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Research Article

Post COVID-19 Vaccine Side Effects Among Iraqi Population Group: A National Cross-Sectional Retrospective Study

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Abstract

Background: The aims of this study are to reveal post covid-19 vaccine local and systematic side effects among Iraqi population group with the three COVID-19 vaccines available in Iraq, Pfizer – BioNTech (BNT 163b2) mRNA, AstraZeneca (chAd0x1 nCoV-19 vaccine) and SinoPharm (BBIBP-Cor Vaccine).

Materials and Methods: Across sectional study design was conducted (3064 online google forms) between October 2022 – January 2023 (4 months) among Iraqi population group of various educational background levels with 14 questions with their subdivisions pertaining 4 sections according to their most post-vaccine side effects via e-mail and social media platform, these 4 sections are: common local and systematic post vaccine side effects among Iraqi population group, most common side effects among female concerning MC irregularity, bleeding and pain, and post vaccine infection with covid-19 virus and its severity.

Results: Among 3064 people enrolled in the study, females comprised (57%), male (39%), (4%) of sample were missing (123). Majority of subjects belonged to age group 18-30 (71.6%), (59.9%) of total sample had no chronic disease and (74.9%) of total sample got vaccinated, Pfizer vaccine constituted the highest percentage (56.4%), following Sinopharm (17.3%) then AstraZeneca (12.4%). Majority of the population had gotten two shots of the available vaccines. Among local side effects pain at injection site constituted highest percentage (35%) followed by difficulty in moving vaccinated arm (30.5%), while among systemic side effects, joint pain constituted the highest percentage (26.7%), followed by fatigue and laziness (26.5%) and fever (11%) for more than 6 hours, while the other systemic effects were not present in most of the study sample and if it was present it was for 1 day like flu cough, shortness of breath, severe headache, chest heaviness, sore throat, GIT, UTI, tinnitus of the ear and skin allergic reactions. Concerning females, majority of them had no irregular MC, pain, or abnormal bleeding post vaccination. Concerning post vaccination

with covid-19 virus, most of the sample (53.3%) were not infected with the virus, the percentage of those who got infected post first or 2nd shot were very low (22.6%, 20.7%), the severity of infection was mild (21%) among those who got infected, with muscle ache, fever, flu, hospitalization cases were (23.9%) among infected cases for less than 7 days.

Conclusion: The study revealed satisfactory acceptance level for all types of vaccines (75%) available in Iraq, (39%) of participants were asymptomatic post vaccination, with mild to moderate symptoms in terms of severity which developed 24 hours post vaccination that requires home or medical symptomatic treatment and can be tolerated. So, these three types were found to be safe according to the observation of these symptoms, unusual adverse effects should be monitored carefully to determine whether they are related to vaccine or not.

Keywords: Pfizer; AstraZeneca; Sinopharm Vaccine; Side Effects; Menstrual Cycle

Introduction

Vaccination is considered as a key factor in the sanitary resolution of Covid-19 pandemic. The vaccine development for Covid-19 prevention has grown into a struggle between viruses and humans which has made it more complicated, along with the discovery of other related strains [1].

Several countries have entered the vaccine development battle, hastening the clinical trial phase and attempting to produce an efficient and safe vaccine against Covid-19, these vaccines have been studied in large, randomized-controlled studies with people of all ages, genders, nationalities, and individuals with non-medical disorders [2].

The Word Health Organization (WHO) had declared the release of Covid-19 vaccines that can be divided into 3 main groups; [1] The first group consists of mRNA-based vaccine, namely P Fizer-Biotech (BNT 162b2), [2] The 2nd GP Adenoviral vector vaccines Oxford-AstraZenica/chAdox 1 n=cov-19 vaccine [3] the third group inactivated whole virus SARS- COVD-2 Vaccine developed by Sinopharm BBIP-corv vaccine (Beijing, China) [3].

Researchers found that efficacy of Astrazenica and Pfizer vaccine is 70% and 95% respectively [4,5], while Sinopharm is safe and effective with a zero conversion of 92-100%, Its T cell responses after vaccination is low compared to the other two leading to its low effectiveness [6]. Despite that, Sinopharm was the first vaccine that had been administered to Iraqi population and acceptable as WHO'S target was on efficiency of more than 50% [7].

Vaccines are not completely free of side effects or complications, their use has not been without evidence of both mild side effects such as fatigue, headache, myalgias and more severe adverse events following administration regarding post-vaccination menstrual cycle changes and how to deal with them accordingly [8,9].

These concerns had raised the need to study post covid-19 vaccination side effects of different vaccines applied in Iraq.

