

Efficacy, Reliability and Potential Side Effects Reported from Selected Covid-19 Vaccination Trials

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Abstract— The COVID-19 disease arisen in Wuhan on December-2019 and was avowed as a contagion. Globally, at present, there have been 517,648,631 verified cases of COVID-19, including 6,261,708 deceased, reported to WHO. The scientific focus on vaccine development has become the ultimatum of the global community. Vaccination is the process of administering a vaccine to develop a defense mechanism against an infection with the help of hosts immune system. The types include protein subunit, RNA-based, non-replicating and replicating virus-like particle, viral vector, live-attenuated virus, replicating bacterial vector, inactivated virus. Though the vaccine has unparalleled benefits it also has potential side effects such as thrombocytopenia, anaphylaxis, local side effects, neurological effects, orofacial effects, effects in cancer patients, effects on women due to estrogen, shingles and associated vasculitis and glomerulonephritis. Thus, it is of paramount importance to evaluate the vaccine safety, including the side effects. The objective of this article is to present an information of the adverse side effects of COVID-19 vaccination.

Keywords— Covid-19, Corona virus, Vaccination, Vaccine, mRNA.

I. INTRODUCTION

The corona virus disease-19 (COVID-19) is an appallingly communicable and pathogenic viral infection caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which emerged in Wuhan, China and escalated throughout globe [1]. Phylogenetically, SARS-CoV-2 is related to SARS-like bat viruses, hence bats could be primary reservoir [1]. The abrupt transfer among humans has been found though intermediate source of origin and transfer to humans is unascertained [1]. The genetic material is single stranded, positive sense strand RNA and belongs to group of enveloped viruses. The presence of nuclear membrane, spike and enveloped proteins including hemagglutinin-esterase (HE) of virus intermingle with human cell receptors viz., ACE2, APN and NEU-5 helping in occurrence and transmission of the distressing disease Figure 1 [2], [3]. In late December-2019, cases of Covid-19 were documented from the seafood market of Wuhan, China. The world health organization (WHO) announced Covid-19 outbreak as a Public Health Emergency of International Concern in January-2020 which later became a global pandemic by March 2020 [3, 4]. The two strains, SARS and Middle East Respiratory Syndrome (MERS) had a mortality rate of 9.6% and 34.45% respectively [5], with an average incubation period of a fortnight from the onset of symptoms to demise [6]. People associated with medical comorbidities viz., obesity, coronary disease, nephropathy, diabetes, pulmonary disease etc., are more prone to severe COVID-19 infection [7]. The virus is found to be sustainable for almost three days of application

on plastic and stainless steel which partly explains its lethality. The countries like, Tuvalu, Saint Helena, Pitcairn Islands, Nauru, Cook Islands etc., didn't report any cases of Covid-19.

II. COVID-19 VACCINATION

As an emergency, globally wearing masks, social distancing and lockdown were announced as a protective measure to tackle COVID-19. Meanwhile achieving herd immunity through natural infection with virus is unethical and inappropriate, many drugs were suggested to be employed against COVID-19. The vaccination was the only route to eradicate this problem which aids in the prevention of illness from incurable conditions by stimulating the body's adaptive immunity [8]. The integral parts of virus spike protein in receptor and Membrane fusion makes it an attractive vaccine antigen [2]. The advanced vaccine technology i.e., messenger RNA vaccine is injected into the host where mRNA is coded by spike protein to produce antibody and can be produced in an industrial scale [2]. At present there are 252 covid vaccine manufactures and trials from different countries and which are at different clinical trial phases. Amongst all protein subunit vaccines are 82, RNA-based are 32, non-replicating viral vector are 30, replicating viral vector are 23, virus-like particle is 22, inactivated virus is 20, live-attenuated virus is 4, replicating bacterial vector are 2, and 16 unknowns [9]. At present only BNT162 (Pfizer-BioNTech), mRNA 1273 (Moderna), ChAdOx1 (AstraZeneca), and Ad26.COVS-2 (Johnson & Johnson)

have been approved globally [9]. This article signifies to create awareness among people regarding the adverse effects of the vaccine and draw special attention to its impact on individuals with comorbidities and compromised immunity.

