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Reactogenicity of COVID-19 Vaccines; Insights from Cairo University Hospitals

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ABSTRACT

Background: Since the emergence of the COVID-19 pandemic, most of the efforts were directed towards developing new vaccines that are safe and effective to terminate the pandemic.

Methods : This is a cross-sectional study, to analyze the short-term side effect profile of the AstraZeneca/Oxford vaccine and Sinopharm Chinese vaccine. A quantitative survey using Google Forms was used for healthcare workers at Cairo University Hospitals from February to May 2021. From total of 4962 healthcare workers who received COVID-19 vaccines through this period, 1190 responded to the questionnaire. The collected data included side effects, duration, and symptoms' severity.

Results: Around 50% and 20% of the participants did not report any symptoms after Sinopharm and AstraZeneca vaccines, respectively. Participants receiving AstraZeneca vaccine were 3.6 times more likely to have fever compared to those receiving Sinopharm [OR (95%CI) 3.62 (2.18-6.04)]. Also, they were more likely to have mild, moderate, and severe local reaction in comparison with those receiving Sinopharm [OR (95%CI) 2.01 (1.46-2.78), 6.13 (3.29-11.40), and 6.06 (1.07-34.33), respectively]. The duration of symptoms of both vaccines did not differ.

Conclusion: While both vaccines were safe, the healthcare workers who received Sinopharm vaccine showed significantly fewer side effects compared to AstraZeneca recipients.

Keywords: Astrazeneca, Covid-19, Side Effects, Sinopharm, Vaccination.

INTRODUCTION

Viruses have been well known long ago to cause much panic with serious economic losses and deaths. In the past few years, coronaviruses have emerged several times to cause a dreadful nightmare to mankind, starting with SARS through MERS-CoV and now, SARS-Cov-2. From its early beginning, SARS-CoV-2 continues to pose catastrophic threats to the whole world. According to the WHO, by1st July 2021, there have been 181,722,790 confirmed cases of COVID-19, including 3,942,233 deaths [(1)]. As effective antiviral agents are still lagging, vaccines are becoming a crucial demand to control the situation. Clinical trials all over the world have been rapidly going to develop an effective and safe vaccine to produce an end to this pandemic. SARS-CoV-2 genome encodes four structural proteins which are the S, N, M, and E proteins. Researchers have shown great interest in S protein because of its ability to induce neutralizing antibodies and cell mediated immune response [(2,3)].

By the end of December 2020, there have been more than 214 candidate vaccines under development using different technologies and platforms [(4)]. By 18th February 2021, there have been seven vaccines across three platforms enrolled all over the world. Namely, Ad5-nCoV (CanSino Biologicals), mRNA-1273 (Moderna), INO-4800 (Inovio, Inc.), BNT162/mRNA (Fosun Pharma), BBIBP-CorV (Sinopharm), CoronaVac (Sinovac), and ChAdOx1 (University of Oxford). These vaccines have entered Phase III clinical trials [(5,6)]. Different vaccine platforms include recombinant viral-vectored vaccines, live attenuated viruses, protein subunit, inactivated vaccines, nucleic acid-based vaccines, and virus-like particles. Till the date of writing these lines, few vaccines have taken the WHO's Emergency Use Listings (EUL); The Pfizer COVID-19 vaccine (BNT162b2) on 31st December 2020, the two versions of the AstraZeneca/Oxford COVID-19 vaccine, manufactured by the Serum Institute of India Covishield and SKBio on 15th February 2021and the Janssen vaccine manufactured by Johnson& Johnson on 12th March 2021and Sinopharm COVID-19 vaccine produced by Beijing Bio-Institute of Biological Products Co Ltd, subsidiary of China National Biotec Group (CNBG) on 7th May 2021[(7)].

The Sinopharm product is an inactivated vaccine called BIBP vaccine. Administration at an interval of 21 days, have an efficacy of 79% against symptomatic SARS-CoV-2 infection 14 days or more after the second dose. Vaccine efficacy against hospitalization was 79% Inactivated viral vaccines have been successfully used in immunization programs for decades [(7)].

The AstraZeneca/Oxford product is a viral vectored vaccine called ChAdOx1-S [recombinant]. It is a monovalent vaccine formed of a single recombinant, replication-deficient chimpanzee adenovirus vector encoding the S glycoprotein of SARS-CoV-2. The recommended schedule is two doses (0.5 ml) given

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intramuscularly into the deltoid muscle [8,9]. It is effective at preventing hospitalizations, intensive care unit (ICU) admissions and deaths due to COVID-19[8]. As for all vaccines, ChAdOx1-S [recombinant] vaccine should be given under health care supervision, with the appropriate medical treatment available in case of allergic reactions. An observation period of 15 minutes after vaccination should be ensured as any vaccine [9].

The objective of this study was to analyze the short-term side effect profile of the AstraZeneca/Oxford COVID-19 vaccine and Sinopharm Chinese vaccine using a self-reported online survey questionnaire among HCWs.

MATERIALS AND METHODS

The study was conducted at Cairo University Hospitals from February to May 2021. Data were collected through quantitative survey using Google forms from health care workers working at Cairo University Hospitals.