Aims of the Study

- Studying potential post-covid-19 vaccine side effects.
- Studying risk factors with severe side effects for the 3 vaccines available in Iraq (Sinopharm, AstraZeneca, Pfizer - BioNTech).
- To study post-vaccination changes in MC Iraqi women.

Materials and Methods

Study design and participants

A cross sectional study design was conducted (3064 online google forms) between October 2022 - January 2023 (4 months) among Iraqi population group of various educational background levels, an online cross -sectional questionnaire with 14 questions including their subdivisions pertaining 4sections circulated to the participants according to their most common post-vaccine side effects via e-mail and social media platform. These 4 sections include: types of vaccines commonly used in Iraq and number of shots given, most common vaccine side effects among Iraqi population group, common post-vaccine side effect among females concerning menstrual irregularity, amount of bleeding, pain during period and post vaccine infection with covid-19 virus and its severity.

Sample size determination

3064 google form were gathered from Iraqi background society, the participants were asked to complete the questionnaire after distribution via e-mail and social media by choosing one answer to each question,15 common side effects were included in the questionnaire.

Inclusion criteria

Anybody who had taken the vaccine shots recently, had an e-mail account has sufficient knowledge about vaccine related aspects of this research to fill in the questionnaire.

Age: 18-80 years old

All Gender (females 1770, males 1294, total 3064).

Exclusion criteria

- Anybody who didn't get vaccinated or hasn't received vaccine shot before.
- People younger than 18 years and pregnant women.
- Anybody who can't fill the questionnaire and doesn't own an e-mail account.

Statistical analysis

The responses from google forms were transferred to Microsoft excel sheet. Descriptive and inferential statistics were applied using SPSS software version 20. Chi-square test was employed to find the association among responses for questions. Significance level was set at $p < 0.05$ level.

Result

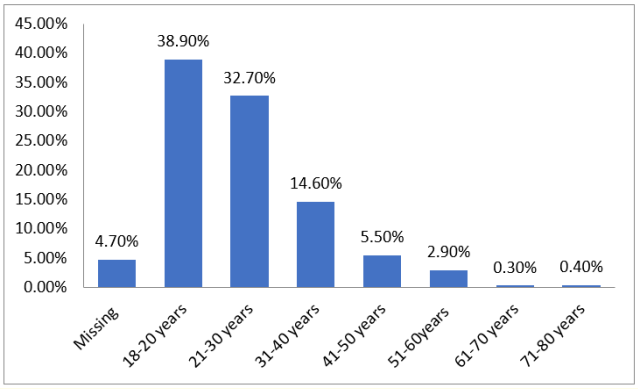

Figure 1: Age-wise distribution of the subjects.

Majority of the subjects belonged to age group 18-30 years (71.6%). 14.6% of the population belonged to 31-40 years. 5.5% belonged to 41-50 years. 2.9% were of 51-60 years. Very few (0.3%, 0.4%) belonged to age group of 61- 80 years as it is shown in figure 1.

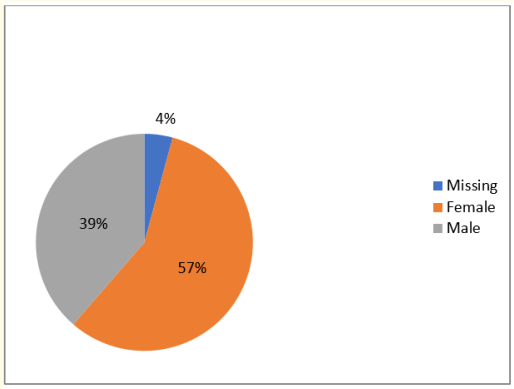

Figure 2: Gender wise distribution of the subjects.

Majority of the subjects were female (57%). Males comprised of (39%). (4%) missing as it is shown in figure 2.

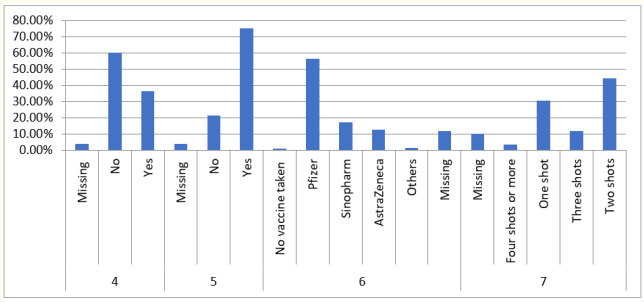

Figure 3: Types of vaccines commonly used in Iraq and number of shots given.

