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Impact of the COVID-19 Pandemic on Emergency Department Visits for Idiopathic Facial Nerve Palsy: An Interrupted Time-Series Analysis

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Abstract

This study evaluated the impact of the COVID-19 pandemic and related social restrictions on emergency department (ED) visits for idiopathic facial nerve palsy (IFNP). A retrospective observational analysis was conducted on a consecutive cohort of patients presenting to a hospital ED from January 1, 2015, to December 31, 2021. Monthly ED visit rates for IFNP were compared before and after the onset of the pandemic and the national lockdown in March 2020 using interrupted time-series analysis. Data were standardized to 1,000 ED visits per month. Among 248,606 total ED visits during the study period, 266 (0.11%) were due to IFNP. No significant change in standardized ED visits for IFNP was observed immediately following the pandemic's onset (1.08/1,000 visits; 95% CI: -0.06 to 2.23; p=0.063). However, a significant reduction in visit rates was noted in the months following March 2020 (-0.08/1,000 visits; 95% CI: -0.15 to -0.002;

p=0.043). The decline in IFNP ED visits likely reflects the protective effects of social distancing measures, face mask usage, and reduced viral transmission during the pandemic. These findings challenge claims of increased IFNP risk associated with SARS-CoV-2 infection or vaccination. Furthermore, the results support the hypothesis that neurotropic viruses contribute to the pathogenesis of IFNP and highlight the role of public health measures in reducing disease incidence. This study provides novel insights into the indirect benefits of pandemic-related interventions on viral-associated conditions such as IFNP.

Introduction

Idiopathic facial nerve palsy (IFNP), commonly referred to as Bell's palsy, is the leading cause of sudden peripheral facial paralysis. It affects approximately 15 to 30 individuals per 100,000 annually and presents as unilateral facial muscle weakness or paralysis. The condition is frequently associated with viral reactivation, particularly herpes simplex virus type 1 (HSV-1), although other viral pathogens, including herpes zoster, cytomegalovirus, Epstein-Barr virus, and influenzavirus, have been implicated **[1–9]**. Transmission pathways often involve oral-oral contact or airborne exposure, with HSV-1 reactivation being a prominent suspect. Despite supporting evidence from serological studies and viral DNA detection in affected nerves **[3–5]**, the pathophysiological link between HSV-1 and IFNP remains under debate **[6]**.

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, significantly disrupted healthcare access and social interactions worldwide. Measures such as lockdowns, curfews, and widespread mask usage were introduced to limit viral spread, indirectly affecting the transmission of other communicable diseases. These interventions also heightened public reluctance to seek hospital-based care due to fears of infection, potentially influencing the frequency of emergency department (ED) visits **[11]**.

There is conflicting evidence regarding the relationship between SARS-CoV-2 infection or COVID-19 vaccination and IFNP risk. While some studies suggest a possible association **[12–16]**, these findings often vary due to methodological differences, follow-up duration, and diagnostic criteria. Conversely, the protective effect of pandemic-related measures, such as reduced viral exposure through social distancing and mask usage, might have led to a decline in IFNP cases caused by other airborne neurotropic viruses.

This study aims to address these uncertainties by analyzing trends in ED visits for IFNP across a seven-year period encompassing the COVID-19 pandemic. Using interrupted time-series analysis (ITSA), we evaluated the impact of the pandemic and associated public health measures on standardized ED visit rates for IFNP.

Methods

Study design and setting

This study employed a retrospective observational design, analyzing a consecutive cohort of patients who presented to the ED of the General Hospital of Merano, Italy, between January 1, 2015, and December 31, 2021. Located in the Alpine region of northern Italy, the hospital serves approximately 100,000 residents and accommodates a significant influx of tourists, accounting for an estimated 2.5 million overnight stays annually.

Patients arriving at the ED are triaged according to the Manchester Triage System (MTS) and subsequently directed to specialized departments based on clinical needs. Cases of idiopathic facial nerve palsy (IFNP) are typically assessed by neurologists and/or otolaryngologists. Comprehensive ED records are systematically archived in a digital database, ensuring data reliability and accessibility.

Despite the COVID-19 pandemic, the ED remained fully operational 24/7. Nationwide lockdown measures, including travel restrictions and social distancing, were enforced in Italy beginning March 9, 2020, marking a key time point for this analysis.

Patients and Data Collection

Patient data were extracted from the hospital's digital database using QlickView management software. Cases of IFNP were identified based on clinical diagnosis, and all records were independently reviewed by an experienced neurologist to confirm diagnostic accuracy.