A total number of 4962 health care workers received COVID-19 vaccine at Cairo University Hospitals through this period, 3515 of them received AstraZeneca/Oxford COVID-19 vaccine (batch numbers 4120Z018 and CTMAV523) and 1447 of them received Sinopharm Chinese vaccine (batch numbers 202007034 and 2021010026).

Participants who voluntarily agreed and consented to proceed and who chose to receive one of COVID-19 vaccines were automatically allowed to move forward to answer subsequent questions about the short-term side effects after receiving the vaccine and other variables.

Persons with history of allergy to vaccine components, persons with history of COVID-19 infection less than 3 months ago and pregnant females were excluded from the study.

The data collected included:

Name, Age, Gender, Date of vaccination and Type of vaccine

Pre-vaccination assessments including history of adverse events after any previous vaccination, history of allergy to vaccine, drug or food, pre-existing morbidities, and pre-existing acute illness (30 days prior to vaccination), Previous history of confirmed COVID-19 infection, and type of the vaccine.

Symptoms appeared after 1st dose vaccination, Severity of symptoms**,** Duration of symptoms**,** Measures taken to relieve symptoms**,** Time of appearance of symptoms after vaccination and Time of disappearance of symptoms

Symptoms appeared after 2nd dose vaccination, Severity of symptoms
Duration of symptoms, Measures taken to relieve symptoms, Time of appearance of symptoms after vaccination and Time of disappearance of symptoms.

Statistical analysis

The different variables were presented in frequencies and percentages. We tested the association of the reported symptoms with the dose number and the type of the vaccine using Chi-square test. The logistic regression was adjusted for age, gender, presence of pre-existing comorbidities and previous COVID-19 infection.
The logistic regression was used for symptoms prediction with Astrazeneca vaccine compared to Sinopharm. Post-estimation test using area under the ROC curve that was estimated to be 0.797.

Ethical approval:

Approval for this survey was obtained from the infection control unit at Cairo University Hospitals and by the Research Ethics Committee of the Institutional Review Board, Faculty of Medicine, Cairo University.This work has been carried out in the accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving human.

RESULTS

participants characteristics

One thousand and one hundred and 90 health care workers responded to the questionnaire. Seven hundred and 70 of them (64.7%) received AstraZeneca vaccine while 420 (35.3%) received Sinopharm. Around half of the participants were between 46 and 65 years old and around 60% of them were males. One hundred and 15 participants (12.69 %) were previously diagnosed as COVID-19 confirmed case (Table 1).

Table 1: participants characteristics (n=1190)

	Number (n)	Percent (%)
Age group		
18-45	431	36.22
46-65	575	48.32
66-89	184	15.46
Gender		
Female	498	41.85
Male	692	58.15
Job title		
Professor	732	61.51
Assistant professor	179	15.04
Lecturer	155	13.03
Assistant lecturer	39	3.28
Resident	5	0.42
Other	80	6.72
History of adverse events after any previous vaccination		
No	1,129	94.87
Yes	26	2.18
Unknown	35	2.94
History of allergy to vaccine, drug, or food		
No	1,076	90.42
Yes	95	7.98
Unknown	19	1.60
Pre-existing comorbidities		
No	928	77.98
Yes	240	20.17
Unknown	22	1.85
Pre-existing acute illness (30 days prior to vaccination		
No	1,166	97.98
Yes	10	0.84
Unknown	14	1.18
Were you previously diagnosed as COVID-19 confirmed case?		
No	1,039	87.31
Yes	151	12.69
If yes, when were you diagnosed with COVID-19?		
Less than 3 months	28	18.18
3-6 months	68	44.16
More than 6 months	58	37.66
Type of the vaccine		
AstraZeneca	770	64.71
Sinopharm	420	35.29

The reported symptoms after the first and second doses of AstraZeneca and Sinopharm.

The most frequent symptoms after AstraZeneca vaccine were mild local reaction (34%), mild headache (27.3%) and mild and moderate fatigue (26.6 and 24.4% respectively). While the most frequent symptoms reported after Sinopharm vaccine were mild local reaction (23.1%) and mild fatigue (20.7%).There was a significant difference of the reported symptoms after the first and second doses of AstraZeneca; fever (p-value <0.001), sleep disturbance (p-value 0.001), change in appetite (p-value 0.014), nasal congestion (p-value 0.026), dizziness (p-value 0.006), local reaction (p-value 0.019), headache (p-value <0.001), fatigue (p-value <0.001), myalagia or arthralgia (p-value <0.001) and sweating (p-value 0.001). While there was a significant difference in the reported change in appetite (p-value 0.012) between the first and second doses of Sinopharm. Also, there was a significant difference between the number of participants who did not need any relieving measures or who had taken paracetamol for relieving the symptoms after the first and second doses of AstraZeneca (p-value <0.001) (Table 2).