Table 1 shows the types of vaccines commonly used in Iraq and number of shots given. A statistically significant association was found for whether people had chronic disease, whether they were vaccinated, type of vaccine and number of vaccine shots received.

		Frequency	Percent	Chi square statistics	p value
Do you suffer from a chronic disease (Diabetes, hypertension, rhinitis, asthma, thyroid disease, kidney disease, osteoarthritis, heart disease, autoimmune disease)	Missing	121	3.9	179.589	<0.001**
	No	1835	59.9		
	Yes	1108	36.2		
	Total	3064	100		
Did you get vaccinated	Missing	116	3.8	916.803	<0.001**
	No	652	21.3		
	Yes	2296	74.9		
	Total	3064	100		
Type of vaccine	No vaccine taken	24	0.8	3616.22	<0.001**
	Pfizer	1729	56.4		
	Sinopharm	531	17.3		
	AstraZeneca	380	12.4		
	Others	40	1.3		
	Missing	360	11.7		
	Total	3064	100		
Number of vaccination shots gotten	Missing	309	10.1	1382.691	<0.001**
	Four shots or more	107	3.5		
	One shot	928	30.3		
	Three shots	361	11.8		
	Two shots	1359	44.4		
	Total	3064	100		

Table 1: Types of vaccines commonly used in Iraq and number of shots given.

** highly significant.

Majority of the population did not suffer from chronic disease. 74.9% of the population were vaccinated. 4% of the responses were missing due to respondents' ignorance or other related reasons. Pfizer vaccine was the most commonly used vaccine (56.4%) among the population. 44% of the population had received two shots as shown in figure 3.

		Frequency	Percent	Chi square statistics	p value
Pain at site of injection?	Missing	283	9.2	494.778	<0.001**
	No pain noticed	334	10.9		
	Yes, for one day	1071	35		
	Yes, for three days or more	498	16.3		
	Yes, for two days	878	28.7		
	Total	3064	100		

Difficulty in moving vaccinated arm?	Missing	294	9.6	280.296	<0.001**
	No difficulty in moving vaccinated arm noticed	382	12.5		
	Yes, for one day	934	30.5		
	Yes, for three days or more	591	19.3		
	Yes, for two days	863	28.2		
	Total	3064	100		
Post-vaccine fever?	Missing	289	9.4	276.479	<0.001**
	No fever	614	20		
	Yes, it lasted for 3 hours	857	28		
	Yes, it lasted for 4 hours	506	16.5		
	Yes, it lasted for 5 hours	461	15		
	Yes, it lasted for 6 hours or more	337	11		
	Total	3064	100		
Post-vaccine flu?	Missing	302	9.9	283.66	<0.001**
	No post-vaccine flu	989	32.3		
	Yes, for one day	773	25.2		
	Yes, for three days or more	383	12.5		
	Yes, for two days	617	20.1		
	Total	3064	100		
Post-vaccine cough?	Missing	300	9.8	368.399	<0.001**
	No post-vaccine cough	1098	35.8		
	Yes, for one day	676	22.1		
	Yes, for three days or more	418	13.6		
	Yes, for two days	572	18.7		
	Total	3064	100		
Post-vaccine joint pain?	Missing	301	9.8	73.307	<0.001**
	No post-vaccine joint pain	752	24.5		
	Yes, for one day	819	26.7		
	Yes, for three days or more	517	16.9		
	Yes, for two days	675	22		
	Total	3064	100		
Post-vaccine fatigue & laziness?	Missing	310	10.1	55.72	<0.001**
	No post-vaccine fatigue & laziness	739	24.1		
	Yes, for one day	813	26.5		
	Yes, for three days or more	551	18		
	Yes, for two days	651	21.2		
	Total	3064	100		

