Critical Care Nurses Perception of COVID-19 Vaccines and its Side Effects at Upper Egypt

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Abstract:

Background: Despite all the efforts that have been made to fasten vaccine development many critical care nurses staff were worried and hesitated from the vaccine. **Aim of the study**: is to assess critical care nurses perception of covid-19 vaccines and its side effects at Upper Egypt. **Sample:** 2429 critical care nurses from five Upper Egypt Governorates, Minia, Assiut, Sohage, Qena and Aswan. **Tools:** the study included two tools, Critical Care Nurses' knowledge questionnaire and Critical Care Nurses' attitudes toward COVID-19 vaccine. **Result:** the included ICU's nurses 88.4% of them were under the age of 29 years, and 57.8 % had a technical institute of nursing. Regarding to the nurses' knowledge it was noticed that 79.5 % of the nurses believed that taking COVID-19 vaccine did not provide protection. But 55.2 % critical care nurses had positive attitude toward COVID-19 vaccines. Regarding to the vaccines side effects, sit pain, swelling fever and redness were the most reported manifestations among nurses. **Conclusion:** critical care nurses had positive attitude about COVID-19 vaccine but hesitated to be vaccinated because of the fear from its side effect. **Recommendations:** Future research evaluating the side effects of all types covid -19 vaccines in all Egypt.

Key word: Critical nurses**,** Perception**,** COVID-19 vaccines, side effects, Upper Egypt.

Introduction

Corona virus disease 2019 (COVID-19) has rapidly become a major public health crisis, affecting 537,591,764 confirmed cases and more than 6,319,395 cumulative deaths have occurred by Jun 2022 all over the world according to the World Health Organization (WHO) Corona virus dashboard **(WHO, 2022).** In order to control this pandemic, the Egyptian Ministry of Health and Population started extraordinary efforts to promote vaccines versus this disease. Numerous vaccinations have been licensed for use as early by the end of 2020 in Canada and the European Union since December 2020 **(Verger, et al 2021)**. COVID-19 vaccine candidates are also being developed, including DNA-based vaccines, inactivated, live attenuated, sub-unit, and replicating viral vector-based vaccines **(Dzieciolowska, et al., 2021).**

Vaccination acceptability includes the readiness and agreement to be vaccinated, as well as desirability **(Al-Amer, et al., 2022).** . Negative attitude toward the vaccine or vaccine apprehension is defined as "the delay in acceptance or refusal of vaccination despite the availability of vaccination services," and it is a global issue and a major contributor to under-vaccination **(Sallam, 2021).** Despite all the efforts that have been made to fasten vaccine

development many critical care nurses (CCNs) and people were hesitated from the vaccine and its side effects. Short-term vaccine side effect differ in clinical presentation, affecting vaccine acceptability; however, they are frequently associated with preventive vaccines' humeral immune response. Injection site discomfort was the most prevalent side effect, followed by fever, fatigue, headache, muscle soreness, and chills **(Riad, et al., 2021).**

The center for disease control (CDC's) Advisory Committee and Immunization Practices (ACIP) prepared recommendations for priority groups for vaccination at its December 1, 2020 seminar. The ACIP recommended that COVID-19 vaccination should be accessible to the health care personnel as the first group because they are on the front lines of the pandemic. COVID-19 exposure and transmission lines were known to be high-risk in health-care settings especially intensive care units **(Dooling, et al., 2020).**

The Egyptian Ministry of Health and population offered three types of COVID-19 vaccine for health care workers for free they were Sinopharm, Sinophace and Extrazinica but on the other hand there were a great worries and hesitancy about them. These concerns were present also in the developed countries, about one-quarter of adults in seven European countries, including the United Kingdom, were ignorant and incapable to receive a COVID-19 vaccine. Worries regarding the vaccine innovation and effectiveness, as well as its possible side effects, have been stated as reasons for not getting the COVID-19 vaccine up to date (**Omar & Hani, 2021)**.