Table 2: The reported symptoms after the 1st and 2nd doses of the AstraZeneca (n=770) and the Sinopharm (n=420) vaccines

	AstraZeneca				Sinopharm			
		1st Dose	2nd Dose			1st Dose	2nd Dose	
	Total n (%)	n (%)	n (%)	p-value*	Total n (%)	n (%)	n (%)	p-value*
	770 (100)	671 (87.14)	99 (12.86)		420 (100)	291 (69.29)	129 (30.71)	
Fever								
No	487 (63.25)	395 (58.87)	92 (92.93)		393 (93.57)	274 (94.16)	119 (92.25)	
< 38 °C	169 (21.95)	163 (24.29)	6 (6.06)		22 (5.24)	16 (5.50)	6 (4.65)	
38-39 °C	86 (11.17)	86 (12.81)	0 (0.00)	<0.001	6 (1.43)	2 (0.69)	4 (3.10)	0.518
> 39-40 °C	22 (2.86)	21 (3.13)	1 (1.01)		0 (0.00)	0 (0.00)	0 (0.00)	
> 40 °C	2 (0.26)	2 (0.30)	0 (0.00)		1 (0.24)	1 (0.34)	0 (0.00)	
Sleep disturbance								
No	543 (70.52)	458 (68.26)	85 (85.86)	0.001	362 (86.19)	254 (87.29)	108 (83.72)	0.329
Yes	227 (29.48)	213 (31.74)	14 (14.14)		58 (13.81)	37 (12.71)	21 (16.28)	
Nausea or vomiting								
No	706 (91.69)	611 (91.06)	95 (95.96)	0.118	399 (95.00)	275 (94.50)	124 (96.12)	0.630
Yes	64 (8.70)	60 (8.94)	4 (4.04)		21 (5.00)	16 (5.50)	5 (3.88)	
Abdominal pain								
No	703 (91.30)	608 (90.61)	95 (95.96)	0.086	399 (95.00)	278 (95.53)	121 (93.80)	0.452
Yes	67 (7.39)	63 (9.39)	4 (4.04)		21 (5.00)	13 (4.47)	8 (6.20)	
Diarrhea								
No	721 (93.64)	629 (93.74)	92 (92.93)	0.665	398 (94.76)	279 (95.88)	119 (92.25)	0.124
Yes	49 (6.36)	42 (6.26)	7 (7.07)		22 (5.24)	12 (4.12)	10 (7.75)	
Change in appetite								
No	673 (87.40)	579 (86.29)	94 (94.95)	0.014	405 (96.43)	285 (97.94)	120 (93.02)	0.012
Yes	97 (12.60)	92 (13.71)	5 (5.05)		15 (3.57)	6 (2.06)	9 (6.98)	
Fainting								
No	732 (95.06)	638 (95.08)	94 (94.95)	1.000	417 (99.29)	289 (99.31)	128 (99.22)	1.000
Yes	38 (4.94)	33 (4.92)	5 (5.05)		3 (0.71)	2 (0.69)	1 (0.78)	
Sore throat								
No	682 (88.57)	592 (88.23)	90 (90.91)	0.434	391 (93.10)	274 (94.16)	117 (90.70)	0.197
Yes	88 (11.43)	79 (11.77)	9 (9.09)		29 (6.90)	17 (5.84)	12 (9.30)	
Nasal congestion								
No	659 (85.58)	567 (84.50)	92 (92.93)	0.026	373 (88.81)	262 (90.03)	111 (86.05)	0.232
Yes	111 (14.42)	104 (15.50)	7 (7.07)		47 (11.19)	29 (9.97)	18 (13.95)	
Ear discomfort								
No	726 (94.29)	631 (94.04)	95 (95.96)	0.642	412 (98.10)	287 (98.63)	125 (96.90)	0.257
Yes	44 (5.71)	40 (5.96)	4 (4.04)		8 (1.90)	4 (1.37)	4 (3.10)	
Difficult breathing								
No	751 (97.53)	654 (97.47)	97 (97.98)	1.000	407 (96.90)	282 (96.91)	125 (96.90)	1.000
Yes	19 (2.47)	17 (2.53)	2 (2.02)		13 (3.10)	9 (3.09)	4 (3.10)	
Dizziness								
No	612 (79.48)	523 (77.94)	89 (89.90)	0.006	376 (89.52)	258 (88.66)	118 (91.47)	0.385
Yes	158 (20.52)	148 (22.06)	10 (10.10)		44 (10.48)	33 (11.34)	11 (8.53)	
Convulsions								
No	760 (98.70)	663 (98.81)	97 (97.98)	0.375	420 (100)	291 (100)	129 (100)	
Yes	10 (1.30)	8 (1.19)	2 (2.02)		0 (0.00)	0 (0.00)	0 (0.00)	
Lymph nodes Enlargement								
No	742 (96.36)	646 (96.27)	96 (96.97)	1.000	414 (98.57)	288 (98.97)	126 (97.67)	0.377
Yes	28 (3.64)	25 (3.73)	3 (3.03)		6 (1.43)	3 (1.03)	3 (2.33)	
Local reaction								
No	328 (42.60)	273 (40.69)	55 (55.56)		304 (72.38)	205 (70.45)	99 (76.74)	
Mild	262 (34.03)	231 (34.43)	31 (31.31)	0.019	97 (23.10)	73 (25.09)	24 (18.60)	0.394
Moderate	154 (20.00)	142 (21.16)	12 (12.12)		17 (4.05)	11 (3.78)	6 (4.65)	
Severe	26 (3.38)	25 (3.73)	1 (1.01)		2 (0.48)	2 (0.69)	0 (0.00)	
Headache								
No	401 (52.08)	329 (49.03)	72 (72.73)		325 (77.38)	221 (75.95)	104 (80.62)	
Mild	210 (27.27)	188 (28.02)	22 (22.22)	<0.001	62 (14.76)	43 (14.78)	19 (14.73)	0.505
Moderate	134 (17.40)	129 (19.23)	5 (5.05)		27 (6.43)	22 (7.56)	5 (3.88)	
Severe	25 (3.25)	25 (3.73)	0 (0.00)		6 (1.43)	5 (1.72)	1 (0.78)	

