a significance of 0.02. With a total of 1508 patients contacted through phone calls without the diagnosis of Bell palsy, 1291 patients responded, that is, 81.86% of whom were found to have been diagnosed with post-Covid Bell palsy and 217 patients had no response to calls, that is, 14.39%. Among 1291 responses, we had received eight death statuses post-COVID, that is, 0.08%. Five patients with Bell palsy had associated diabetes mellitus, that is, 2.08% and one with Bell palsy had associated hypertension, that is, 0.54%. When compared to patients who had not been diagnosed with Bell palsy but had a diagnosis of Bell palsy associated with comorbidities, there was a significant difference of $P=0.03$.

The mean age was 50.88 years, with the male age group with SD 16.24 and 51.13 years with the female age group with SD 17.81 [Table 1, Graph 1]. There was a slight gender disparity, with males 943 (59.80%) and females 634 (40.20%) [Table 1, Graph].

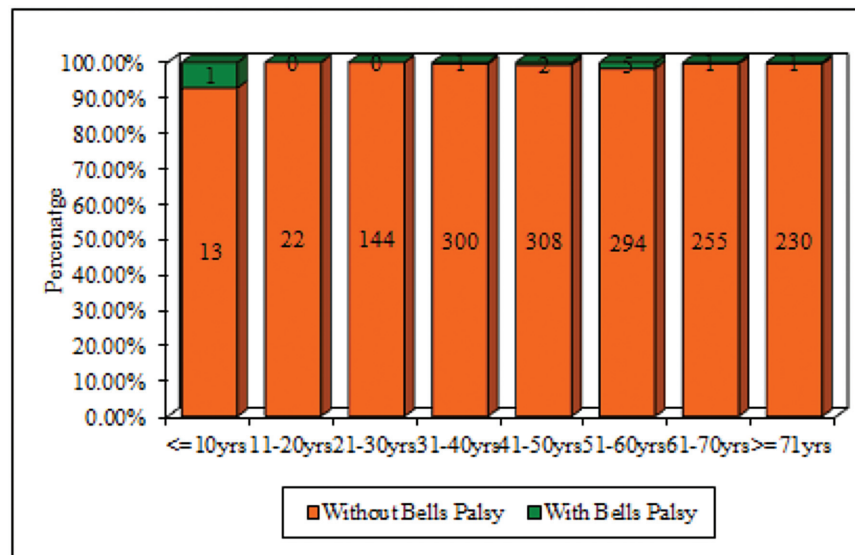
This retrospective review of Bell palsy cases revealed 11 instances during the COVID pandemic timeframe (Mar 2021–Feb 2022), where the total number of patients with COVID was 1577. This shows a percentage of Bell palsy cases as 0.70% [Table 2]. When this is retrospectively compared to data collected before COVID, it shows 0.04% of patients with Bell palsy. This demonstrates a considerable increase in Bell palsy patients during COVID. Incidences of Bell palsy in post-COVID patients were reported in one patient below 10 years of age, one patient between 31 and 40 years, two patients between 41 and 50 years, five patients between 51 and 60 years, one patient between 61 and 70 years, and one patient above 71 years of age with a significance of $P=0.03$ [Table 2, Graph 2].

Table 1: Age and gender-wise distribution

Age	No. of patient	Percentage of patient
≤10 yrs	14	0.89
11–20 yrs	22	1.40
21–30 yrs	144	9.13
31–40 yrs	301	19.09
41–50	310	19.66
51–60	299	18.96
61–70	256	16.23
≥71 yrs	231	14.65
Mean age	50.98	
SD age	16.89	
Total	1577	100.00
Gender	No. of patient	% of patient
Male	943	59.80
Female	634	40.20
Total	1577	100



Graph 1: Age and gender-wise distribution.



Graph 2: Incidence of Bell palsy in post-Covid patients according to age groups.