Negative attitudes regarding vaccines, as well as apprehension or refusal to undergo vaccinations, are important roadblocks to effectively managing the COVID-19 pandemic in the long run. This conduct has been linked to a number of factors, including a lack of evident advantages, a low perceived risk of infection, fear of adverse effects, and questions about the vaccine's safety and efficiency **(Dooling, et al., 2020).**

Health-care workers and critical-care nurses may not only be among the first to receive the COVID-19 vaccine, but they will also play a key role in the vaccine's adoption among the larger public. Their intentions for vaccination uptake and recommendation are determined by their perspective and attitude about vaccines **(Kuter, et al., 2021)**. Patients seek medical advice and treatment from health care providers, including vaccine recommendations. It is commonly known that when a practitioner recommends a vaccination, people are considerably more likely to get it **(Verger, et al., 2020).**

Significance of the study

Critical care nurses (CCNs) staff from earlier pandemics were in the front lines working with infected patients. Many of them get COVID-19 and leave the ICU because they were infected. According to **Hoedl, et al., 2020**, 16.3% of the hospital nurses get infected with covid-19. Despite the significant danger of becoming infected while caring for patients and the potential of spreading the infection to their close families, critical care nurses felt a sense of professional obligation **(Mortensen, et al., 2021).** It has been stated that the general population's acceptability of COVID-19 vaccine is less than ideal. The percentage of adults planning to take a COVID-19 vaccine ranged from 35 to 75 % in eight polls conducted between May and October 2020, with no discernible trend over time. Low acceptance level and concern about vaccine is growing worldwide, **(Paul, et al., 2021).** At Upper Egypt the University and Ministry of health hospitals**,** about 95 % from critical care nurses staff were vaccinated using the three different types of vaccines as Sinopharm, Sinophace and Extrazinica according to each one age and general health condition. So this study was conducted to determine the perception of critical care nurses staff in Upper Egypt toward the covid-19 vaccine and its side effect.

Aim of the study

The present study aimed to assess critical care nurses perception of covid-19 vaccines and its side effects at Upper Egypt

Research questions:

1.What is level of critical care nurses' knowledge about COVID-19 vaccine at Upper Egypt?

2.What is critical care nurses' attitude toward COVID-19 vaccine at Upper Egypt?

3.What are common side effects of COVID-19 vaccines among critical care nurses at Upper Egypt?

Operational Definition

COVId-19: a mild to severe respiratory illness that is caused by SARS-COVE 2 or corona virus which cause severe acute respiratory syndrome.

Critical care nurses: a specialty within nursing that deals specifically with very sick, complex patients facing life-threatening problems. According to the American Association of Critical-Care Nurses.

Vaccine: preparation that is administered (as by injection) to stimulate the body's immune response against a specific infectious agent or disease.

Subjects and Method

Research Design: Web-based cross-section survey.

Research Setting: The current web-based survey involved critical care nurses worked in ICU, isolation units and emergency unites at the University Hospitals and Ministry of Health Hospitals in the following Governorates, Minia, Assiut, Sohage, Qena and Aswan.

Subjects: the study involved available online sample of critical care nurses from the five Upper Egypt Governorates during the cross section period of the study from the first of August to the end of October 2021 (for three months), the collected number were (2429) at the end of October 2021. The collected number from each governorates were: Minia 405 nurses, Assiut 1154 nurses, Sohage 450 nurses, Qena 300 nurses and Aswan 150 critical care nurses. The study included critical care nurses whom were on duty and involved in patient care in critical care unites and had met COVID-19 cases.

Tools for data collection: Two tools were utilized in the study.

Tool one: **Critical Care Nurses' knowledge questionnaire**.