		AstraZeneca				Sinopharm		
		1st Dose	2nd Dose			1st Dose	2nd Dose	
	Total n (%)	n (%)	n (%)	p-value*	Total n (%)	n (%)	n (%)	p-value*
Fatigue								
No	273 (35.45)	209 (31.15)	64 (64.65)	<0.001	294 (70.00)	201 (69.07)	93 (72.09)	0.766
Mild	205 (26.62)	178 (26.53)	27 (27.27)		87 (20.71)	64 (21.99)	23 (17.83)	
Moderate	188 (24.42)	181 (26.97)	7 (7.07)		31 (7.38)	21 (7.22)	10 (7.75)	
Severe	104 (13.51)	103 (15.35)	1 (1.01)		8 (1.90)	5 (1.72)	3 (2.33)	
Myalgia or arthralgia								
No	356 (46.23)	286 (42.62)	70 (70.71)	<0.001	338 (80.48)	239 (82.13)	99 (76.74)	0.273
Mild	167 (21.69)	145 (21.61)	22 (22.22)		44 (10.48)	27 (9.28)	17 (13.18)	
Moderate	159 (20.65)	155 (23.10)	4 (4.04)		33 (7.86)	23 (7.90)	10 (7.75)	
Severe	88 (11.43)	85 (12.67)	3 (3.03)		5 (1.19)	2 (0.69)	3 (2.33)	
Muscle cramps								
No	637 (82.73)	548 (81.67)	89 (89.90)	0.216	384 (91.43)	266 (91.41)	118 (91.47)	0.709
Mild	76 (9.87)	70 (10.43)	6 (6.06)		18 (4.29)	12 (4.12)	6 (4.65)	
Moderate	40 (5.19)	38 (5.66)	2 (2.02)		14 (3.33)	11 (3.78)	3 (2.33)	
Severe	17 (2.21)	15 (2.24)	2 (2.02)		4 (0.95)	2 (0.69)	2 (1.55)	
Itching								
No	723 (93.90)	631 (94.04)	92 (92.93)	0.532	406 (96.67)	278 (95.53)	128 (99.22)	0.325
Mild	35 (4.55)	30 (4.47)	5 (5.05)		11 (2.62)	10 (3.44)	1 (0.78)	
Moderate	9 (1.17)	8 (1.19)	1 (1.01)		2 (0.48)	2 (0.69)	0 (0.00)	
Severe	3 (0.39)	2 (0.30)	1 (1.01)		1 (0.24)	1 (0.34)	0 (0.00)	
Sweating								
No	652 (84.68)	556 (82.86)	96 (96.97)	0.001	408 (97.14)	282 (96.91)	126 (97.67)	0.877
Mild	65 (8.44)	64 (9.54)	1 (1.01)		3 (0.71)	2 (0.69)	1 (0.78)	
Moderate	41 (5.32)	40 (5.96)	1 (1.01)		3 (0.71)	3 (1.03)	0 (0.00)	
Severe	12 (1.56)	11 (1.64)	1 (1.01)		6 (1.43)	4 (1.37)	2 (1.55)	
Anaphylactic reaction								
No	770 (100)	671 (100)	99 (100)		420 (100)	291 (100)	129 (100)	

* p-value is calculated using Chi-square test and is considered significant if <0.05.

Around 50% and 20% of the participants did not report any symptoms after receiving Sinopharm and AstraZeneca vaccines, respectively. Figure 1 shows time of the start of the reported symptoms after Sinopharm and AstraZeneca vaccines (p-value <0.001). Around 25% and 54.81% of participants reported the symptoms started in the first 24 hours after receiving Sinopharm and AstraZeneca vaccines, respectively. Figure 2 illustrates the duration of symptoms of the first and second dose of both vaccines with insignificant difference between both vaccines (p-value 0.086 and 0.594, respectively).