Table 2: Incidence of Bell palsy in post-COVID patients according to age groups

Age group	Without Bell palsy's	Percentage (%)	With Bell palsy	Percent (%)	Total	%
≤10 years	13	92.86	1	7.14	44	0.89
11–20	22	100	0	0.00	22	1.40
21–30	144	100	0	0.00	144	9.13
31–40	300	99.67	1	0.33	301	19.09
41–50	308	99.35	2	0.65	310	19.66
51–60	294	98.33	5	1.67	299	18.96
61–70	255	99.61	1	0.39	256	16.23
≥70	230	99.57	1	0.43	231	14.65
Total	1566	99.30	11	0.70	1577	100.00

Chi-square= 13.9170, $p = 0.0310$

DISCUSSION

Study findings show that Bell palsy can develop during the COVID-19 clinical trial with a considerable increase in the incidence of Bell palsy from 0.04% to 0.7% in the population of South Bangalore, India. In idiopathic facial palsy, the inadequate blood supply of vasa nervorum and inflammation-inducing demyelination determining an increase in D-dimer shall be assumed as potential mechanisms associated with neural injury. This increase in D-dimer is ambiguous, signaling an acute infectious event.^[11] However, in this study, the presence of COVID-19 antibodies and the absence of other infectious agents allow us to infer this association. Consistently reported vascular events and relative formation of microthrombi in several post-mortem studies may be responsible for developing the facial nerve ischemia in COVID.^[12] Hypercoagulability in a few COVID-19 patients resulted in vascular endothelial damage and associated thrombotic complications. This circumstance

determines the pathogenesis underpinning facial paralysis.^[13] Worsening of nerve functioning can result directly from viral injury or an autoimmune reaction that could trip a rise in neural inflame.^[14] It is unilateral, incomplete, or complete paralysis without any potential neurological complaints.^[2] Motor neurons infected by viral infections affecting the brainstem, seventh nerve ganglia, or by sustaining nerve tissue cells, also leading to subsequent inflammation and edema, causing facial paralysis by blocking the nerve functioning. Relatively, CoV is known to have a neuro-invasive property. The presence of recoverable viruses in the nasopharynx of asymptomatic patients may indicate the existence of the virus or signify an aggravation of a latent infection.^[1]

Bell palsy has several risk factors, dependent or independent, such as pregnancy, obesity, diabetes, chronic hypertension, severe preeclampsia, and upper respiratory ailments.^[15] Six patients with Bell Palsy were presented with comorbidities, that is, 0.84%, and five patients with Bell Palsy had no

comorbidities, that is, 0.58% without any significant difference ($P=0.5$). COVID-19 and SARSCoV-2 have an important feature, the neuro-invasive propensity, and these are also likely to have neurotrophic activities. The coronavirus's strong propinquity for ACE2 receptors, persistently seen in the nervous system, represents neurotropism by direct nerve injury, producing a cytokine storm and inflammatory flare. Most studies hypothesized that infection with COVID-19 is mostly accompanied by a decrease in lymphocytes, monocytes, and eosinophils, as well as a sharp decline in B cells, NK cells, CD4+T cells, and CD8+T cells. As a result, immune suppression increased susceptibility to infections, and reactivation of dormant illnesses may occur.^[1] Finally, damage to the nerve can be caused by the COVID-19 spike binding directly with glycolipids of the peripheral nerves.^[9] COVID-19-associated FNPs are now being reported increasingly, with majority of cases presenting as an initial symptom or developing within the first week of onset of COVID symptoms. Hence, we speculate on COVID-19's potential contribution to the rising incidence of Bell palsy. Family nurse practitioner (FNP) can occur at any moment in the clinical course of CoV infection; it can also develop as late as a month after diagnosis.^[16] Our study also found a case of Bell palsy manifested at 1 month of COVID infection, and the rest of the cases of Bell palsy developed within the course of hospital stay, that is, within 2 to 3 weeks. Another cohort study found that peripheral nervous system involvement in patients with COVID-19 was 8.9%. Numerous additional causes of facial paralysis were considered, but only COVID-19 was the prevalent cause. Even though Bell palsy can be caused by herpes simplex infection without any obvious signs, it was thought to be less likely in light of the pandemic. SARS-CoV-2 was, therefore, the main etiology to be taken into consideration. Other less plausible causes, in contrast to the pandemic, were also dropped. Nevertheless, it is still prudent to believe that the patient acquired the two ailments simultaneously.^[17] But in our study, the precipitating factor seems to be CoV infection. It has not been clear whether peripheral nerve damage, as an early neurologic complication of CoV disease, is caused by the direct viral invasion of the neuronal system or a reaction by the immune system. The underlying mechanisms explain the involvement of the nervous system in CoV patients. One mechanism includes the propagation of synapse and the ACE2 receptor access to the virus. Previous studies suggest neural death in mice caused by CoV, which can enter CNS through the ethmoid bone cribriform and further enter the olfactory neuroepithelia. /Theory of synaptic propagation/ states COVID could permeate through synaptic transmission from the olfactory nerve to the cardiorespiratory center. Based on this theory, SARSCoV-2 implies respiratory failures. SARS-CoV-2 might invade sensory or motor nerve endings directly by attaining axonal transport. The ACE2 receptor entranceway has been accepted in direct neural permeate contradiction. Further, it can affect macrophages to permeate through the Blood-Brain Barrier