A structured online questionnaire, it was developed by the researcher after exploring related literature **(Qattan, et al., 2021, and Hagan Jr, et al., 2021)** It consisted of three parts:

Part I: **Critical Care Nurses' sociodemographic data:** that included age, sex, location, educational level, years of experience and chronic diseases.
Part II: Nurses' knowledge questionnaire: This part conducted to assess critical care nurses' perception of the available COVID-19 vaccine. It consisted of (11) closed ended questions (yes or No).

Scoring system: If the answer is (yes) it was given score (2) and it (No) answer was given score (1). The total score of the assessment questionnaire was 22. The total level of knowledge was considered "unsatisfactory" for score less than 65% "satisfactory" for score more than 65%.

Part III: Critical care nurses' experience of Covid-19 vaccines and its side effects. This questionnaire sheet include their previous contact with covid-19 cases, presence of previous covid-19 infection, and the most common vaccine's side effects as (Insertion sit pain, Swelling and redness, Headache & fatigue, Muscle &joint pain, Chills& fever, Diarrhea, Nausea& Vomiting, Arm Pain and Allergic reaction) evaluated as present (scored 1) or absent (scored 0).

Tool two: Critical care nurses attitudes toward COVID-19 vaccine.

This tool was developed by the researcher depending on related review of literatures **(Paul, et al., 2021, Biswas, et al., 2021, and Hagan, et al., 2021)** to assess attitudes of critical care nurses toward COVID-19 vaccine. The attitudes Likert scale of critical care nurses toward COVID-19 vaccine consists of 18-items using a 5-point Likert scale to indicate respondents' attitudes toward COVID-19 vaccine, and had 5 response options:

- SD = Strongly Disagree, D = Disagree, U = Uncertain, A = Agree and strongly agree = AS. Positive attitude statements are scored (1to 5) (1 = strongly disagree) to (5 = strongly agree). Scores are reversed for negative statements (5 = strongly disagree) to (1 = strongly agree). The overall score could range from a minimum of 18 to a maximum of 90.

Scoring system:

- Possible scores range from 18 to 90, positive attitude equals to or more than 50 of the total score of attitude Likert Scale. Negative attitude less than 50 of the total. A higher score indicates a more positive attitude toward COVID-19 vaccine.

- **Field work**

- **Preparatory phase**

- **Validity and reliability:** Five expert professors in critical care nursing and emergency assessed the tools' validity. Cronbach's alpha test was used to determine the tool's reliability; it was (0.89 percent) for (tool one), and (0.95 percent and 0.85 percent) for (tool two). To verify that the tools are clear, applicable, feasible, and relevant.

- **A pilot study** was conducted on 240 (10%) critical care nurses, to assess the applicability and visibility of the tools, necessary correction were made.

- **Implementation phase**

- The researcher used a Google Docs web page to construct the study's tools, the questionnaire sheet was sent to all critical care nurses who participated in the study and accessed online social media platforms (Facebook, Messenger and Whats App application and personal e-mails). The tools of the study were sent to all the famous nursing groups through the social media, and also the hospitals communication groups at the beginning of the study and till its end (for three months) to let critical care nurses access it at any time.

- The questionnaire was structured so that all questions must be answered by the critical care nurses, and they were unable to submit the questionnaire until they have signed all of the questions and only one answer and response for each statement.

- The researcher continued to follow-up & and sent a reminder messages for all the nursing platforms groups on Facebook groups and Whats App that included critical care nursing staff. The participants were sent submission after completing the two tools included in the study.

Ethical consideration

- The researchers sent online permission message (informed consent) through the famous Upper Egypt's nursing platforms groups before starting the questionnaire, which contained the aim and importance of the study and also contained that the participant critical care nurses have the right to refuse the study and not completing the submission at any time.

- **Statistical analysis**

- SPSS version 25 was used to analyses the data, and descriptive statistics were utilized to describe the quantitative variables. The t test at the 0.05 significance level was used to compare different factors between the sample and different types of COVID-19 vaccines. Continuous variables were expressed as mean

standard deviation (SD), and the t test was used to compare different factors between the sample and different types of COVID-19 vaccines.