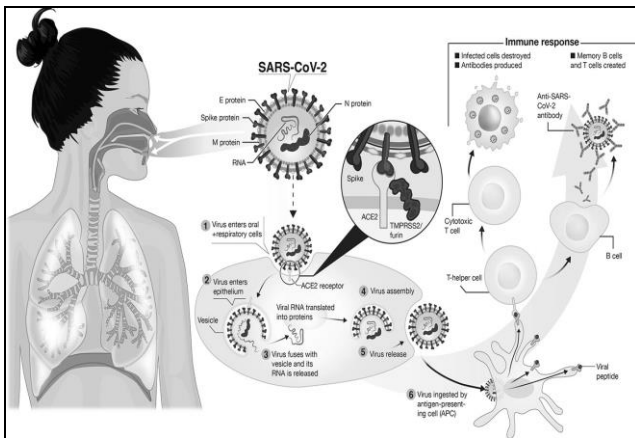


Figure 1: Transmission and life-cycle of SARS-CoV-2 causing COVID-19 [28].

III. SIDE EFFECTS of COVID-19 VACCINATION

Commonly reported primary side effects of any vaccines could be nausea, cephalalgia, myalgia, fatigue, fever, chills, swelling, redness and pain [10]. The AstraZeneca, Pfizer, and Moderna vaccines administration has showed blood clotting events in addition to primary side effects [11]. Omeish *et al.*, 2021, reported that post 1st and 2nd dose of vaccination, 851 participants suffered from pain, 177 participants presented to inflammation and soreness at the vaccination spot. 408 participants suffered from pain at muscles and bones after the 1st dose (Table-1). Fever was presented by 300 individuals after receiving the 1st and 57 individuals after the 2nd dose. Fatigue was amongst 563 individuals after the first dose and 121 individuals after the 2nd dose. 359 individuals reported mild migrane after first dose and 59 after the second dose.

Table 1: Side effects of Covid-19 vaccination at different doses.

Symptoms	First dose N (%) N =1086	Second dose N (%) N =299	P value
pain at injection site	851 (78.4)	200 (66.8)	0.004
Redness and swelling of injection site	177 (16.3)	45 (15.0)	0.216
Pain at muscles and bone	408 (37.6)	85 (28.4)	<0.001
Fever	300 (27.6)	57 (19.1)	<0.001
Headache	359 (33.1)	59 (19.7)	<0.001
Chills	351 (32.3)	69 (23.1)	<0.001
Sore throat	90 (8.3)	18 (6.0)	0.031
Fatigue	563 (51.8)	121 (40.4)	<0.001
Cough	91 (8.4)	10 (3.3)	0.048
Runny nose	76 (7.0)	14 (4.6)	0.115
Loss of taste	14 (1.3)	2 (0.7)	0.264
Loss of smell	16 (1.5)	3 (1.0)	0.428

Nausea	164 (15.1)	23 (7.7)	<0.001
Diarrhea	70 (6.4)	13 (4.3)	0.022
Vomiting	30 (2.8)	8 (2.7)	0.003
Loss of appetite	102 (9.4)	19 (6.3)	<0.001
Abdominal pain	65 (6.0)	7 (2.3)	<0.001
Constipation	7 (0.6)	2 (0.7)	0.431
Sleep disturbance	110 (10.1)	22 (6.7)	<0.001
Anxiety and stress	68 (6.3)	8 (2.4)	0.003
Depression	48(4.4)	6 (1.8)	0.007
Irregular menses (Females)	17 (1.6)	4 (1.3)	0.861
Declined libido	14 (1.3)	5 (1.6)	0.264
Lymph node widening/swelling	12 (1.1)	4 (1.3)	0.044
Blurry vision	40 (3.7)	8 (2.7)	0.011
Skin itching	29 (2.7)	6 (2.0)	0.209
Acne	22 (2.0)	5 (1.6)	0.978
Sweating	76 (7.0)	11 (3.7)	0.001
Increase urination	16 (1.5)	2 (0.7)	0.428
Change urine color	11 (1.0)	2 (0.7)	0.985
Shortness of breath	76 (7.0)	21 (7.0)	0.017
Palpitation	93 (8.6)	10 (3.3)	0.010
Chest pain	56 (5.2)	11 (3.7)	0.023
Loss of consciousness	7 (0.6)	0 (0.0)	0.362
Paleness	35 (3.2)	6 (2.0)	0.311
Bleeding anywhere	5 (0.5)	0 (0.0)	0.167
Dizziness	157 (14.5)	27 (9.0)	<0.001