(BBB). The neurotropic virus causes a proinflammatory state, contributing to neurological symptoms of the illness as seen by glial cell propagation and elevated cytokines. Since SARS-spike CoV-2's protein interacts with ACE 2 receptors, these receptors spread in glial cells and neurons in the CNS may serve as an entrance for neurological symptoms of CoV.^[18] /Cytokine storm/ might be the other mechanism referring to the involvement of vasa vasorum.^[19] Patients with COVID-19 were reported to have partial neuronal degeneration and edematous brain tissue post-autopsy.^[20] The plausibility of autoimmune etiology for facial nerve palsy was reduced by the absence of systemic involvement. Theophanous *et al.*^[21] report a case of PFNP in a 6-year-old boy. Figueredo *et al.*^[22] described another study of a pregnant woman with PFNP. Ribeiro and Marchiori^[23] described a case of a 26-year-old man. Ribeiro and Marchiori^[23] reported a case of a 26-year-old man. Goh *et al.*^[24] reported a case of PFP that developed in a 27-year-old male on the sixth day of CoV infection. CoV raised the incidence of PFP by comparing a timeframe of COVID-19 with non-CoV time and also emphasized PFP as the first presentation in CoV patients as reported by Zammit *et al.*^[25] and Codeluppi *et al.*^[26] Eight children with PFP associated with CoV described by Alessandra Iacono *et al.*^[9] presented a case of a 5-year-old boy with Bell palsy associated with post-CoV. Our study found a post-CoV Bell palsy case in a 3-year 7-month female, suggesting that COVID-associated Bell palsy can also affect the pediatric population. Our data indicate that there may be a high association between COVID-19 and Bell palsy, in addition to these case studies and case series published in the literature.

CONCLUSION

Even though the previously identified likely causes can bring on Bell palsy, peripheral facial palsy may be the only indication of COVID-19 disease. This might be caused by a COVID-19 infection-induced immune response or by the virus directly affecting the nervous system. Therefore, more investigation is required to demonstrate a causal relationship. Bell palsy could be considered one of the neurological complications among COVID-19 patients, and appropriate preventative measures should be taken.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Srinivas CV, Kauser S, Sangoli B. The surge of Bell's Palsy in COVID – the pandemic era. *Int J Otorhinolaryngol Head Neck Surg* 2020;6:2042-5.
2. Cirpaci D, Cm G. Recurrences of Bell's s palsy. *J Med Life* 2014; 7: 1-10.