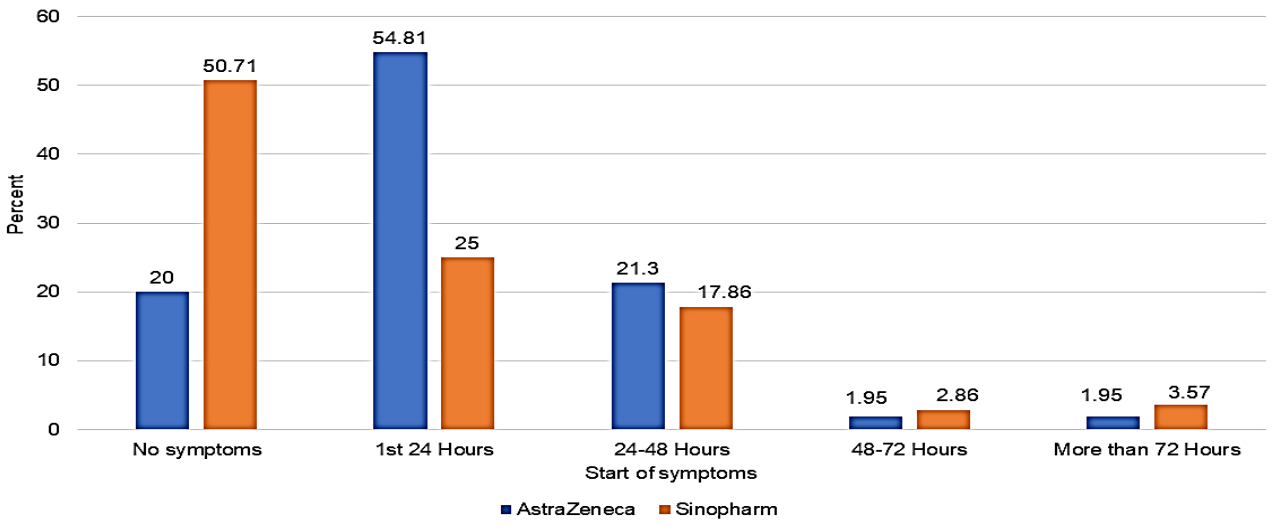
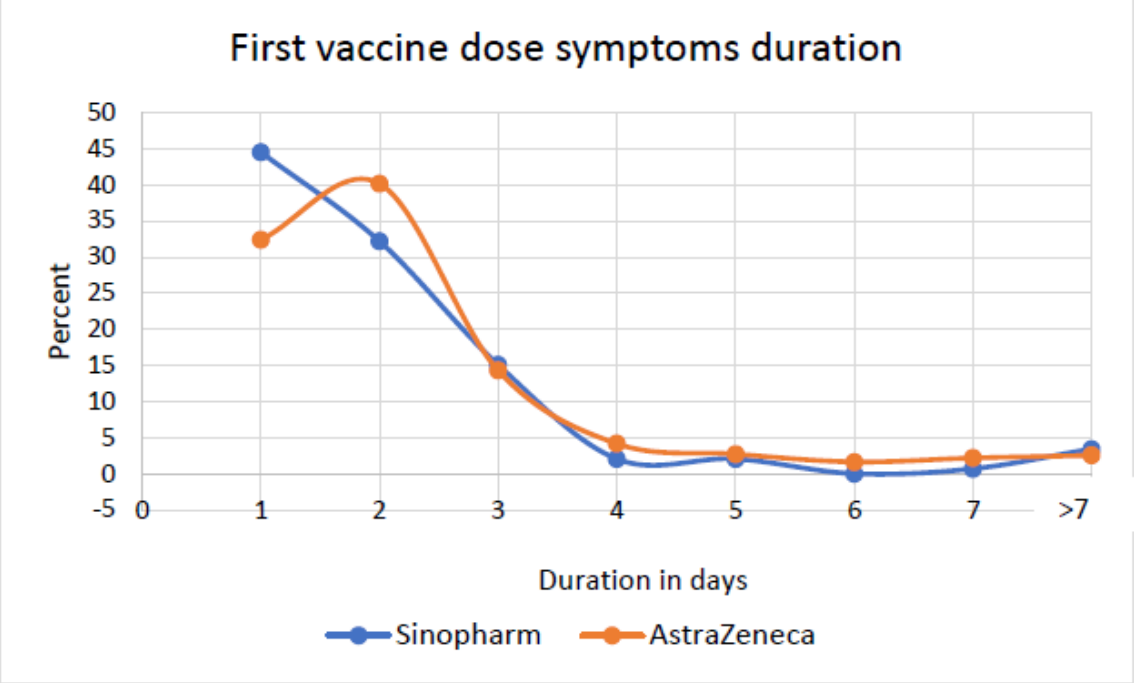