After first dose 351 participants suffered from chills compared to second dose of 69 participants whereas nausea was presented by 164 individuals after receiving the 1st dose of vaccination. Another study reports first dose of vaccination affected female participants (92.3%) more than male participants (85.8%). After first dose vaccination, pain at the injection site was more in females (83%) when compared with males (70.4%). Females reported to show cardiac side effects, pointedly higher than males (P<0.5)[11] (Table-2). The Table-3 displays list of adverse effects after receiving 1st and 2nd dose related to AstraZeneca, Pfizer and Sinopharma vaccine associated with elevated symptoms like Myalgia and Ostealgia, cold symptoms, digestive, mental discomforts, and giddiness. The earlier symptoms are more prominent after the first and second dose in Pfizer vaccine as compared to AstraZeneca Vaccine. (Table 4). Like in FDA reported Pfizer and AstraZeneca vaccine studies, Covid-19 vaccine clinical trial also presented local injection site symptom as a common side effect [11] and consistent reports were reported earlier from Henan Province [12]. The side effects like, pain, Pfizer, AstraZeneca, and Sinopharm vaccine universally displayed redness and swelling at site of injection whereas, headache, nausea, chills, fever, Musculoskeletal pain, fatigue, and unease were reported higher with AstraZeneca vaccine [11] [13]. The above reported side effects were not so prevalent among two available messenger RNA (mRNA) vaccines which showed unexpectedly lower count than expected earlier through clinical trial data that stated about 80% people

may feel injection site pain. One of these two vaccines *i.e.*, Pfizer–BioNTech is found to have more side effects with the 2nd dose.

Thrombocytopenia

The Pfizer and Moderna vaccinations tend to show secondary immune thrombocytopenia (ITP) that attracted public attention. With the aid of CDC, FDA, HHS and VAERS reports, out of twenty-one patients diagnosed with thrombocytopenia post vaccination, 80.95% without pre-existing thrombocytopenia and 66.6% with reported bleeding symptoms prior to hospitalization were reported [14]. Out of 20 patients, details of 95% shows the age ranging between 22 to 73 years old and 57.89% females including 40.2% males. The Pfizer for nine and Moderna by eleven patients was received. Every single one of the 20 patients were admitted to the hospital and a majority of the patients presented with petechiae, ecchymosis or mucosal bleeding gums, with onset of symptoms between 1–23 days (median 5 days) post vaccination [15].

Anaphylaxis

After Pfizer-BioNTech vaccine doses administration 21 cases were reported to show anaphylaxis which met Brighton Collaboration case definition criteria with an estimated rate of 11.1 cases per million [10]. During the time of report to VAERS, 19% of the patients were hospitalized and 81% were in an emergency followed by 95% who were discharged [10]. The side effects such as hives, angioedema, dermatitis, and a sense of anaphylaxis were most common symptoms and signs. Meanwhile, VAERS reported 83 cases of non-anaphylaxis cases with non-anaphylaxis allergic reactions after Pfizer-BioNTech COVID-19 vaccination that included pruritus, rash, allergic rhinitis, and mild respiratory symptoms. The allergic reactions aggravated due to earlier anaphylactic shock, chronic asthma and mast cell disease [16] and in Norway, soon after the Pfizer BioNTech vaccination 29 patients were reported dead [17]. Later it was found that common adverse reactions of mRNA vaccines, such as fever, nausea, and diarrhea, might have played a vital role in to fatal [18]. Allergic reactions are manifested due to disguised symptoms like Flushing, tremor, dyspnea,

tachycardia, hyperkinesia, and dizziness that were closely related with anxiety and panic [17]. Anaphylaxis may be disguised and manifested in the form of dyspnea, globus sensation, and inducible paradoxical vocal fold motion, such as vocal cord dysfunction.

Effect on Women due to Estrogen

According to European data, after receiving the 1st of Covid-19 vaccination women under 55 years are found to be at high risk for blood clotting [19]. Germany and Austria performed a study and concluded that nine individuals showed thrombosis or thrombocytopenia post the first dose with Oxford -AstraZeneca vaccine which was due to platelet-activating anti-bodies that act against PF4 [20]. In another study, venous thrombosis and thrombocytopenia was experienced by four out of five females on taken of 1st dose of Oxford-AstraZeneca which was due to elevation of antibodies to platelet factor 4-polyanion complexes [21]. The vaccine recipients show an elevated risk of thrombosis due to the estrogen intake as the immune reaction to influenza vaccines are impacted due to estrogen, which resembles with respect to other vaccines too [22, 23].