Table (1): The demographic data of the included CCNs revealed that about 88.4% of them were under the age of 29 years, and 57.8 % had a technical institute of nursing. Regarding to the experience years 41.6 % were less than one year. Furthermore, almost 55 % of the nurses did not have a chronic illness.

Table (2): shows that 79.5 % of the CCNs included in the study believed that taking COVID-19 vaccine did not provide protection from infection. The present study found 54.5 % of CCNs were infected with COVID-19 virus. Also 75.4 % of the CCNs were involved in the care of COVID-19 patients. CCNs involved in the study 69.5 % of them were knowledgeable that COVID-19 vaccine should be obligatory for all citizens in Upper Egypt. In order to provide protection from the virus for themselves and their families about 50 % of nurses believed that medical professionals should take the new Corona vaccine. Regarding to the reason for refusing the vaccine 63.3 % the CCNs were hesitated from COVID-19 vaccine because of its adverse effects then because of the rumors of its efficacy.

Table (3): shows that 95.1% - 96.7% of CCNs experienced sit pain, Swelling and redness after 1st and 2nd dose respectively of Sinopharm vaccine. In Sinovac 89.2%, 94.8% of both doses respectively and AstraZeneca vaccine 100 %, 99.2 % of both doses respectively had the same side effect. Regarding, headache & fatigue were present by Sinopharm vaccine in 50.1%, 42.4% in 1st and 2nd dose respectively. Also Sinovac produced the same side effect in 59.2%, 82.4% of both doses respectively, and AstraZeneca vaccine also produced them in 73%, 86.1% of both doses respectively. Fever and chills in Sinopharm vaccine were presented in 33.1 %, 50.1% of the 1st and 2nd dose respectively; however Sinovac vaccine produced the same side effect in 56.7 % , 59.5 % of both doses respectively; while AstraZeneca produce the same side effects in 48%, 65.2% of both doses respectively.

Table (4):- showed that 59.9 % and 93 % of critical care nurses agree and strongly agree (respectively) about refusing to be vaccinated because of the fear from the side effects and less efficiency of the vaccine. On the other hand 50.5 % of the studied ICU's nurses were uncertain that the COVID-19 vaccines were safe. Also 38.1% of the nurses disagree that infection with COVID-19 provide natural immunity. But 50.8 % of them agree that getting infected with the virus lead to more acceptance of the vaccine.

Table (5): reveals a highly significant positive correlation between attitude of CCNs toward COVID-19 vaccines and their level of knowledge respectively with p value = 0.001 while no correlation between occurrence of COVID-19 to person or family (p value = 0.564 & 0. 203) respectively.

Table (1):- Distribution of socio-demographic characteristics of critical care nurses of the study (n=2429)

Variables	No	%
Age		
18–29 years.	2147	88.4
30–39 years.	213	8.8
40–49 years.	57	2.3
From 50 and more.	12	.5
Educational level		
Diploma of Nursing.	113	4.7
Technical nursing institute.	1403	57.8
Bachelorette.	724	29.8
Master.	102	4.2
Doctor (PhD).	87	3.6
Experience of years		
Less than One year.	1011	41.6
From 1-3 years.	780	32.1
From 4-5 years.	152	6.3
More than 5 years.	486	20.0
Residence		
Rural.	1613	66.4
Urban.	816	33.6
Location		
Minia Governorate.	605	24.9
Assuit Governorate.	1154	47.5
Sohage Governorate.	450	18.5
Qena (South valley) Governorate.	300	14.6
Aswan Governorate.	150	9.6
Having chronic conditions		
Yes.	1081	44.5
No.	1348	55.5

Table (2): Distribution of critical care nurses knowledge toward COVID-19 vaccines (n=2429)

