Case Report

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Guillain–Barre syndrome following Pfizer-BioNTech (BNT162b2) vaccination: a case report

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Introduction Pfizer-BioNTech (BNT162b2) is one of the mRNA vaccines currently approved by the WHO and the Food and Drug Administration (FDA) against COVID-19.

Case presentation: Here, the authors report a case of an 8-year-old female with Guillain–Barré syndrome following the second dose of Pfizer-BioNTech (BNT162b2) vaccination requiring respiratory support who was managed with intravenous immunoglobulin.

Discussion: There have been reports of Guillain–Barré syndrome following the Pfizer-BioNTech vaccination. In the authors' case, as the symptoms of Guillain–Barré syndrome occurred right after the vaccination, there could be an association, and this report can add to the existing literature and raise awareness about the possible adverse effects of the Pfizer-BioNTech vaccination.

Conclusion: Although most adverse effects following Pfizer-BioNTech (BNT162b2) vaccination have been reported as non-serious, clinicians must be aware of serious adverse effects that, although rare, can follow the administration of Pfizer-BioNTech vaccination and require prompt recognition and management.

Keywords: case report, Guillain–Barré syndrome, Intravenous immunoglobulin, Pfizer-BioNTech

Introduction

Vaccinations have been a crucial measure to control the COVID-19 pandemic. Increasing the availability of accurate and relevant data on vaccine efficacy and safety to the public is vital to generating vaccine acceptance and demand for a successful vaccination drive[1]. Most of the side effects following approved COVID-19 vaccinations are classified as non-serious, and the benefits of the vaccine outweigh the risks[2,3]. Pfizer-BioNTech (BNT162b2) is one of the mRNA vaccines currently approved by the WHO and the Food and Drug Administration (FDA) against COVID-19[4,5].

However, in some cases, there are reports of adverse outcomes following vaccination, which warrant vigilant surveillance and responses to handle such outcomes. Guillain–Barré syndrome is one of the rare complications that can occur following certain infections and vaccinations and is characterized by symmetrical ascending motor flaccid paralysis, paresthesia, and neuropathic pain[6]. Here, we report a case of an 8-year-old female with Guillain–Barré syndrome following the second dose of the Pfizer-BioNTech (BNT162b2) vaccination. This case report has been reported in line with CARE guidelines and SCARE 2023 guidelines[7,8].

HIGHLIGHTS

- Guillain–Barre syndrome can be a rare complication following Pfizer-BioNTech (BNT162b2) vaccination.
- Albuminocytological dissociation is not present in all cases of Guillain–Barre syndrome.
- Guillain–Barré syndrome can be managed with supportive treatment along with Intravenous immunoglobulin (IVIG).

Case presentation

A case of an 8-year-old female presented to our tertiary care center from another hospital with complaints of progressive bilateral weakness of the lower limbs following the second dose of the Pfizer-BioNTech (BNT162b2) COVID-19 vaccine. The symptoms appeared on the third day after vaccination. She gave no history of any symptoms of a recent respiratory or gastrointestinal infection. On presentation, there was bilateral lower limb hypotonia and areflexia with decreased proximal muscle power in both lower limbs and a negative Babinski reflex. On cerebrospinal fluid (CSF) examination, the CSF appeared hazy with protein at 31 mg%, glucose at 64 mg%, a total count of 70 white blood cells per mm^3, 10% neutrophils and 90% lymphocytes, and red blood cell (RBC) present. An MRI of the brain and spine showed normal results. Other laboratory investigations were in the normal range. She was diagnosed with Guillain–Barré

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syndrome (acute inflammatory demyelinating polyneuropathy) clinically.

The child developed urinary and bowel incontinence and respiratory distress, requiring respiratory oxygen support. Intravenous immunoglobulin (IVIG) was given for 48 h. The patient gradually improved, and slight movements of the toes and fingers were observed. The child started regaining bladder control, and regular physiotherapy was done. A nerve conduction study was performed, which showed abnormal results in bilateral lower limbs with findings of decreased onset latency, reduced amplitude, and reduced conduction velocity involving posterior tibial nerves and common peroneal nerves. The onset latency, amplitude, and conduction velocity were normal for both the left and right sural nerves.

Discussion

As of 22 August 2023, the FDA has approved Pfizer-BioNTech (BNT162b2), Moderna (mRNA-1273), and Novavax (NVX-CoV2373) for emergency use to prevent the transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)[5]. Recently, the FDA has also approved the use of Pfizer-BioNTech and Moderna vaccinations in individuals aged 6 months to 17 years[9]. Meanwhile, vaccines approved on the WHO emergency use listing as of 22 August 2023, are Comirnaty, Comirnaty Original/Omicron, AstraZeneca, Covishield, Janssen, Moderna, Sinovac, Covaxin, Covovax, Nuvaxovid, Convidecia and SKYCovione[10] Pfizer-BioNTech (BNT162b2) mRNA vaccine is a lipid nanoparticle formulated modified RNA vaccine that encodes membrane-anchored SARS-CoV-2 full-length spike protein[11]. According to the Vaccine Adverse Event Reporting System (VAERS) database, most of the side effects following the Pfizer-BioNTech (BNT162b2) vaccination have been reported as non-serious[12]. The most commonly reported side effects following Pfizer-BioNTech (BNT162b2) vaccinations are injection site pain, fatigue, muscle pain, local swelling, headache, joint pain, chills, fever, itching, lymph node swelling, nausea, dyspnea, and diarrhea[13].