Neurological effects

A rare neurological abnormality has been reported after receiving different Covid-19 vaccination. Guillain–Barre Syndrome (GBS) developed in a 61-year-old male patient and an 82-year-old female patient post-vaccination with Pfizer [24] and Moderna [25] vaccines, respectively. The sixty-one-year-old male post second dose vaccination of Moderna vaccine after 4 days reported symptoms like proximal weakness, on analysis of his cerebrospinal fluid and electrodiagnostic tests, acute demyelinating polyneuropathy was detected. The eighty-two-year-old women after the first dose of vaccination experienced body ache after seven days of administration which aggravated during the next seven days, symptoms that lead to lumbar puncture were struggle to walking, fatigue in extremities and muscles. The occurrence of GBS was confirmed by the analysis of cerebrospinal fluid.

Table 2: Side effects vaccination with respect to genders [11].

Symptoms	After 1 st dose of COVID-19 vaccine Frequency (%)		p Value	After 2 nd dose of COVID-19 vaccine Frequency (%)		p Value
	Female N =684	Male N =402		Female N = 211	Male N = 109	
Presence						
No	53 (7.7)	57 (14.2)	0.001	54(25.6)	18(16.5)	0.065
Yes	631 (92.3)	345 (85.8)		157 (74.4)	91 (83.5)	
Injection site pain	568 (83.0)	283 (70.4)	<0.001	125 (59.2)	75 (68.8)	0.872
Redness and swelling	129 (18.9)	48 (11.9)	0.003	33 (15.6)	12 (11.0)	0.142
Bone and muscle pain	264 (38.6)	144 (35.8)	0.362	57 (35.5)	28 (25.6)	0.418
Fever	174(25.4)	126 (31.3)	0.036	38(18.0)	19 (17.4)	0.554
Headache	248 (36.3)	111 (27.6)	0.003	45(21.3)	14(12.8)	0.030
Chills	244 (35.7)	107 (26.6)	0.002	47(22.2)	22(20.1)	0.362