Questions	No	%
Did you know that taking COVID -19 vaccine provide protection?		
Yes.	498	20.5
No .	1931	79.5
Did you know the risk level of COVID-19 infection among Upper Egypt population?		
Minor risk.**1**	181	7.5
Moderate risk. 2	1060	43.6
Major risk.3	1188	48.9
Did you infected with COVID-19?		
Yes.1	1324	54.5
No.0	1105	45.5
Did your family infected with COVID-19?		
Yes.	1474	60.7
No.	955	39.3
Did you involvement in the care of COVID-19 patients?		
Yes.1	1394	57.4
No.0	1035	42.6
Which method is suitable for delivering COVID-19 vaccine for Upper Egypt citizens?		
Choosing.1	416	17.1
Obligatory.2	1687	69.5
In case of dealing with infected person.3	326	13.4
Information sources about COVID-19 vaccines		
Health care teams. 4	1378	56.7
Medical information sites. 3	427	17.6
Internet news sites. 2	161	6.6
Social media. 1	463	19.1
Knowledge about the main reason for accepting COVID-19 vaccine critical care nurses		
Control the epidemic and reduce the chances of infection.	955	39.3
The Ministry of Health decision that all medical workers should be vaccinated.	1000	41.2
Because the vaccine is currently offered for free.	270	11.1
Because the vaccine reduces the severity of symptoms.	453	18.6
Providing protection for self and family.	1217	50.1
To protect patients from infection.	378	15.6
Because the vaccine reduces the level of viral mutation.	220	9.1
Reasons for not accepting the idea of taking COVID-19 vaccine.		
Concern about side effects.	1537	63.3
Rumors spread about the effectiveness of the vaccine.	896	36.9
Lack of confidence about the product effectiveness and the speed of its circulation.	681	28.0
Lack of available information about the vaccine.	626	25.8
Lack of vaccine clinical trials.	304	12.5
Total knowledge Mean ± S.D	**13.20 ± 3.23**	

Figure (1): shows that 46.9 % of the studied nurses had Poor Knowledge toward COVID-19 vaccines. While, 47.1% of them had faire knowledge toward COVID-19 vaccines and 5.9% had good knowledge toward COVID-19 vaccines.