Figure 1: start of symptoms after vaccination with both vaccines



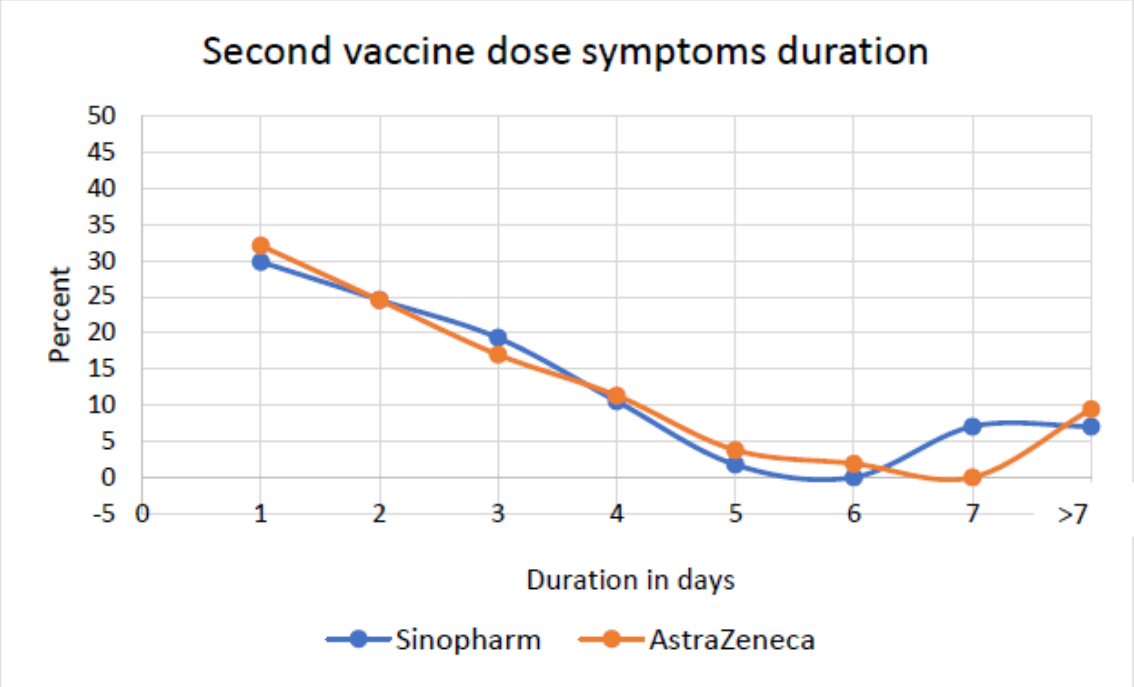


Figure 2: Duration of symptoms after both doses of the two vaccines

The reported symptoms with regard to the different vaccines

There was a significant difference in most of the reported symptoms after vaccination with AstraZeneca and Sinopharm; fever (p-value <0.001), sleep disturbance (p-value <0.001), nausea and vomiting (p-value 0.034), abdominal pain (p-value 0.02), change in appetite (p-value <0.001), fainting (p-value <0.001), sore throat (p-value 0.012), ear discomfort (p-value 0.002), dizziness (p-value <0.001), convulsions (p-value 0.018), lymph node enlargement (p-value <0.029), local reaction (p-value <0.001), headache (p-value <0.001), fatigue (p-value <0.001), myalgia or arthralgia (p-value <0.001), muscle cramps (p-value <0.001), and sweating (p-value <0.001).There was a significant difference between the number of participants who did not need any relieving measures or who had taken paracetamol and NSAIDS or applied local measures for relieving the symptoms after AstraZeneca and Sinopharm vaccines (p-value <0.001)(Table 3).

Table 3: The reported symptoms with regard to the different vaccines (n=1,190)

	Total n (%)	AstraZeneca n (%)	Sinopharm n (%)	p-value*
	1,190 (100)	**770 (64.71)**	**440 (35.29)**	
Fever				
No	880 (73.95)	487 (63.25)	393 (93.57)	
< 38 °C	191 (16.50)	169 (21.95)	22 (5.24)	
38-39 °C	92 (7.73)	86 (11.17)	6 (1.43)	<0.001
> 39-40 °C	22 (1.85)	22 (2.86)	0 (0.00)	
> 40 °C	3 (0.25)	2 (0.26)	1 (0.24)	
Sleep disturbance				
No	905 (76.05)	543 (70.52)	362 (86.19)	<0.001
Yes	285 (23.95)	227 (29.48)	58 (13.81)	
Nausea or vomiting				
No	1,105 (92.86)	706 (91.69)	399 (95.00)	0.034
Yes	85 (7.14)	64 (8.70)	21 (5.00)	
Abdominal pain				
No	1,102 (92.61)	703 (91.30)	399 (95.00)	0.020
Yes	88 (7.39)	67 (7.39)	21 (5.00)	
Diarrhea				
No	1,119 (94.03)	721 (93.64)	398 (94.76)	0.433
Yes	71 (5.97)	49 (6.36)	22 (5.24)	
Change in appetite				
No	1,078 (90.59)	673 (87.40)	405 (96.43)	<0.001
Yes	112 (9.41)	97 (12.60)	15 (3.57)	
Fainting				
No	1,149 (96.55)	732 (95.06)	417 (99.29)	<0.001
Yes	41 (3.45)	38 (4.94)	3 (0.71)	
Sore throat				
No	1,073 (90.17)	682 (88.57)	391 (93.10)	0.012
Yes	117 (9.83)	88 (11.43)	29 (6.90)	
Nasal congestion				
No	1,032 (86.72)	659 (85.58)	373 (88.81)	0.117
Yes	158 (13.28)	111 (14.42)	47 (11.19)	
Ear discomfort				
No	1,138 (95.63)	726 (94.29)	412 (98.10)	0.002
Yes	52 (4.37)	44 (5.71)	8 (1.90)	
Difficulty in breathing				
No	1,158 (97.31)	751 (97.53)	407 (96.90)	0.522
Yes	32 (2.69)	19 (2.47)	13 (3.10)	
Dizziness				
No	988 (83.03)	612 (79.48)	376 (89.52)	<0.001
Yes	202 (16.97)	158 (20.52)	44 (10.48)	
Convulsions				
No	1,180 (99.16)	760 (98.70)	240 (100)	0.018
Yes	10 (0.84)	10 (1.30)	0 (0.00)	
Lymph nodes Enlargement				
No	1,156 (97.14)	742 (96.36)	414 (98.57)	0.029
Yes	34 (2.86)	28 (3.64)	6 (1.43)	
Local reaction				
No	632 (53.11)	328 (42.60)	304 (72.38)	
Mild	359 (30.17)	262 (34.03)	97 (23.10)	<0.001
Moderate	171 (14.37)	154 (20.00)	17 (4.05)	