Post-vaccine Shortness of Breath (SoB)?	Missing	309	10.1	424.57	<0.001**
	No post-vaccine Shortness of Breath	1110	36.2		
	Yes, for one day	727	23.7		
	Yes, for three days or more	396	12.9		
	Yes, for two days	522	17		
	Total	3064	100		
Post-vaccine severe headache?	Missing	309	10.1	180.325	<0.001**
	No post-vaccine severe headache	942	30.7		
	Yes, for one day	746	24.3		
	Yes, for three days or more	468	15.3		
	Yes, for two days	599	19.5		
	Total	3064	100		
Post-vaccine chest heaviness?	Missing	311	10.2	526.173	<0.001**
	No post-vaccine chest heaviness	1181	38.5		
	Yes, for one day	673	22		
	Yes, for three days or more	399	13		
	Yes, for two days	500	16.3		
	Total	3064	100		
Post-vaccine sore throat?	Missing	316	10.3	589.077	<0.001**
	No post-vaccine sore throat	1215	39.7		
	Yes, for one day	627	20.5		
	Yes, for three days or more	373	12.2		
	Yes, for two days	533	17.4		
	Total	3064	100		
Post-vaccine GIT symptoms?	Missing	317	10.3	146.787	<0.001**
	No	1691	55.2		
	Yes	1056	34.5		
	Total	3064	100		
Post-vaccine urinary symptoms (UTI) symptoms?	Missing	313	10.2	180.671	<0.001**
	No	1728	56.4		
	Yes	1023	33.4		
	Total	3064	100		
Post-vaccine tinnitus symptoms in the ear (Ringing sound in one or both ears)?	Missing	314	10.2	162.263	<0.001**
	No	1709	55.8		
	Yes	1041	34		
	Total	3064	100		
Any noticed post-vaccine skin allergic reactions?	Missing	306	10	213.859	<0.001**
	No	1763	57.5		
	Yes	995	32.5		
	Total	3064	100		

Table 2: Most common vaccine side effects among Iraqi population group.

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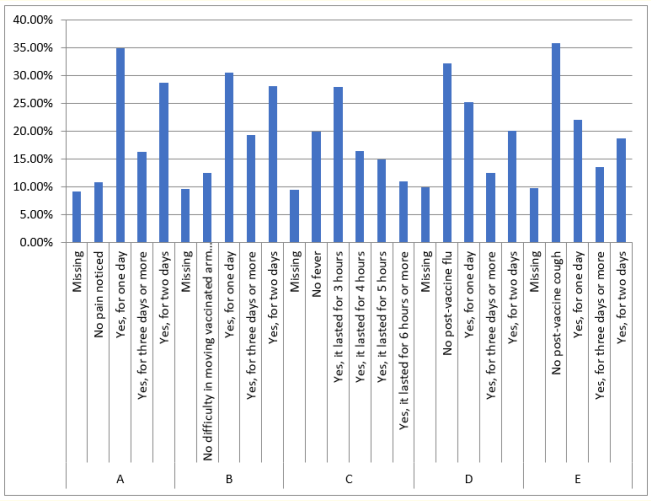

Figure 4: A: Most common vaccine side effects among Iraqi population group (Questions A-E).

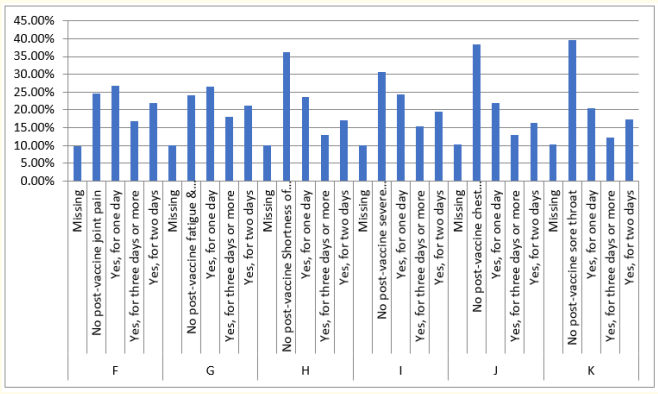

Figure 4: B: Most common vaccine side effects among Iraqi population group (Questions F-K).

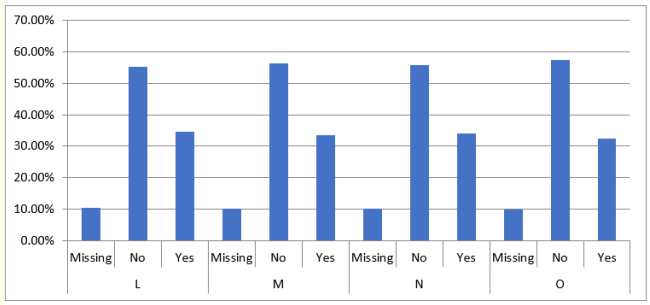

Figure 4: C: Most common vaccine side effects among Iraqi population group (Questions L-O).

Table 2 shows most common vaccine side effects among Iraqi population group. There was a statistically significant association for all the post vaccine side effects. Nearly 10% of the responses are missing for the variables which may indicate lack of knowledge, awareness and ignorance. Majority had pain, difficulty in moving the arm, joint pain, fatigue and laziness, for one day. Post vaccine, 20% reported no fever whereas 11% of the population had fever for more than 6 hours as shown in figure 4A. Flu, cough, shortness of breath, severe headache, chest heaviness, sore throat as shown in figure 4B, GIT symptoms, urinary symptoms (UTI) symptoms, tinnitus symptoms in the ear and skin allergic reactions were mainly not present in most of them as shown in figure 4C. Among those who suffered from flu, cough, shortness of breath, severe headache, chest heaviness, sore throat majority had for one day.

