

to rely on caregivers to handle even their most basic needs, including eating, washing, and going to the bathroom. They may also have difficulty in communication including telling names of things, or finding appropriate words to express themselves [3].

Table 2 – Given below explain us about the incidence rate of Alzheimer’s disease in Kerala among men and women out of respective participants

Age	Males	Females
55–59	5	20
60–64	155	222
65–69	132	146
70–74	85	106
75–79	43	63
80–84	21	35
> 85	18	15

Conclusion

1. These are the first Alzheimer’s Disease incidence rates to be reported from southern India. The incidence rates appear to be much higher than that reported from rural north India.

2. Even though Alzheimer’s Disease is a public health issue, as of now, there is only two classes of drugs approved to treat Alzheimer’s Disease, including inhibitors to cholinesterase enzyme (naturally derived, synthetic and hybrid analogues) and antagonists to N-methyl d-aspartate.

3. Alzheimer’s Disease has been considered a multifactorial disease associated with several risk factors such as increasing age, genetic factors, head injuries, vascular diseases, infections, and environmental factors (heavy metals, trace metals, and others). The underlying cause of pathological changes in Alzheimer’s disease such as A β and synaptic loss is still unknown.

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Mandara Hasangani Kande Vidanaralage

Scientific supervisor: Ph.D., Associate Professor N. N. Usova

Educational Establishment

«Gomel State Medical University»

Gomel, Republic of Belarus

NEUROLOGICAL COMPLICATIONS ASSOCIATED WITH COVID 19 VACCINATION

Introduction

In December 2019 SARS Covid 2 was introduced to world causing pandemic situation. As of year 2023, 682 million people were diagnosed with COVID 19 and 6.826 million deaths reported worldwide. In early 2021, vaccination against COVID 19 was introduced to control

the spreading of the infection. 69.8 % of the world population has received at least one dose of COVID 19 vaccine. There are types of mechanism of action of vaccines, nucleic acid based vaccine (mRNA), viral vector (replication - non replication), live inactivated (or attenuated) virus and protein (spike protein or its subunits). As of November 2021, 11 COVID 19 vaccines have been approved by World Health Organization for mass vaccination, by just completing the phase 3 clinical trials. Since the vaccines do not complete the standard clinical trials, the negative effects of each vaccine should be monitored. According to data from CDC, VAERS and EMA, short term effects of vaccine are favorable, while long term effects in doubt and side effects were reported. Venous sinus thromboses is the most severe disorder that should be diagnosed and managed immediately. Therefore the medical personnel, should be able to identify the patients with the complication as soon as possible [2].

Goal

To evaluate the importance of early diagnosis and possible neurological complications, long term neurological effects due to COVID 19 vaccination.

Material and Methods of research

The analysis and generalization of modern medical scientific literature on neurological manifestations and complication due to COVID 19 vaccines.

The results of the research and their discussion

Based on the database of vaccine adverse event reporting system, presence of several neurological manifestations due to COVID vaccination from mild to severe features depending on age, sex, co-existing health conditions were reported. Complications are acute, transient, self-limiting while severe cases required ICU admission. Women are more prone to neurological complication compared to men due to increased immune response. Most common mild neurological manifestations are weakness, dizziness, numbness, headache, imbalance, fatigue, joint pain, muscle spasm, restless leg syndrome and less common features are tinnitus, tremors and Herpes zoster. Reported neurological complications such as Bell's palsy, Guillain-Barre Syndrome, stroke seizure, anaphylaxis and demyelinating syndromes like transverse myelitis, acute encephalomyelitis [1]. Most severe complication is the cerebral venous thrombosis, which required immediate medical attention, occurred in women at childbearing age.

Post vaccination vascular complications in brain, especially after adenovirus based vaccine are thrombocytopenia, cerebral venous sinus thrombosis, ischemic stroke, intracerebral hemorrhage. The mechanism of causing thrombocytopenia is that inducing synthesis of IgG against platelet factor 4, which activate platelet and blood clot in large venous artery [2]. In Adenovirus based vaccine, transfer of nucleic acids encoding the viral spike (S) protein. Autoimmunity developed due to leakage of genetic material and their binding to platelet factor 4. Excessive coagulation cause venous sinus thrombosis. Viral antigen of the COVID vaccine activate the complement pathway or increase the thrombin activity, that lead to increase in blood clot formation.