Sore throat	73 (10.7)	17 (4.2)	<0.001	15(7.1)	3 (2.7)	0.071
Fatigue	381 (55.8)	182 (45.3)	0.004	85(40.2)	36 (33.0)	0.079
Cough	70 (10.2)	21 (5.2)	0.013	7(3.3)	3(2.7)	0.644
runny nose	58 (8.5)	18 (4.5)	0.076	8 (3.7)	6 (5.5)	0.649
loss of taste	12 (1.8)	2 (0.5)	0.041	2 (0.9)	0 (0.0)	0.278
loss of smell	14 (2.0)	2 (0.5)		3 (1.4)	0 (0.0)	0.184
Nausea	127(18.6)	37 (9.2)	<0.001	16 (7.5)	7 (6.4)	0.509
Diarrhea	52(7.6)	18(4.5)	0.043	9(4.2)	4(3.6)	0.639
Vomiting	18(2.6)	12(3.0)	0.731	7 (3.3)	1 (0.9)	0.149
loss of appetite	74 (11.1)	28 (7.2)	0.039	14(6.6)	5(4.5)	0.330
abdominal pain	53 (7.7)	12 (3.0)	0.001	4 (1.8)	3 (2.7)	0.748
constipation	6 (0.9)	1 (0.2)	0.211	1 (0.4)	1 (0.9)	0.703
Sleep disturbance	74 (10.8)	36 (9.0)	0.326	17(8.0)	5(4.5)	0.161
Anxiety and stress	47 (6.9)	21 (5.2)	0.279	6(2.8)	2(1.8)	0.480
Depression	35 (5.1)	13 (3.2)	0.145	4(1.8)	1(0.9)	0.430
Irregular menses	17 (2.5)	0 (0.0)	0.001	4 (1.8)	0 (0.0)	0.125
Decreased libido	4 (0.6)	10 (2.5)	0.007	4(1.8)	1(0.9)	0.43
Lymph node enlargement & swelling	8 (1.2)	4 (1.0)	0.79	2(0.9)	2 (1.8)	0.59
Skin itching	26(3.8)	3 (0.7)	0.003	5 (2.3)	1 (0.9)	0.301
Acne	20 (2.9)	2 (0.5)	0.006	5 (0.7)	0 (0.0)	0.086
Sweating	45 (6.6)	31 (7.7)	0.480	9 (4.2)	2 (1.8)	0.193
Increase urination	9 (1.3)	7 (1.7)	0.574	1 (0.1)	1 (0.2)	0.703
Change urine color	6 (0.9)	5 (1.2)	0.560	2(0.3)	0 (0.0)	0.278
Blurred vision	30 (4.4)	10 (2.5)	0.109	8 (1.2)	0 (0.0)	0.03
Shortness of breath	56 (8.2)	20 (5)	0.045	14 (6.6)	7 (6.4)	0.724
Palpitation	72 (10.5)	21 (5.2)	0.003	6 (2.8)	4(3.6)	0.844
Chest pain	39 (5.7)	17 (4.2)	0.289	8 (3.7)	3(2.7)	0.501
Loss of consciousness	4 (0.6)	3 (0.7)	0.748	0 (0.0)	0 (0.0)	---
Paleness	24 (3.5)	11 (2.7)	0.486	5 (0.7)	1 (0.2)	0.301
Bleeding anywhere	4 (0.6)	1 (0.2)	0.430	0 (0.0)	0 (0.0)	---
Dizziness	119 (17.4)	38 (9.5)	<0.001	20 (9.4)	7 (6.4)	0.227
Require hospitalization	0 (0.0)	0 (0.0)	0.26	2 (1.0)	0 (0.0)	0.241
Onset of Symptoms Immediately	69(11.0)	26 (7.9)	0.577	20(11.4)	7(6.9)	0.153
1 st day	506(80.7)	275 (83.1)		120(68.2)	70(68.6)	
1 st week	44 (7.0)	24 (7.3)		16(9.1)	5(4.9)	
2 nd week	6(1.0)	4 (1.2)		19(10.8)	19(18.6)	
3 rd week	2(0.3)	2 (0.6)		0 (0.0)	1(1)	
Duration of Symptoms mean (SD)	2.32(2.3)	2.64 (4.5)	0.082	2.82 (3.74)	2.54 (4.1)	0.354

Table 3: Side effects associated with different vaccines after first and second doses [11].

Symptoms	First dose of COVID19 vaccine				Second dose of COVID19 vaccine		
	Sinopharm N = 287	Pfizer N = 441	AstraZeneca N = 358	p value	Sinopharm N = 124	Pfizer N = 175	p value
Bone and muscle pain	55 (19.2)	116 (26.3)	237 (66.2)	<0.001	12 (9.6)	73 (41.7)	<0.001
Local Injection site pain	166 (57.8)	385 (87.3)	300 (83.8)	<0.001	52 (41.9)	148 (84.5)	<0.001
Local swelling and redness	12 (4.2)	81 (18.4)	84 (23.5)	<0.001	4 (3.2)	41 (23.4)	<0.001
Fever	32 (11.1)	65 (14.7)	203 (56.7)	<0.001	5 (4.0)	52 (29.7)	<0.001
Chills	38 (13.2)	93 (21.1)	220 (61.5)	<0.001	5 (4.0)	64 (36.5)	<0.001
Fatigue	92 (32.2)	197 (44.7)	274 (76.5)	<0.001	25 (20.1)	96 (54.8)	<0.001
Headache	62 (21.6)	113 (25.6)	184 (51.4)	<0.001	10 (8.0)	49 (28.0)	<0.001
Cough	25(8.7)	27(6.1)	39(10.9)	0.052	3(2.4)	7 (4.0)	0.141
Sore throat	23(8.0)	31(7.0)	36 (10.1)	0.298	3 (2.4)	15 (8.5)	0.001
Runny nose	13 (4.5)	24 (5.4)	39 (10.9)	0.002	4 (3.2)	10 (5.7)	0.018
Loss of taste	3 (1.0)	3 (0.7)	8 (2.2)	0.14	0 (0.0)	2 (1.1)	0.231
Loss of smell	4 (1.4)	3 (0.7)	9 (2.5)	0.101	0 (0.0)	3 (1.7)	0.111
Loss of appetite	16 (5.7)	23 (5.4)	63 (17.8)	<0.001	2 (1.6)	17 (9.7)	<0.001
Nausea	22 (7.7)	42 (9.5)	100 (27.9)	<0.001	2 (1.6)	21 (12.0)	<0.001
Vomiting	2 (0.7)	4 (0.9)	24 (6.7)	<0.001	1 (0.8)	7 (4.0)	0.023