To account for variations in total ED attendance over time, monthly IFNP visit rates were standardized using the formula:

$$Standardized\ ED\ visits\ for\ PFP = \left(\frac{ED\ accesses\ for\ PFP}{number\ of\ access\ per\ month}\right) x\ 1000$$

Patients and Data Collection

An interrupted time-series analysis (ITSA) **[17-19]** was performed to evaluate the impact of the COVID-19 pandemic and its related social restrictions on standardized ED visits for IFNP. This quasi-experimental design identifies changes in trends by comparing pre- and post-intervention periods, with the intervention being the pandemic onset and associated lockdown measures in March 2020.

The analysis divided the study period into two phases: the pre-pandemic period (January 1, 2015, to February 28, 2020) and the post-pandemic period (March 1, 2020, to December 31, 2021). Changes in the direction, magnitude, and shape of monthly IFNP visit trends were assessed across these phases, with comparisons made between pre-pandemic trends and both immediate and longer-term post-pandemic changes.

Data analyses were conducted using STATA 16.0, with a significance threshold set at $p<0.05$.

Ethical considerations

This study adhered to the ethical principles outlined in the Declaration of Helsinki and received approval from the Local Ethics Committee of the Azienda Sanitaria dell'Alto Adige, Bolzano, Italy (approval number 57-2020).

Results

From January 1, 2015, to December 31, 2021, a total of 248,606 ED visits were recorded at the General Hospital of Merano. Among these, 266 cases (0.11%) were attributed to idiopathic facial nerve palsy (IFNP). Monthly ED visit rates for IFNP were standardized per 1,000 visits to account for fluctuations in total ED access over time.

Interrupted time-series analysis revealed no significant change in standardized ED visits for IFNP immediately following the onset of the COVID-19 pandemic in March 2020 compared to the pre-pandemic period (1.08/1,000 visits; 95% CI: -0.06 to 2.23; p=0.063). However, a

significant reduction in visit rates was observed in the months following the initial lockdown. Comparing March 2020 with the subsequent trend, ED visits for IFNP decreased by -0.08/1,000 visits (95% CI: -0.15 to -0.002; p=0.043) (Figure 1).

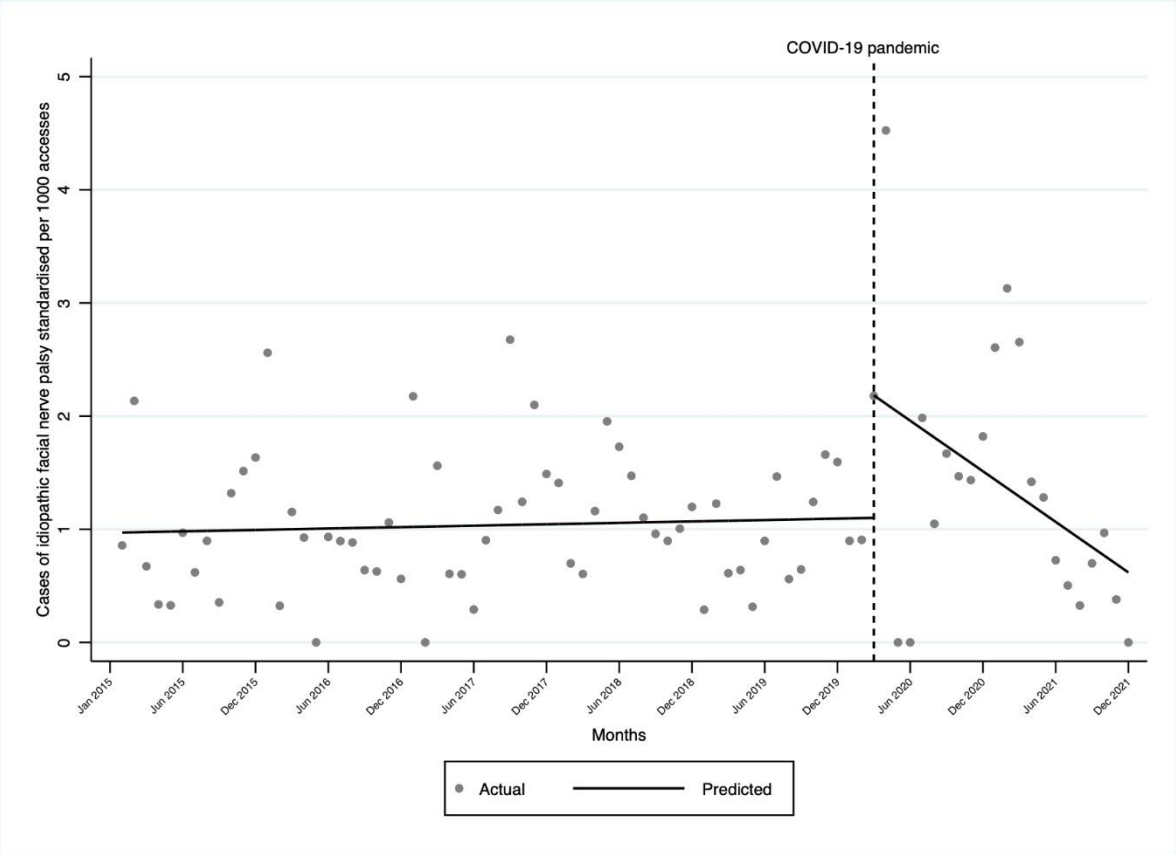

Figure 1: Interrupted time series analysis assessing the rate ED visits for IFNP per 1000 monthly accesses.