	Total n (%)	AstraZeneca n (%)	Sinopharm n (%)	p-value*
	1,190 (100)	**770 (64.71)**	**440 (35.29)**	
Severe	28 (2.35)	26 (3.38)	2 (0.48)	
Headache				
No	726 (61.01)	401 (52.08)	325 (77.38)	<0.001
Mild	272 (22.86)	210 (27.27)	62 (14.76)	
Moderate	161 (13.53)	134 (17.40)	27 (6.43)	
Severe	31 (2.61)	25 (3.25)	6 (1.43)	
Fatigue				
No	567 (47.65)	273 (35.45)	294 (70.00)	<0.001
Mild	292 (24.54)	205 (26.62)	87 (20.71)	
Moderate	219 (18.40)	188 (24.42)	31 (7.38)	
Severe	112 (9.41)	104 (13.51)	8 (1.90)	
Myalgia or arthralgia				
No	694 (58.32)	356 (46.23)	338 (80.48)	<0.001
Mild	211 (17.73)	167 (21.69)	44 (10.48)	
Moderate	192 (16.13)	159 (20.65)	33 (7.86)	
Severe	93 (7.82)	88 (11.43)	5 (1.19)	
Muscle cramps				
No	1,021 (85.80)	637 (637)	384 (91.43)	<0.001
Mild	94 (7.90)	76 (9.87)	18 (4.29)	
Moderate	54 (4.54)	40 (5.19)	14 (3.33)	
Severe	21 (1.76)	17 (2.21)	4 (0.95)	
Itching				
No	1,129 (94.87)	723 (93.90)	406 (96.67)	0.213
Mild	46 (3.87)	35 (4.55)	11 (2.62)	
Moderate	11 (0.92)	9 (1.17)	2 (0.48)	
Severe	4 (0.34)	3 (0.39)	1 (0.24)	
Sweating				
No	1,060 (89.08)	652 (84.68)	408 (97.14)	<0.001
Mild	68 (5.71)	65 (8.44)	3 (0.71)	
Moderate	44 (3.70)	41 (5.32)	3 (0.71)	
Severe	18 (1.51)	12 (1.56)	6 (1.43)	
Anaphylactic reaction				
No	1,190 (100)	770 (100)	420 (100)	

* p-value is calculated using Chi-square test and is considered significant if <0.05.

The result of the adjusted logistic regression shows that participants in between the age of 46 and 65 years old, male gender and receiving Sinopharm vaccine were less likely to develop symptoms after vaccination [OR (95% CI) 0.22 (0.07-0.67), 4.13 (1.33-12.81), 0.13 (0.038-0.45), and0.077 (0.027-0.22), *p-value* 0.008, 0.001, and <0.001respectively].

The adjusted logistic regression for the reported symptoms after AstraZeneca compared to Sinopharm vaccine.

Participants receiving AstraZeneca vaccine were 3.6 times more likely to have fever compared to those receiving Sinopharm [OR (95% CI) 3.62 (2.18-6.04), *p-value*<0.001].Also, they were more likely to have mild, moderate, and severe local reaction in comparison with those receiving Sinopharm [OR (95% CI) 2.01 (1.46-2.78), 6.13 (3.29-11.40), and 6.06 (1.07-34.33), *p-value*<0.001, <0.001, and 0.042, respectively].They were more likely to complain of moderate and severe fatigue, mild and severe myalgia or arthralgia and mild sweating [OR (95% CI) 2.42 (1.22-4.8), 4.13 (1.33-12.81), 2.07 (1.34-3.2), 5.71 (1.29-25.31) and 5.16 (1.45-18.31), *p-value* 0.012, 0.014, 0.001, 0.022, and 0.011, respectively] (Table 4).