Acute neurological disorders caused due to COVID 19 vaccination are transverse myelitis, acute diffuse encephalomyelitis, Bell's palsy, encephalopathy and seizures. Synthesis and release of spike proteins due to vaccination cause convulsions, lead to severe inflammation and hyperthermia. Hyperthermia increase the activity of glial cells, increasing blood brain barrier permeability, therefore peripheral blood cells and albumin enter into brain causing disruption of osmotic balance. Peripheral blood cells secrete inflammatory mediators into brain destructing myelin and axonal degeneration, which lead to brain disorder. SARS CoV-2 spike domain S1 antibody presence in cerebrospinal fluid illustrate the etiology of encephalopathy and seizures.

Transverse myelitis, inflammation of part of spinal cord, usually after infection associated with impaired sensory, motor and autonomic function in the region below the area of inflammation. The mechanism of induction of this disorder related to vaccination is that the viral antigen

of the vaccine develop autoimmune response by molecular mimicry, which cause demyelinating syndromes such as multiple sclerosis, neuromyelitis Optica. Majority from the age range 20–60 years are affected [3].

COVID 19 vaccination also affect on cranial and peripheral nerves causing Bell's palsy (facial nerve, seventh cranial nerve), Abducens nerve palsy (lateral rectus ocular muscle nerve palsy, sixth cranial nerve), impaired vision, olfactory, hearing, Guillain Barre syndrome, small fiber neuropathy, Parsonage Turner's syndrome, Herpes zoster. Similarly, the same mechanism inducing autoimmunity by molecular mimicry involved. Bell's palsy which cause paralysis of one side of the face and the small fiber neuropathy were reported as a neurological complication due to mRNA based vaccine [4]. Inability to blink in Bell's palsy, lead to eye dryness causing blindness. Therefore early diagnosis and management is required. Guillain Barr syndrome, a rare neurological disorder immune system damage nerve cells and cause muscle weakness and occasional paralysis, manifested in elderly patients, vaccinated with adenovirus based vaccine. Pfizer vaccine was reported with impairment of vision, auditory, olfactory and abducens nerve palsy [4]. Impairment of olfactory function illustrated from the range of symptoms of lack of sense to olfactory hallucination, that cause due to bilateral disturbance or augmentation of olfactory pathway and olfactory bulb. Impairment of auditory function manifested as hearing loss, tinnitus and dizziness. Pfizer and AstraZeneca vaccinated people also presented with optic nerve inflammation, which lead to vision disorder in middle age. mRNA vaccine such as Pfizer vaccine in increasing the risk of herpes zoster. Recent studies reported that Pfizer vaccine cause Ramsey Hunt syndrome which manifested with facial nerve palsy, vestibulocochlear neuropathy, glossopharyngeal nerve neuropathy [5].

According to a study, conducted in Oxford university, even the mild cases of COVID 19 infection, cause brain shrinkage from 0.2 % to 2 %, which was proven by MRI scan Shrinking of brain lead to cause impairment in memory and cognition. The changes in size of brain that could cause due to COVID 19 vaccination still remain unclear [6].

Conclusion

Based on the studies on COVID vaccine, adverse effects due to mass vaccination strategy, but the desired effect of the vaccination are more significant. Majority of neurological complications associated with COVID 19 vaccine reported in people with history of immune related disease, women in childbearing age, already existing neurological disorders and elderly. The most important and the most common complications are cerebral venous thrombosis prominent in AstraZeneca, transverse myelitis prominent in Pfizer, Moderna, AstraZeneca and Johnson & Johnson, Bell's palsy prevalent in Pfizer, Moderna, Guillain Barr syndrome prominent in Pfizer, AstraZeneca and Johnson & Johnson, the first manifestation of multiple sclerosis mostly reported with Pfizer vaccination. Further studies has to be improved to confirm and observe the possible neurological manifestations on COVID vaccination.

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