Abdominal pain	11(3.8)	16(3.6)	38(10.6)	<0.001	2 (1.6)	5 (2.8)	0.248
Diarrhea	13(4.5)	19(4.3)	38(10.6)	<0.001	3 (2.4)	10 (5.7)	0.024
Constipation	1(0.3)	3(0.7)	3(0.8)	0.737	2 (1.6)	0 (0.0)	0.494
Anxiety	15 (5.2)	18 (4.1)	35 (9.8)	0.003	2 (1.6)	6 (3.4)	0.138
Depression	11 (3.8)	14 (3.2)	23 (6.4)	0.072	2(1.6)	3 (1.7)	0.393
Sleep disturbance	17 (5.9)	23 (5.2)	70 (19.6)	<0.001	4(3.2)	18 (10.2)	<0.001
Irregular menses	2 (0.7)	7 (1.6)	8 (2.2)	0.294	2 (1.6)	2 (1.1)	0.559
Loss of consciousness	1(0.3)	3(0.7)	3(0.8)	0.737	0 (0.0)	0 (0.0)	-
Palpitation	16(5.6)	24(5.4)	53(14.8)	<0.001	2 (1.6)	8 (4.5)	0.025
Chest pain	10(3.5)	15(3.4)	31(8.7)	0.001	2(1.6)	9 (5.1)	0.02
Shortness of breath	16(5.6)	19(4.3)	41(11.5)	<0.001	6 (4.8)	15 (8.5)	0.006
Paleness	5(1.7)	11 (2.5)	19 (5.3)	0.021	1 (0.8)	5 (2.8)	0.085
Bleeding anywhere	1 (0.3)	1 (0.2)	3 (0.8)	0.424	0 (0.0)	0 (0.0)	-
Dizziness	32 (11.1)	37 (8.4)	88 (24.6)	<0.001	4 (3.2)	23 (13.1)	<0.001
Decreased libido	2(0.7)	5(1.1)	7 (2.0)	0.346	2 (1.6)	3 (1.7)	0.291
Lymph node enlargement	1 (0.3)	5 (1.1)	6 (1.7)	0.276	0 (0.0)	4 (2.2)	0.053
Eye (blurred vision)	10 (3.5)	8 (1.8)	22 (6.1)	0.005	2 (1.6)	6 (3.4)	0.082
Itching	5 (1.7)	10 (2.3)	14 (3.9)	0.188	2 (1.6)	4 (2.2)	0.212
Acne	4 (1.4)	10 (2.3)	8 (2.2)	0.675	1 (0.8)	4 (2.2)	0.161
Sweating	5 (1.7)	14 (3.2)	57 (15.9)	<0.001	2 (1.6)	9 (5.1)	0.014
Increase urination	0 (0.0)	5 (1.1)	11 (3.1)	0.004	0 (0.0)	2 (1.1)	0.231
Change urine color	2 (0.7)	4 (0.9)	5 (1.4)	0.65	0 (0.0)	2 (1.1)	0.231

Table 4: Appearance of side effects after first and second dose amongst three different vaccines [11].

Variable	First dose of COVID19 vaccine				Second dose of COVID19 vaccine		
	Sinopharm N =287	Pfizer N =441	AstraZeneca N =358	p value	Sinopharm N = 124	Pfizer N = 175	p value
Presence of symptoms	237 (82.6)	409(92.7)	330 (92.2)	<0.001	57 (45.9)	159(90.8)	0.034
Require hospitalization	0 (0.0)	0(0.0)	0(0.0)	-	1 (0.8)	1 (0.5)	0.085
Onset of symptoms				0.012			<0.001
Immediately	29 (10.1)	46 (10.4)	20(5.6)		9 (7.2)	16 (9.1)	
1st day	159 (55.4)	321(72.8)	301(84.1)		53 (42.7)	134 (76.5)	
1st week	20 (7.0)	31(7.0)	17(4.7)		9 (7.2)	12 (6.8)	
2nd week	3 (1.0)	5(1.1)	2(0.6)		20 (16.4)	10 (5.7)	
3rd week	2 (0.7)	1(0.2)	1(0.3)		0 (0.0)	1 (0.5)	
>30 days	0(0.0)	0(0.0)	0(0.0)		0 (0.0)	0(0.0)	
Duration of symptoms (days)Mean (SD)	2.02(1.67)	2.59(3.6)	1.67(0.57)	0.31	3.32(4.6)	2.56(3.6)	0.33
Min-Max	0-10	0-30	0-30		0-21	0-30	

