

# Association of COVID-19 vaccination and Bell's palsy in a Philippine tertiary hospital

April Grayle M. Taclobao MD, Golden Tamon-Gayo MD MPH, Laurence Kristoffer J. Batino MD MPM, Maria Socorro Florendo-Sarfati MD FPNA

<sup>1</sup>Baguio General Hospital and Medical Center, Department of Neurosciences, Baguio City, Philippines.

## Abstract

**Background:** Bell's palsy or peripheral facial palsy after coronavirus-19 (COVID-19) vaccination is relatively rare and presents only as an adverse event that resolves spontaneously. The increasing reports of Bell's palsy after immunization shows an increased risk and this hinders some individuals from acquiring vaccination in this certain time of pandemic. **Methods:** This case-control study was performed from September 2021 to March 2022, at the emergency and outpatient departments of a tertiary hospital in the Philippines to determine the association of COVID-19 vaccination and Bell's palsy. Patients diagnosed with facial nerve palsy were matched by age, sex, and date of consult with control patients admitted for other reasons. The proportion of patients with Bell's palsy after vaccination was compared between groups, and odds ratio for exposure to the vaccine was calculated. A secondary comparison with the overall number of patients with facial nerve palsy in preceding years was also performed. **Results:** Thirty-one patients were evaluated for new-onset facial nerve palsy during the study period. The mean (SD) patient age was 42.9 (15.6) years, wherein 12 (37.8%) were males and 19 (61.3%) were females. Out of the 31 patients, 8 (25.8%) had hypertension, 3 (9.7%) had diabetes mellitus, 1 (3.2%) had dyslipidemia and 2 (6.5%) had previous episode of peripheral nerve palsy. Of the vaccinated cases, 5 (62.5%) received Sinovac, 2 (25%) received the Pfizer-BioNTech vaccine and 1 (12.5%) had Moderna. Comparing recently vaccinated (8 of 31 [25.8%]) with unvaccinated (23 of 31 [74.2%]) patients showed no meaningful difference in age (mean [SD], 46.5 [11.7] vs 40 [16.6] years;  $P = 0.92$ ), or sex (5 [62.5%] male, 3 [37.5] female) vs 7 [30.4%] male, 16 [69.6] female;  $P = 0.10$ ). The mean (SD) time from vaccination was 6.1 (4.5 [range, 1-14]) days. The calculated OR for exposure to the vaccine among cases was 0.91 (95% CI, 0.40-1.99;  $P = 0.76$ ). Furthermore, a relatively stable trend of cases of Bell's palsy was seen during the same period in the preceding years (mean [SD], 27.5 [3.4] cases; median, 28 [range, 23-29] cases).

**Conclusion:** This study revealed no significant association between new-onset Bell's palsy and recent vaccination with COVID-19 vaccines. However, it is important to note that Bell's palsy can be an adverse effect of COVID-19 immunization and is a typically benign condition with excellent prognosis. The protective effects of COVID-19 vaccination outweigh the risk of this generally self-limiting treatable adverse effect.

**Keywords:** COVID-19, facial nerve palsy, Bell's palsy, pharmacovigilance, COVID-19 Vaccine

## INTRODUCTION

Idiopathic peripheral facial nerve palsy or commonly known as Bell's palsy manifests as a transient unilateral facial paralysis that may resolve spontaneously without treatment within a 6 month period.<sup>1</sup> It may be caused by an infection, ischemia or immune mechanisms but exact causation remains unclear.<sup>2</sup> Different etiologies may contribute to Bell's palsy like herpes zoster infection, diabetes, pregnancy<sup>3</sup> or post influenza

vaccination.<sup>4</sup> Recently, the administration of coronavirus disease 2019 (COVID-19) vaccine was instituted worldwide and some reports revealed facial nerve palsy after immunization.<sup>5</sup> Bell's palsy after coronavirus-19 (COVID-19) vaccination is relatively rare and may present as a transient adverse event following immunization. Incidence of Bell's palsy was noted to be 1.5 – 3 times higher following COVID-19 mRNA vaccines in some reports.<sup>6,7</sup>

*Address correspondence to:* Laurence Kristoffer Batino, 1Baguio General Hospital and Medical Center, Department of Neurosciences, Baguio City, Philippines. Email: lkbatino@gmail.com

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## METHODS

We conducted a retrospective study of all the cases seen with new-onset peripheral facial nerve palsy from September 2021 to March 2022 in the Emergency and Outpatient Departments of a tertiary hospital in the Philippines. This was compared to the same cases seen in the preceding three years based on the institution's medical records. Data were collected by a computerized hospital system according to International Classification of Diseases, Ninth Revision, code 351.0 (Bell palsy).

Included were all patients who were older than 18 years and of any medical status. Controls were patients who had been admitted to the same Emergency Department and Outpatient Department for any reason other than facial nerve palsy and were matched for age, sex, and admission date within 24 hours. Controls were matched for date of admission because seasonality is a risk factor for peripheral nerve palsy, and matching excluded this as a possible bias between groups. Vaccines were also being offered in the Philippines during this time, and later admission predisposed a given patient to a higher chance of being vaccinated. Matching for admission date was a way to ensure that timing was not a possible factor for bias.