		Frequency	Percent	Chi square statistics	p value
Post-vaccination menstrual cycle irregularity? (Female ONLY)	Missing	509	16.6	93	<0.001**
	I am not included in the category pf this question as either am a man, pregnant or menopause woman	558	18.2		
	No	930	30.4		
	Yes, less than thirty days	628	20.5		
	Yes, more than thirty days	439	14.3		
	Total	3064	100		

Post-vaccination less amount of bleeding? (Female ONLY)	Missing	519	16.9	144.967	<0.001**
	I am not included in the category pf this question as either am a man, pregnant or menopause woman	614	20		
	No	1108	36.2		
	Yes	823	26.9		
	Total	3064	100		
Post-vaccination pain during the period? (Female ONLY)	Missing	516	16.8	113.252	<0.001**
	I am not included in the category pf this question as either am a man, pregnant or menopause woman	620	20.2		
	No	1057	34.5		
	Yes	871	28.4		
	Total	3064	100		

Table 3: Common vaccine side effects among females concerning menstrual irregularity, amount of bleeding, pain during period.

** highly significant.

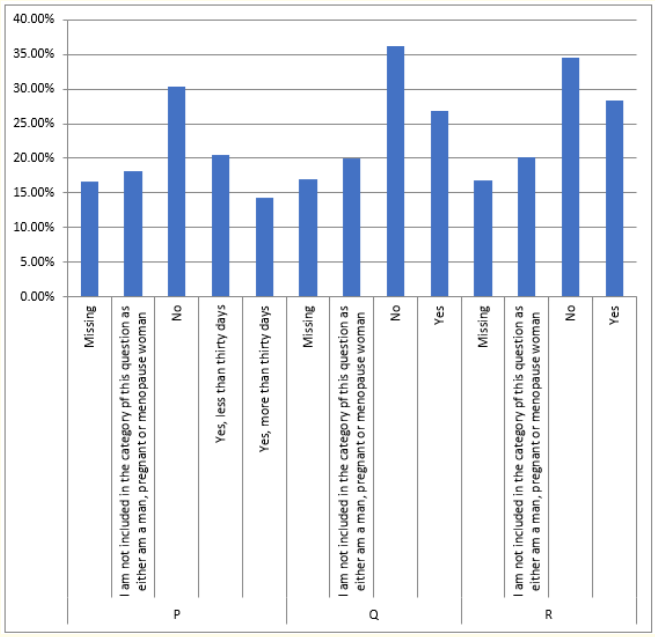

Figure 5: Common vaccine side effects among females concerning menstrual irregularity, amount of bleeding, pain during period.

Table 3 shows common vaccine side effects among females concerning menstrual irregularity, amount of bleeding, pain during period. there was a statistically significant association for all variables. Majority of them had no irregular menstrual cycles, pain of abnormal bleeding post vaccination as shown in figure 5.

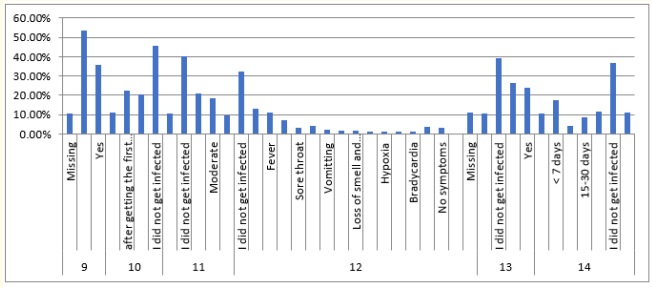

Figure 6: Post vaccination infection with COVID-19 virus and its severity.