Orofacial effects

A few people reported orofacial side effects such as inflammation of lips, tongue, throat, and face on being vaccinated with Pfizer and Moderna vaccines [26]. Healthcare providers reported that individuals who previously used cosmetic injections (such as dermal filler) on their faces exhibited a rare temporary side effect called Bell's palsy where temporary one-sided facial drooping is observed [26].

Side effects in cancer patients

After the administration of Covid-19 vaccine five patients showed unilateral axillary lymphadenopathy [26]. Positron Emission Tomography/Computerized Tomography, Magnetic Resonance Imaging, Ultra Sound, Mammogram, and biopsy tests revealed that the appearance of benign lymph node was found different pre and post vaccination [26]. After Moderna vaccine administration the Center for Disease Control and Prevention, reported axillary

adenopathy at the injection site/arm as a typical local reaction. The adenopathy observed in the 18–64 age group after the administration of first dose was in 11.6 % entities and after second dose administration in 16% individuals [26].

Shingles

In a sixty-eight-year-old patient with previous medical history of hypertension, anxiety, and dysrhythmia, vaccination has led to reactivation of varicella-zoster virus (VZV) or shingles [26]. The symptoms such as, pain at right side of his chest leading to back, vascular lesions at right mammary area with puncturing sensation were reported after vaccination with second dose 5 days later [26]. Out of ninety-one patients suffering from shingle 17.7% had hypertension, 13.3% showed autoimmunity, and 10% were on immunosuppressants soon after the vaccination [26]. After 5.8 days of vaccination, everyone was reported to show VZV reactivation. The treatment employed was Valacyclovir oral administration.

Antineutrophil cytoplasmic antibody (ANCA) - Associated Vasculitis and Glomerulonephritis

Few individuals reported the set of Antineutrophil cytoplasmic antibody ANCA-Associated Vasculitis on administration of the vaccine [26]. One of the cases reported to display renal-limited anti-myeloperoxidase (MPO) after the 1st Pfizer-BioNTech vaccination who was a 78-year-old female having type-2 diabetes mellitus, high blood pressure, and paroxysmal atrial fibrillation as a medical history [26]. She was under recovery after 16 days of post-vaccination and second dose led her to cause vomiting, diarrhea, and fatigue [27]. Similarly, a Fifty-two-year-old man with a medical history of hypertension 14 days post-vaccination with Moderna mRNA vaccine had ANCA-glomerulonephritis. The person was confirmed to have had paucity immune necrotizing and crescentic glomerulonephritis with the aid of blood tests, kidney biopsy, and immunological tests [26].

IV CONCLUSION

As viral particles evolve and mutate, manufacturing an effective and reliable vaccine against potential SARS-CoV-2 variant outbreaks is indispensable. Despite significant advancement and commending results from vaccine candidate trials, side effects such as thrombocytopenia, anaphylaxis, local side effects, neurological effects, orofacial effects, effects in cancer patients, effects on women due to estrogen, Shingles, ANCA- associated vasculitis and glomerulonephritis were still recorded. The importance of this article is to create awareness among people regarding the side effects of vaccination and draw special attention to its impact on individuals with co morbidities and compromised immunity like hypersensitivity reactions and allergies. In cancer patients a fully acceptable conclusion is yet to be derived concerning the impact the vaccine has on the immune system when administered along with the ongoing therapy of the patients. There is still a lacuna among the

hospitals and governance in developing countries regarding the adverse effects of vaccination, so this article aids research institutes to design a protocol considering the previous medical history of an individual and proceed with the vaccination to avoid any severe implications. Hence, extensive vaccine research and collaborations for advancement of vaccines against COVID-19 is a requisite.

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