The percentage of patients exposed to the COVID-19 vaccines (first or second dose) within the previous six months in both groups was calculated and the odds ratio (OR) for exposure were compared with corresponding 95% CIs. Age, sex, and seasonality are risk factors for facial nerve palsy and are inherently controlled for by the study design; however, existence of immune- or inflammatory-related disorders, diabetes, and a previous episode of peripheral nerve palsy are also implicated as possible risk factors. As a secondary analysis, all cases of facial nerve palsy during the same period (September to March of the succeeding year) in the three preceding years were extracted according to International Classification of Diseases, Ninth Revision, codes and compared with September 2021 to March 2022. The months of September to March were selected because the national vaccination campaign in the Philippines has reached 97% of its target population by March 2022.<sup>26</sup> Thus, post-vaccination adverse events should be evident during this period. For this analysis, the data are presented as they are and no statistical analyses for the overall trend was done.

The patients who were diagnosed with post-vaccination Bell's palsy were diagnosed clinically

and they presented purely with peripheral facial motor weakness. House-Brackmann scoring for Bell's palsy was used to evaluate severity of the facial nerve palsy.<sup>25</sup> There were no other accompanying signs and symptoms. Electrodiagnostic testing and neuroimaging were not done. All patients were treated with prednisone at 60 mg/day for 5 days, then reduced by 10 mg per day (for a total treatment time of 10 days).<sup>2,9</sup> Eye care by eye patching and lubrication was also applied. Patients were also referred for physical therapy. The type of vaccine used, latency from the vaccination, severity of facial palsy, and clinical outcome were also recorded.

### Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics, version 25 (IBM Corp). Categorical variables were compared using the  $\chi^2$  test. Continuous variable distributions were tested for normality by the Shapiro-Wilk test. Independent 2-tailed t tests were conducted for continuous variables with a normal distribution and the Mann-Whitney test for continuous variables with a non-normal distribution. The OR for exposure to the vaccine was calculated with the corresponding 95% CI. Two-sided  $P < 0.05$  was considered statistically significant. For sample calculation, a case-control model was used with a CI of 0.95 and power was set at 80%. Assuming an exposed proportion of 0.6 among the controls and an expected OR of 4.00, the total sample size needed (in both groups) to detect a significant association was calculated to be 70 patients. Sample size calculations were performed using OpenEpi version 3, open source calculator.

## RESULTS

A total of 31 patients were evaluated for new-onset facial nerve palsy during the study period. The mean (SD) patient age was 42.9 (15.6) years, wherein 12 (37.8%) were males and 19 (61.3%) were females. Out of the 31 patients, 8 (25.8%) had hypertension, 3 (9.7%) had diabetes mellitus, 1 (3.2%) had dyslipidemia and 2 (6.5%) had previous episode of peripheral nerve palsy.

A detailed description of the patients who developed acute-onset Bell's palsy after recent COVID-19 vaccination is provided in Table 1. Of the vaccinated cases, 5 (62.5%) received Sinovac, 2 (25%) received the Pfizer-BioNTech vaccine and 1 (12.5%) had Moderna. Comparing recently vaccinated (8 of 31 [25.8%]) with unvaccinated (23 of 31 [74.2%]) patients showed no meaningful

**Table 1: Characteristics of patients with new-onset Bell's palsy after recent COVID-19 vaccination**

Patient No.	Co-morbidities	Laterality	COVID-19 vaccine	Latency from vaccination	House-Brackmann grade	Outcome at last follow-up
1	None	Right	Sinovac	3 days	II	Recovered
2	None	Right	Moderna	1 day	II	Partially recovered
3	Hypertension	Right	Sinovac	14 days	III	Partially recovered
4	Hypertension, dyslipidemia	Right	Sinovac	10 days	III	Partially recovered
5	Hypertension	Right	Sinovac	7 days	II	Recovered
6	Hypertension, diabetes mellitus	Right	Sinovac	8 days	IV	Partially recovered
7	None	Right	Pfizer	4 days	II	Partially recovered
8	None	Right	Pfizer	2 days	II	Recovered

difference in age (mean [SD], 46.5 [11.7] vs 40 [16.6] years;  $P = .92$ ), or sex (5 [62.5%] male, 3 [37.5] female) vs 7 [30.4%] male, 16 [69.6] female;  $P = .10$ ). The mean (SD) time from vaccination was 6.1 (4.5 [range, 1-14]) days.

Overall, 8 of 31 individuals (25.8%) with facial nerve palsy were recently vaccinated with the first or second dose of COVID-19 vaccine, compared with 21 of 73 (28.8%) in the control group (Table 2). The calculated OR for exposure to the vaccine among cases was 0.91 (95% CI, 0.40-1.99;  $P = 0.76$ ).