		Frequency	Percent	Chi square statistics	p value
Did you get infected with COVID-19 after getting vaccinated?	Missing	330	10.8	103.52	<0.001**
	No	1633	53.3		
	Yes	1101	35.9		
	Total	3064	100		
If you got infected with COVID-19 AFTER GETTING VACCINATED, were you infected:	Missing	337	11	399.611	<0.001**
	after getting the first shot	692	22.6		
	after getting the second shot	635	20.7		
	I did not get infected	1400	45.7		
	Total	3064	100		
Generally speaking, if you got infected with COVID-19 AFTER GETTING VACCINATED; how severe the infection was?	Missing	327	10.7	694.426	<0.001**
	I did not get infected	1237	40.4		
	Mild	642	21		
	Moderate	566	18.5		
	Severe	292	9.5		
	Total	3064	100		
If you got infected with COVID-19 AFTER GETTING VACCINATED, specify the signs and symptoms you suffered from?	I did not get infected	993	32.4	5385	<0.001**
	Muscle ache	398	13		
	Fever	347	11.3		
	Flu	222	7.2		
	Sore throat	98	3.2		
	Cough	122	4		
	Vomitting	60	2		
	Diarrhea	59	1.9		
	Loss of smell and taste sensation	48	1.6		
	Hypoxemia	37	1.2		
	Hypoxia	33	1.1		
	Heart palpitations	39	1.3		
	Bradycardia	34	1.1		
	Headache	114	3.7		
	No symptoms	98	3.2		
	Others	15	0.5		
	Missing	347	11.3		
	Total	3064	100		
If you got infected with COVID-19 AFTER GETTING VACCINATED, were you hospitalized at anytime?	Missing	328	10.7	137.535	<0.001**
	I did not get infected	1198	39.1		
	No	806	26.3		
	Yes	732	23.9		
	Total	3064	100		

If you got infected with COVID-19 AFTER GETTING VACCINATED, how many days did the infection last from the day symptoms appeared till recovery?	Missing	319	10.4	1373.249	<0.001**
	< 7 days	530	17.3		
	> 30 days	129	4.2		
	15-30 days	263	8.6		
	7-15 days	360	11.7		
	I did not get infected	1130	36.9		
	No symptoms appeared	333	10.9		
	Total	3064	100		

Table 4: Post vaccination infection with COVID-19 virus and its severity.

** highly significant.

Table 4 depicts post vaccination infection with COVID-19 virus and its severity. Most of them were not infected post vaccination (53.3%). Those who got infected post first or second shot were very less (20.7%, 22.6%). The severity of the infection was mild (21%) among those who got infected. The type of infection mostly observed were muscle ache, fever, flu. Hospitalization for those affected was among only 23.9%. In most of them the infection lasted for less than 7 days. The association found was significant for all the variables as shown in figure 6.

Discussion

Since declaration of COVID-19 as a pandemic by WHO, it was clear that vaccination is the best way to overcome it, the three COVID-19 vaccines that are currently available in Iraq were introduced and compared (Pfizer, AstraZeneca, and Sinopharm).

Our study revealed that percentage of female participation was 57% as shown in figure 2, this result was in accordance with [10] where 61.9% were females and in contrast with [11] where female participation was 39.8% and [12] 78.8%. All these studies were conducted in Iraq. The differences in the result could be attributed to differences in sample size as [10] (1564), [11] (1012), [12] (843), compared to our larger sample size (3064).

Concerning table 1: this study revealed that 59.9% of participants were free from chronic diseases as shown in figure 3, this result was lower than [13] in Kurdistan region who found that over 3 quarters of the sample (77.9%) had no chronic diseases. This difference maybe attributed to local sample collection in Kurdistan region and generalized sample including all Iraqi society in our study. We studied this factor of chronic disease as it could affect the frequency of post vaccine side effects like diabetes [14].

Hypertension and various heart diseases, cancers, impaired lung functions, heart, blood circulations, renal system, immunocompromised individuals, chronic obstructive pulmonary disease (COPD), chronic kidney disease, immunodeficiency, asthma, autoimmune disease such as MS (multiple Sclerosis), rheumatoid arthritis, lupus, cerebral vascular diseases, and chronic liver diseases are risk factors for COVID-19 infections [15-18]. Our study revealed that (74.9%) of the population study had gotten vaccinated as shown in figure 3. This expressed high level of knowledge and awareness as it is important to improve public vaccine acceptance. This result was in accordance with an Iraqi study [19] who found (77.6%) of the respondents agreed to take vaccine when available. This level of acceptance would be sufficient for the population to acquire herd immunity according to some studies [20].

Our result was lower than that reported by a Chinese study in which the rate of vaccine agreement among general population was (91.3%) [21]. Our result was lower than Indonesian study, they reported 93.3% acceptability for COVID-19 vaccine [22]. Our result was much higher than public surveys in Saudi Arabia and USA (64.7%, 57.6%) respectively [23,24].

Figure 3 revealed that the most commonly used vaccine was pfizer (56.4%), followed by sinopharm (17.3%), then AstraZeneca 12.4%, which was in contrast with [13] who reported that the most common type of vaccines were AstraZeneca, Pfizer, and SinoPharm respectively (49.7%, 39.5%, 10.9%).