Table 4: Adjusted logistic regression for the vaccines' reported symptoms^ for AstraZeneca vaccine compared to Sinopharm

	Odds Ratio (OR)#	95% Confidence interval (95% CI)	p-value*
Fever	3.62	2.18-6.04	<0.001
Sleep disturbance	1.23	0.79-1.91	0.348
Nausea or vomiting	0.94	0.45-1.97	0.878
Abdominal pain	0.95	0.45-2.00	0.903
Change in appetite	1.39	0.63-3.06	0.414
Fainting	4.23	0.96-18.59	0.056
Sore throat	0.46	0.26-0.83	0.011
Ear discomfort	1.08	0.38-3.05	0.879
Dizziness	0.63	0.37-1.07	0.087
Enlarged lymph nodes	0.88	0.28-2.81	0.836
Local reaction			
Mild	2.01	1.46-2.78	<0.001
Moderate	6.13	3.29-11.40	<0.001
Severe	6.06	1.07-34.33	0.042
Headache			
Mild	1.21	0.80-1.84	0.362
Moderate	0.87	0.46-1.67	0.689
Severe	0.42	0.13-1.39	0.156
Fatigue			
Mild	1.39	0.94-2.06	0.098
Moderate	2.42	1.22-4.80	0.012
Severe	4.13	1.33-12.81	0.014
Myalgia or arthralgia			
Mild	2.07	1.34-3.20	0.001
Moderate	1.41	0.73-2.73	0.300
Severe	5.71	1.29-25.31	0.022
Muscle cramps			
Mild	0.89	0.46-1.74	0.746
Moderate	0.41	0.17-0.97	0.044
Severe	0.35	0.05-2.39	0.286
Sweating			
Mild	5.16	1.45-18.31	0.011
Moderate	1.08	0.28-4.08	0.911
Severe	0.25	0.04-1.56	0.139

^ The logistic regression was adjusted for age, gender, presence of pre-existing comorbidities, and previous COVID-19 infection.

OR for symptoms prediction with AstraZeneca vaccine compared to Sinopharm

* p-value is considered significant if <0.05

DISCUSSION

Since the emergence of COVID-19 pandemic, it was believed that vaccination with high coverage is the most powerful intervention to curb the massive spread of COVID-19 across the globe. Like any other vaccine, different grades of side effects might be reported succeeding the use of COVID-19 vaccines due to stimulating the immune system. Currently, little is known about real- world safety and reactogenicity events of COVID-19 vaccines outside of clinical trials. Here, we present 1910 vaccinated health - care workers in Cairo university hospital for better understanding and assessing adverse events following COVID-19 vaccine use.

This study showed that the frequency of reporting post-vaccination symptoms was 50% and 80% among Sinopharm and AstraZeneca recipients respectively. Same results were reported by Rajeev Jayadevan in India where the frequency of symptoms among the HCW was 66% for AstraZeneca and 24.4% for Sinopharm [(10)]. The adjusted logistic regression revealed that receiving AstraZeneca is a significant predictor for experiencing multiple and stronger side effects. According to World Health Organization, the evolving of different grades of side effects is considered normal and they might differ according to the type of vaccine [(11)].

Reactogenicity rates in older age groups (46-65 y) were less, which was also compatible with the data of Janssen phase II trial and Oxford/Astrazeneca (ChAdOx1), that the incidence rates of side effects were lower in the older age groups [(12,13)]. This might be attributed to the deterioration of immune system is response to aging process.

In the current study women were liable to complain of post-vaccination symptoms more than men, Data Safety Summary (DSM) of Pfizer and Moderna vaccine trials stated that 79% of vaccine side effects were reported by women although they only constitute 61% of administered doses [(14)]. It is still ambiguous why woman react worse than men to some vaccines such as: influenza, yellow fever, yet several studies have evaluated different likely causes including biology, behavior, genetics, and hormones.

In the current study, the most common local symptoms after receiving AstraZeneca were mild local reaction (34%), whereas mild headache (27.3%), mild and moderate fatigue (26.6 and 24.4% myalgia 21.6% respectively, were most observed systemic adverse events [(15)]. These findings were also in consistent with what was reported in the interim analysis of clinical trials conducted in 4 countries on (Oxford/AZ-ChAdOx1 nCoV-19) vaccine [(16)].

More than half of the AstraZeneca cohort and one quarter of the Sinopharm group had reported local and systemic post- vaccination symptoms within the first 24 hours following injection. In a survey conducted in Nepal, 84.4% of the general population had experienced minor side effects within the first day following immunization [(17)]. The majority of this symptoms lasts no longer and fades away on their own later [(18,19)].

Noteworthy, Dizziness was figured out in one third of AstraZeneca recipients, despite of being "uncommon "one [(20)], with a noted statistical difference with Sinopharm group. According to Vaccine Adverse Event reporting system (VARES), 16.5% of their entries mentioned dizziness as a complaint after receiving different types of COVID-19 and it was thought to be attributed to previous COVID-19 infection or an allergic reaction to the vaccine [(14)].

CONCLUSIONS

While both vaccines were safe, the healthcare workers who received Sinopharm vaccine showed significantly fewer post-vaccination side effects compared to AstraZeneca recipients.

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