3. Eviston TJ, Croxson GR, Kennedy PGE, Hadlock T, Krishnan AV, Hospital A. Bell's s palsy: etiology, clinical features, and multidisciplinary care. *J Neurol Neurosurg Psychiatry* 2015;86: 1356-61.
4. Ji X, Tan W, Zhang C, *et al.* TWIRLS, a knowledge-mining technology, suggests a possible mechanism for the pathological changes in the human host after coronavirus infection via A CE2. *Drug Dev Res* 2020;81:1004-18.
5. Wan Y, Cao S, Wang M, Huang Y. Coronavirus disease 2019 complicated with Bell's Palsy: a case report. *Res Square* 2020;4-9. DOI: 10.21203/rs.3.rs-23216/v1
6. Mao L, Jin H, Wang M, *et al.* Neurologic manifestations of hospitalized patients with coronavirus disease 2019 in Wuhan, China. *JAMA Neurol* 2020;77:683-0.
7. Egilmez OK. Can COVID-19 Cause Peripheral Facial Nerve Palsy? *SN Compr Clin Med* 2021;3:1707-13.
8. Tamaki A, Cabrera CI, Li S, *et al.* Incidence of Bell palsy in patients with COVID-19. *JAMA Otolaryngol Head Neck Surg* 2021;147:767-8.
9. Iacono A, Pennisi E, Benincasa C, Marchetti F. A case of facial nerve palsy in a pediatric patient associated with Covid â 19. *Ital J Pediatr* 2022;48:75.
10. Jeong J, Yoon SR, Lim H, Oh J, Choi HS. Risk factors for Bell's Palsy based on the Korean National Health Insurance Service National Sample Cohort data. *Sci Rep* 2021;11:9-14.
11. Conte G, Cei M, Evangelista I, *et al.* The Meaning of D-Dimer value in Covid-19. *Clin Appl Thromb Hemost* 2021;27:10760296211017668.
12. Duarte-neto AN, Monteiro RAA, Silva LFF, *et al.* Pulmonary and systemic involvement in COVID-19 patients assessed with ultrasound-guided minimally invasive autopsy. *Histopathology* 2020;77:186-97.
13. Lee SG, Fralick M, Mdcn MS. Coagulopathy associated with COVID-19. *CMAJ* 2020;192:E583.
14. Lima MA, Silva MTT, Soares CN, *et al.* Peripheral facial nerve palsy associated with COVID-19. *J Neurovirol* 2020;26:941-4.
15. Baugh RF, Basura GJ, Ishii LE, *et al.* Clinical practice guideline: bell's palsy executive summary. *Otolaryngol Head Neck Surg* 2013; 149:656-3.
16. Oke IO, Oladunjoye OO, Oladunjoye AO, Paudel A, Zimmerman R. Bell's s Palsy as a late neurologic manifestation of COVID-19 infection. 2021;13:13-6.
17. Eid MM. Bell's s Palsy Caused by SARS-CoV-2. *Case Rep Acute Med* 2021;4:91-4.
18. Wu Y, Xu X, Chen Z, Duan J, Hashimoto K, Yang L. Brain, Behavior, and Immunity Nervous system involvement after infection with COVID-19 and other coronaviruses. *Brain Behav Immun.* 2020;87:18-22. Available from: <https://doi.org/10.1016/j.bbi.2020.03.031>
19. Netland J, Meyerholz DK, Moore S, Cassell M, Perlman S. Severe Acute Respiratory Syndrome Coronavirus Infection Causes Neuronal Death in the Absence of Encephalitis in Mice Transgenic for Human A CE2. *J Virol* 2008;82:7264-75.
20. Xu Z, Shi L, Wang Y, *et al.* Case report pathological findings of COVID-19 associated with acute respiratory distress syndrome. *Lancet Respir* 2020;8(4):420-2. Available from: [http://dx.doi.org/10.1016/S2213-2600\(20\)30076-X](http://dx.doi.org/10.1016/S2213-2600(20)30076-X).
21. Cavalcante TM, Gubert VT, Lima CD, Luciano LA, Croda MG, Venturini J, Gasparoto AL, Santiago WM, Motta-Castro AR, Reis FP, Marques AP. Late peripheral facial paralysis after COVID-19: a rapid systematic review and two case reports. *Journal of Venomous Animals and Toxins including Tropical Diseases.* 2022;28.
22. Figueiredo R, Falcão V, Pinto MJ, Ramalho C. Peripheral facial paralysis as presenting symptom of COVID-19 in a pregnant woman. *BMJ Case Rep* 2020;13:13-5.
23. de Freitas Ribeiro BN, Marchiori E. Facial palsy as a neurological complication of SARS-CoV-2. *Arquivos de Neuro-Psiquiatria* 2020; 78:667.
24. Goh Y, Beh DL, Makmur A, Somani J, Chan AC. Pearls and oy-sters: facial nerve palsy as a neurological manifestation of Covid-19 infection. *Neurology.* 2020.
25. Zammit M, Markey A, Webb C. A rise in facial nerve palsies during the coronavirus disease 2019 pandemic. *J Laryngol Otol* 2020;1:4-7.
26. Codeluppi L, Venturelli F, Rossi J, *et al.* Facial palsy during the COVID-19 pandemic. *Brain Behav* 2021;11:e01939.