Moreover, we compared the overall number of patients with new-onset Bell's palsy with that of preceding years, before the advent of the COVID-19 vaccination campaigns. Table 3 shows the number of cases of facial nerve palsy diagnosed during September 2021 and March of 2022 and in the same period during the 3 preceding years. A similar volume of admissions was seen in September 2021 to March 2022 for facial nerve palsy compared with preceding years (mean [SD], 27.5 [3.4] cases; median, 28 [range, 23-29] cases).

**Table 2: Distribution of vaccinated and non-vaccinated patients among cases with new-onset Bell's palsy and matched controls**

Group of patients	Number of cases	Number of controls	Total
Vaccinated	8	21	29
Non-vaccinated	23	52	75
Total	31	73	104

## DISCUSSION

In this study, the occurrence of acute-onset Bell's palsy was evaluated for an association with recent COVID-19 vaccinations. In a case-control comparison with controls matched for age, sex, and date of admission, no association between Bell's Palsy and vaccination status was observed. In addition, when comparing the number of patients admitted for facial nerve palsy during the same period in the three preceding years, a similar volume of cases is seen.

The diagnosis of Bell's palsy is fundamentally established based on clinical manifestations, and cannot be confirmed by any specific laboratory test. It is characterized by rapidly progressive (less than 72 hours), unilateral, and generally self-limited symptoms that resolve within 3-6 months in majority of cases.<sup>8</sup> Its etiology is uncertain and it may be triggered by numerous causes.<sup>9</sup>

The mechanism of Bell's palsy in patients following vaccination is unclear. One hypothesis links the trigger of Bell's palsy with an autoimmune

**Table 3: Cases of Bell's palsy in September 2021 to March 2022 and during the same period in the 3 preceding years**

Year	Number of cases	Age, mean (SD), in years	Male, No. (%)	Female, No. (%)
September 2017 – March 2018	23	46.2 (17.4)	7 (30.4)	16 (69.6)
September 2018 – March 2019	27	43 (14.2)	13 (48.1)	14 (51.9)
September 2019 – March 2020	29	42.6 (14.7)	15 (51.7)	14 (48.3)
September 2021 – March 2022	31	42.9 (15.6)	12 (37.8)	19 (61.3)

phenomenon occurring via either mimicry of host molecules by the vaccinal antigen or bystander activation of dormant autoreactive T cells.<sup>10</sup> Other proposed mechanisms include reactivation of latent herpes simplex type 1 infections of the geniculate ganglia of facial nerves<sup>11-13</sup> and an immune-mediated segmental demyelination similar to Guillain-Barré syndrome.<sup>14,15</sup> It is also known that inactivated virus in vaccines produced against viral infections such as influenza consists of a variety of viral antigens that can alter the immune response in a wider group of patients.<sup>16</sup> By contrast, the COVID-19 vaccine might induce innate immune activation and production of interferon proteins by a combined effect of mRNA and lipids.<sup>17</sup> Several reports have linked interferon therapy to the development of facial nerve palsy.<sup>18</sup> Although several potential individual pathways including viral, autoimmune reaction, or innate immune activation have been hypothesized to cause post-COVID-19 vaccination Bell's palsy, such mechanisms may be multicausal and are unlikely to be applicable to all cases, such as onset with varying intervals after vaccination. Further investigation should be done to verify the mechanism of Bell's palsy following COVID-19 vaccination.

After several cases of Bell's palsy have been reported during the phase 3 clinical trials of COVID-19 vaccinations conducted in the United States – four following administration of Pfizer/BioNTech BNT162b2 and three cases following administration of Moderna mRNA-1273<sup>19,20</sup> – multiple case reports of Bell's palsy following COVID-19 vaccination have since been published, leading to larger population-based studies.<sup>21-22</sup> The findings of a population-based study in Hong Kong also showed an increased risk of Bell's palsy following CoronaVac (Sinovac) vaccination and

most of the clinically confirmed Bell's palsy cases from the voluntary reporting surveillance system occurred within 21 days after vaccination.<sup>23</sup>

Other research has produced conflicting results in which has not found any association between COVID-19 vaccination and incidence of Bell's palsy.<sup>19-21</sup>

FDA recommendations and existing evidence show the importance of monitoring for the development of Bell's palsy symptoms during the 60 days following COVID-19 vaccination.<sup>24</sup> However, it is important to note that Bell's palsy is a typically benign condition with excellent prognosis.

This study has several limitations. First, the study population was only limited to one tertiary hospital in the Philippines. Second, only the effects of recent vaccination were analyzed and evaluated, and long-term outcomes are not available for analysis. Finally, the secondary analysis of overall patients admitted compared with the three preceding years could be biased by unmeasurable factors such as referral patterns.

In conclusion, there is no association between acute facial nerve palsy and recent vaccination with COVID-19 vaccines was observed. Moreover, despite the extensive vaccination of the population, a similar volume of cases for facial nerve palsy was seen compared with the same period in the preceding years. Despite these results, treatment options including medications and physical therapy will help alleviate the burden of peripheral facial paralysis as possible side effects from immunization. The benefit and protective effects of COVID-19 vaccination outweigh the risk of this generally self-limiting treatable adverse effect.

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