Guillain–Barré syndrome is a rare post-infectious neuropathy resulting in acute flaccid paralysis[6]. Almost 70% of cases of GBS report prior infection, making molecular mimicry the core of its pathophysiology[14]. The antibody-mediated immune process triggered by molecular mimicry targets ganglioside epitopes of peripheral nerves and results in nerve damage presenting as symmetrical ascending weakness, areflexia or hyporeflexia, non-length-dependent sensory symptoms, and sometimes facial diplegia and dysphagia[15]. Almost two-third cases of GBS follow gastroenteritis and respiratory illnesses. There is no established association between Guillain–Barré syndrome and vaccination except for the 1976 swine influenza vaccine[16]. However, cases of Guillain–Barré syndrome have been reported following the Pfizer-BioNTech (BNT162b2) vaccination[17,18].

A systematic review showed the rate of Guillain–Barré syndrome following COVID-19 vaccination ranged from 1.8 to 53.2 cases per 1 million doses. The reported case patients had received Oxford/AstraZeneca followed by Pfizer-BioNTech (BNT162b2) vaccination. The presented symptoms included myalgia, paraparesis, quadriparesis, paresthesia, facial palsy, and dysautonomia, with symptoms occurring an average of 11.3 days post-vaccination. Albuminocytologic dissociation in the CSF was also observed in the majority of cases[19]. According to one study, the average side effects occurred more in females (69.8%) as compared to males (30.2%) and more after the second dose of vaccination (84%) as compared to the first dose of vaccination (79%)[13]. There are also studies showing an association between COVID-19 infection and neurological complications like Guillain–Barré syndrome and transverse myelitis. A meta-analysis showed the pooled prevalence in the COVID-19 population (including hospitalized and non-hospitalized patients) to be 0.15%[20].

The results of clinical evaluation, CSF investigations, and electrodiagnostic studies are used to establish the diagnosis of Guillain–Barré syndrome[21]. The clinical features consistent with the syndrome are the acute onset of progressive muscle weakness, mostly symmetric, and reduced or absent deep tendon reflexes[21]. Typical albuminocytologic dissociation was not present in our case. Electrophysiological testing on GBS patients usually reveals a sensorimotor polyradiculoneuropathy or polyneuropathy, which is manifested by unusual temporal dispersion, decreased conduction velocities, reduced sensory and motor evoked amplitudes, and/or partial motor conduction blocks[22]. A "sural sparing pattern," which is typical of GBS, is characterized by normal sural sensory nerve action potentials[22].

Immunotherapy, such as IVIG or plasma exchange (PLEX), helps treat Guillain–Barré syndrome and change the course of the disease[23,24]. Treatment with PLEX or IVIG may reduce the onset of recovery by ~40–50 percent[25]. There is some evidence suggesting that IVIG likely speeds up recovery in children when compared to supportive care alone[23]. IVIG is generally preferred as it is easier to administer and better tolerated[23]. However, not all patients respond favorably to the treatment, and immunotherapy may not always have an impact on the eventful functional outcome[26].

Among the millions of doses administered to date, there are reports of 440 cases of Guillain–Barré syndrome in the VAERS database as of 10 December 2022, following the Pfizer-BioNTech vaccination[12]. However, an etiological relationship can't be established based on these reports alone, as VAERS is susceptible to bias[12]. In our situation, the occurrence of the Guillain–Barré syndrome may have just been an unconnected coincidence among the vast population that received the Pfizer-BioNTech (BNT162b2) vaccination. To demonstrate such proof, more extensive research is needed. However, as the symptoms of Guillain–Barré syndrome occurred right after the vaccination, there could be an association, and this report can add to the existing literature and raise awareness about a possible adverse effect of the Pfizer-BioNTech vaccination.

Conclusion

Guillain–Barré syndrome can be a rare complication following the Pfizer-BioNTech (BNT162b2) vaccination. The majority of side effects following Pfizer-BioNTech's (BNT162b2) immunization have been reported to be non-serious, and the vaccine's advantages exceed its risks. However, despite their rarity, major adverse reactions to Pfizer-BioNTech (BNT162b2) vaccinations are possible and should be recognized and treated promptly.

Ethical approval

Patient anonymity is maintained throughout this manuscript, and consent was obtained for publication from the patient.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Author contribution

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Conflicts of interest disclosure

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