As AstraZeneca became exclusively available in Kurdistan region, majority of people got vaccinated with it as it was the

only option accessible. However, when Pfizer was introduced to Kurdistan region, it rose to prominence and the general population gravitated more towards it.

Also our study revealed that (30.3%), (44.4%) of participants had gotten one and two shots as shown in figure 3 which was in contrast with [13] where over 3 quarters of participants (79.3%) had a single dose of vaccine at the time of study that was maybe due to fear or hesitancy to accept or refuse vaccine [25,26].

Table 2

Previous studies reported variety of post vaccination signs and symptoms with different percentages at different regions [11,27,28].

Concerning pain at injection site in figure 4A, this study revealed that majority of participants (35%) suffered from pain at injection site so its in accordance with FDA findings [29,30], with multinational study (6 Arab countries including Iraq with them) that stated the most common adverse effect of covid-19 post vaccination was local arm reaction, body pain, fever, bone and muscle pain [10], also with [28] where local reactions at injection site were the most common side effect.

With an Iraqi study among HCW in Mosul city, pain at injection site was noted among majority of individuals who received 1 of 3 vaccines [12]. Concerning signs and symptoms of post vaccination.

This study revealed that (39%) of population were asymptomatic as shown in figure 4A, this was in accordance with [28] where (40%) of participants didn't report any sign or symptom, but it was much higher than [12] which revealed only (25.5%) of participants didn't suffer from any adverse effects among 3 types of vaccines documented to be used in Iraq.

Figure 4A and 4B was in contrast with [11] where (84%) of participants were symptomatic,also with [31] where (80%) of responents experienced side effects like generalized pain,pain at injection site, fever, headache were more experienced after first and second dose of vaccines among Iraqi HCW, pharmacists, dentists and physicians, also in contrast with [13] another Iraqi study in Kurdistan Region, who reported the most common side effects were headache, pain at injection site, fatigue and fever.

Comparing OUR result with figure 4A and 4B Arab countries studies,its in accordance with [10] (6 Arab countries study involving Iraq), with Jordanian study [27], with Saudies studies [32,33] they revealed that the most common side effect was pain at injection site with fever, joint pain, difficulty in breathing and headache, also with [34] Egyptian study concerning frequency order of systemic and local effects of post vaccination, also with UAE study [35] the major side effect was pain at injection site.

Among Asian countries, our result in figure 4A was in accordance with [36] Malaysian study that highlighted pain at injection site (61%) was commonly reported in participants who received Pfizer vaccine.

Among European studies, our result in figure 4A was in accordance with Italian study [37] that reported fever was the most frequent mild side effect after administration of vaccine comparable to our figure (11%) of participants had fever, also figure 4A was in accordance with German study [38] reported injection site pain had the high prevalence of local side effect in contrast to other systemic side effects.

Our result in figure 4A, B, and C was in contrast with Libyan study [39], Saudian study [40] and with Czech study [41] concerning frequency sequence of local and systemic side effects compared with our result, these differences could be attributed to differences in sample size,residency localization as our sample was more inclusive and diverse (3064) if its compared with other studies.

Table 3

Figure 5 depicts most common side effects of covid-19 vaccines among females concerning menstrual irregularity (MC), menorrhagia (abnormal bleeding), and dysmenorrhea (pain during MC).

During the initial phases of covid-19 mass vaccination campaigns, there were reservations that these vaccines could potentially affect MC in women.The idea was reinforced when many women reported that their MC unexpectedly changed after vaccination [42], our study in table 3 and figure 5 revealed that majority of females participants had NO irregular MC, bleeding (menorrhagia) or pain during MC (dysmenorrhea) (30.4, 36.2,

34.5%) respectively, this result was in accordance with UK cross-sectional study [43] that was unable to detect strong signals to support the idea that covid-19 vaccination is linked to MC changes, also was with retrospective-cohort US study [44] where NO change in menses length between or within vaccination cohorts was found, also with Norway-cohort study [45] where covid-19 vaccines were associated with a small delay to the subsequent period which was not statistically significant and with Africa-cross sectional study where NO predictors reported for menstrual adverse effects [46].

The percentage of female participants who replied (Yes) for MC irregularity or disturbance for less than 30 days was (20.5%) which was much higher than Jordan-Saudia Arabia cross sectional study (4.8%) for all types of vaccines [47].

These adverse events that claimed for more than one month after vaccination adminstration, also our result in table 3 and figure 5 was much higher than Chinese cross -sectional study [48] for SinoPharm vaccine among 1264 females HCW while some MC irregularities were reported, it still fails to establish whether they were due to vaccination or they were a coincident event,also with Saudia Arabia study [49] who reported NO predictors for menstrual adverse effects.