Standardized visit rates for IFNP remained relatively stable during the pre-pandemic period. Following the implementation of pandemic-related social restrictions, a downward shift in the trend was detected, suggesting reduced incidence or altered healthcare-seeking behavior during this period.

While the immediate impact of the pandemic on IFNP-related ED visits was not statistically significant, the subsequent trend demonstrated a moderate but meaningful decline. These findings indicate that pandemic-related measures, such as social distancing and mask usage, likely contributed to this reduction by limiting exposure to airborne or orally transmitted neurotropic viruses.

Discussion

This study explored the impact of the COVID-19 pandemic and its associated public health measures on ED visits for idiopathic facial nerve palsy (IFNP). By ITSA, we observed a moderate reduction in standardized ED visit rates for IFNP during the post-lockdown period, despite no immediate change following the pandemic's onset in March 2020.

The findings align with the hypothesis that pandemic-related interventions, such as social distancing and widespread mask usage, reduced the transmission of airborne and orally transmitted neurotropic viruses, including HSV-1 **[3–5,10]**. These viruses are frequently implicated in the pathogenesis of IFNP, and their diminished spread may explain the decline in IFNP cases during this period.

Reports of an increased risk of IFNP following SARS-CoV-2 infection or COVID-19 vaccination remain contentious **[12–16]**. Discrepancies in findings across studies likely reflect differences in methodology, follow-up duration, and diagnostic accuracy. Our data do not support a significant rise in IFNP cases related to COVID-19 or its vaccines, particularly as no vaccines were available during the early lockdown phase analyzed in this study.

Reduced ED visits during the pandemic may also reflect changes in healthcare-seeking behavior rather than an actual decrease in IFNP incidence. Public apprehension regarding hospital visits due to potential SARS-CoV-2 exposure may have led some patients to seek alternative care through primary physicians or outpatient settings. However, given the acute and often dramatic presentation of IFNP, it is unlikely that a significant number of cases went unaddressed.

The retrospective nature of this study introduces certain limitations. The lack of granular data on individual patient characteristics, including vaccination status or reasons for ED attendance, precludes a comprehensive evaluation of potential contributing factors. Regional differences and the study's single-center design may also limit the generalizability of our findings to other populations.

Despite these limitations, this study is the first to investigate trends in IFNP-related ED visits using ITSA with data standardized for total ED attendance. Diagnostic accuracy was ensured through detailed chart reviews by neurologists, avoiding potential errors from reliance on administrative coding alone.

Our findings contribute to the growing body of evidence suggesting a viral etiology for IFNP and emphasize the role of public health measures in mitigating disease transmission. By reducing the prevalence of neurotropic viruses, interventions such as social distancing and mask mandates may have indirectly decreased the incidence of IFNP.

Conclusion

The COVID-19 pandemic and related public health measures moderately reduced ED visits for IFNP, likely through decreased viral transmission. These findings challenge the hypothesis of an increased IFNP risk associated with SARS-CoV-2 infection or vaccination and provide indirect support for a viral etiology of IFNP. Future studies should examine the long-term effects of pandemic-related interventions on IFNP and other viral-associated conditions.

Declarations

Conflict of Interest

The Authors declare that there is no conflict of interest.

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The authors have no funding sources to report.

Author Contributions

Francesco Brigo: Conceptualization, Methodology, Investigation, Supervision, Data curation, Writing-Original draft preparation; **Serena Sibilio:** Investigation; **Gianni Turcato:** Investigation; **Arian Zaboli:** Conceptualization, Methodology, Investigation, Formal analysis, Data curation, Writing-Original draft preparation

References

1. Hauser WA, Karnes WE, Annis J, Kurland LT (1971) Incidence and prognosis of Bell's palsy in the population of Rochester, Minnesota. Mayo Clin Proc 46:258-264
2. Morris AM, Deeks SL, Hill MD, Midroni G, Goldstein WC, Mazzulli T, Davidson R, Squires SG, Marrie T, McGeer A, Low DE (2002) Annualized incidence and spectrum of illness from an outbreak investigation of Bell's palsy. Neuroepidemiology 21(5):255-61. DOI: 10.1159/000065645
3. Adour KK, Bell DN, Hilsinger RL Jr (1975) Herpes simplex virus in idiopathic facial paralysis (Bell palsy). JAMA. 233(6):527-30.
4. Murakami S, Mizobuchi M, Nakashiro Y, Doi T, Hato N, Yanagihara N (1996) Bell palsy and herpes simplex virus: identification of viral DNA in endoneurial fluid and muscle. Ann Intern Med. 124(1 Pt 1):27-30. DOI: 10.7326/0003-4819-124-1_part_1-199601010-00005
5. Schirm J, Mulkens PS (1997) Bell's palsy and herpes simplex virus. APMIS. 105(11):815-23. DOI: 10.1111/j.1699-0463.1997.tb05089.x
6. Kennedy PG (2010) Herpes simplex virus type 1 and Bell's palsy-a current assessment of the controversy. J Neurovirol. 16(1):1-5. DOI: 10.3109/13550280903552446
7. Morgan M, Nathwani D (1992) Facial palsy and infection: the unfolding story. Clin Infect Dis. 14(1):263-71. DOI: 10.1093/clinids/14.1.263

8. Peitersen E (2002) Bell's palsy: the spontaneous course of 2,500 peripheral facial nerve palsies of different etiologies. Acta Otolaryngol Suppl. 549:4-30.
9. Monini S, Lazzarino AI, Iacolucci C, Buffoni A, Barbara M (2010) Epidemiology of Bell's palsy in an Italian Health District: incidence and case-control study. Acta Otorhinolaryngol Ital. 30(4):198.
10. Corey L, Spear PG (1986) Infections with herpes simplex viruses (1). N Engl J Med. 314(11):686-91.
11. Zaboli A, Brigo F, Sibilio S, Fanni Canelles M, Rella E, Magnarelli G, Pfeifer N, Turcato G (2022) The impact of COVID-19 pandemic on the urgency of patients admitted to the emergency department. Int Emerg Nurs. 65:101229. DOI: 10.1016/j.ienj.2022.101229
12. Gupta S, Jawanda MK, Taneja N, Taneja T (2021) A systematic review of Bell's Palsy as the only major neurological manifestation in COVID-19 patients. J Clin Neurosci. 90:284-292. DOI: 10.1016/j.jocn.2021.06.016
13. Lai YH, Chen HY, Chiu HH, Kang YN, Wong SB (2022) Peripheral Nervous System Adverse Events after the Administration of mRNA Vaccines: A Systematic Review and Meta-Analysis of Large-Scale Studies. Vaccines (Basel). 10(12):2174. DOI: 10.3390/vaccines10122174
14. Gordon AJ, Varelas A, Eytan DF (2023) Bell's Palsy After Vaccination Against Covid-19: A Systematic Review and Meta-analysis. Otolaryngol Head Neck Surg. doi: 10.1002/ohn.385.
15. Soltanzadi A, Mirmosayyeb O, Momeni Moghaddam A, Ghoshouni H, Ghajarzadeh M (2023) Incidence of Bell's palsy after coronavirus disease (COVID-19) vaccination: a systematic review and meta-analysis. Neurologia (Engl Ed). 9:S2173-5808(23)00038-X. DOI: 10.1016/j.nrleng.2023.06.002
16. Rafati A, Pasebani Y, Jameie M, Yang Y, Jameie M, Ilkhani S, Amanollahi M, Sakhaei D, Rahimlou M, Kheradmand A (2023) Association of SARS-CoV-2 Vaccination or Infection With Bell Palsy: A Systematic Review and Meta-analysis. JAMA Otolaryngol Head Neck Surg. 149(6):493-504. DOI: 10.1001/jamaoto.2023.0160

17. Bernal JL, Cummins S, Gasparrini (2017). Interrupted time series regression for the evaluation of public health interventions: a tutorial. Int J Epidemiol. 46:348-355. DOI: 10.1093/ije/dyw098
18. Turcato G, Zaboli A, Luchetti A, Sighele F, Sibilio S, Donato C, et al (2022) "Effect of the SARS-COV-2 pandemic outbreak on the emergency department admission for an acute psychiatric condition". J Psychiatr Res. 151:626-632. DOI: 10.1016/j.jpsychires.2022.05.035
19. Brigo F, Zaboli A, Rella E, Sibilio S, Canelles MF, Magnarelli G, et al (2022) The impact of COVID-19 pandemic on temporal trends of workplace violence against healthcare workers in the emergency department. Health Policy. 126:1110-1116. DOI: 10.1016/j.healthpol.2022.09.010