Our study was in accordance with an Iraqi study [50] among several medical Iraqi colleges who found (24.7%) of female participants experienced irregularity in their cycle, also with [51] experienced (28.7%) irregularity of MC (dysmenorrhea), also was comparable with [52] who found (14.2%) of females experienced MC irregularity.

Concerning Menorrhagia(abnormal bleeding), this study revealed (26.9%) of female participants replied (Yes) that they had abnormal bleeding, this result was in accordance with Saudia Arabia cross sectional study [53] (34.9%) who attributed that these changes could be related to immune response frequently associated with Pfizer vaccine and with MENA (Middle east and North African) cross sectional study [54] who revealed that females subjected to covid-19 vaccines may experience menstrual abnormalities including (19.46%).

Our result in table 3 and figure 5 was much lower than an Iraqi cross-sectional study [50] who found about (48.5%) of participants had heavier bleeding, these differences could be attributed to differences in sample size (663) while our sample was (3064), also this result was much lower than Italian cross-sectional study [55] who reported menorrhagia in (55.6%) of women who received first dose of Pfizer and Astrazeneca vaccine when the first dose of vaccine was administered during the first 14 days of MC, also much lower than US cross-sectional study [56] who reported menrrhagia prevalence was (42.1%), he stated that increased bleeding can occur post SARS-COV-2 vaccines in 42% of people with regular MC, bleed more heavily than usual.

But our figure 5 was higher than Norway-Cohort study [57] who reported significant increase in MC disturbance after vaccination particularly for heavy bleeding than usual,second dose of pfizer was the predictor of MC adverse effects.

Concerning Dysmenorrhea (pain during MC), this study exhibited (28.4%) of women had pain during MC, this result was in accordance with [54] (21.25%) and greater than [57] (14.6%) but lesser than [53] (62.4%) and lesser than [50] (84.9%) of participants experienced pain during MC, so this study provides evidence that females subjected to covid-19 vaccines may experience MC abnormalities including dysmenorrhea, menorrhagia and irregular MC, such abnormalities can impact daily life activities and ultimately impair female's quality of life, most people who reported change in their MC were observed to be self limiting and short duration.

Regarding pain during MC is mainly directed by prostoglandin hormone, those females might use NSAIDS or Analgesics for other side effects like headache or fever that might decrease or affect pain perception. In general one fifth of our sample had irregular MC and approximately one third complaint on menorrhagia and dysmenorrhea.

Table 4

Table 4, figure 6 concerning post vaccination COVID-19 virus and its severity, most of participants were not infected with covid-19 infection, this expresses that covid-19 vaccines are safe and our community is encouraged to receive vaccine.

Concerning severity in figure 6, only (21%) of participants were infected, severity of infection was mild, this result was in contrast

with [11] where (84%) of participants had local and systemic adverse effects ranging from mild to moderate in term of severity while (16%) were asymptomatic, But our figure was in accordance with An Iraqi/Mosul study [31] who declared that the experienced side effects after the first and second dose was mild to moderate, also it was with Jordanian study [58] that majority of adverse effects were mild to moderate and with [41].

Concerning hospitalization

In table 4 and figure 6, only (23.9%) of infected cases required hospitalization for less than 7 days, this figure was in contrast with [10,11,31,41,58] who stated that most of symptoms were tolerable ranging from mild to moderate required medical symptomatic treatment without the need for hospitalization.

Limitations of the study

First, the study is adescriptive cross-sectional study using an online survey so its prone to selective bias, so only individuals who frequently used the internet participated in the study so we missed poor, illiterate and old people. A face-to-face interview is preferred to collect an accurate result, although the sample size was large, but (4%) of population were missing as this study used subjective measures and was based on trust, so a casual association between exposure and the outcome cannot be confirmed.

Strength of the study

A large sample size (3064) involving the whloe Iraqi society with diverse educational background, ages and income level.

Conclusion

The general population had high acceptance level for taking vaccine (75%), all types of vaccines were found to be safe according to the observation (39% of participants were asymptomatic) with mild to moderate postvaccine signs and symptoms that can be well tolerated with medical symptomatic treatment as majority of these adverse effects cases mostly developed within 24 hours post vaccination that required home-based or medical symptomatic treatment.

Recommendations

- Further prospective studies with long duration follow-up including important laboratory parameters such ad D-Dimer are required for better understanding side effects of covid -19 vaccines.
- Unusual adverse effects should be monitered carefully to determine whether they are related to vaccine or not.

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