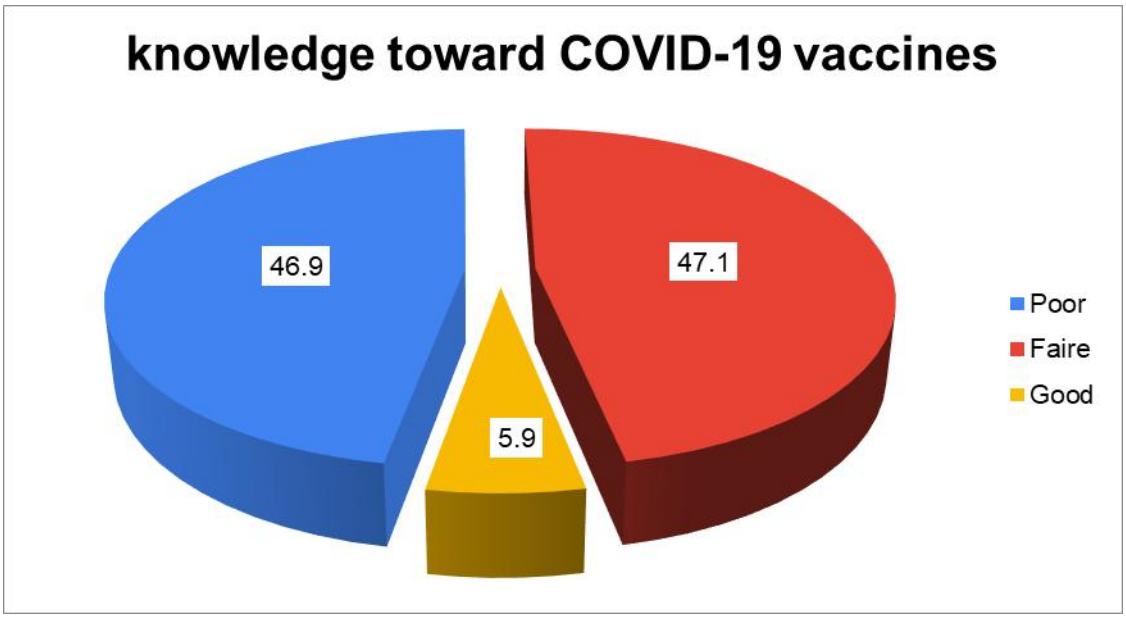

Figure (2): shows that Sinovac vaccine was highly introduced vaccine in the three Upper Egypt Governorates Minia, Assuit, Sohage, South Valley and Aswan (there percentage were75 .3 %, 85.8 %, 78.9 %, 68 .3 % and 70 % respectively).

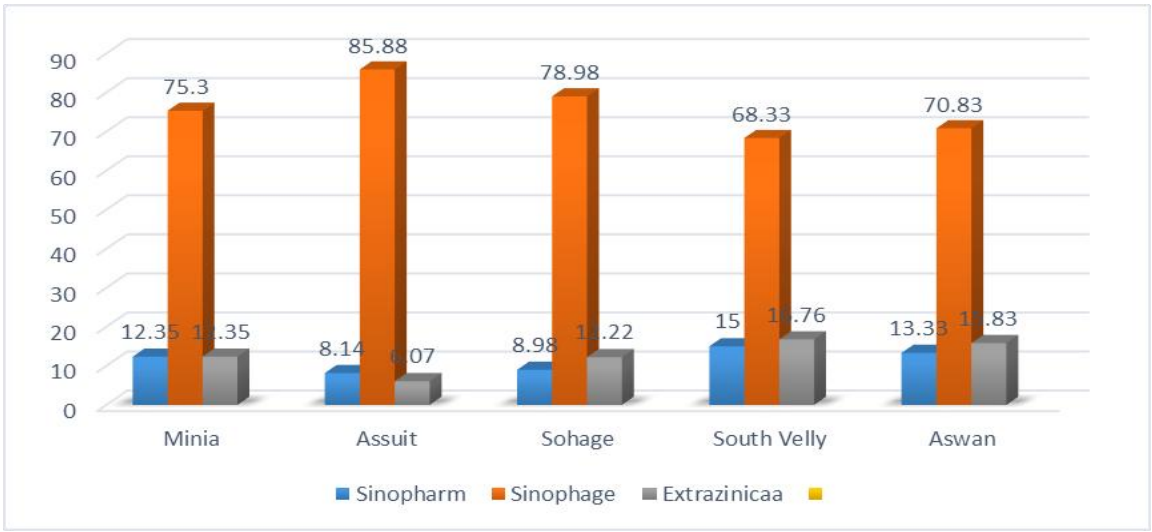

Table (3): Comparison between the side effects of the three Covid -19 vaccines types among critical care nurses at Upper Egypt (no= 2429).

Side effects	Sinopharm (245)				P value 1	Sinovac (1940)				P value 2	AstraZeneca (244)				P value 3
	1st dose		2nd dose After 3 weeks			1st dose		2nd dose After 3 weeks			1st dose		2nd dose (after 3 months)		
	No	%	NO	%		NO	%	No	%		NO	%	NO	%	
Insertion sit pain, swelling and redness	233	95.1	237	96.7	0.505	1730	89.2	1840	94.8	<0.001**	244	100.0	242	99.2	0.494
Headach & fatigue	123	50.2	104	42.4	0.100	1148	59.2	1598	82.4	<0.001**	178	73.0	210	86.1	<0.001**
Muscle &joint pain	151	61.6	172	70.2	0.055	1433	73.9	1250	64.4	<0.001**	181	74.2	203	83.2	0.020*
Chills& fever	81	33.1	123	50.2	0.000**	1100	56.7	1154	59.5	0.082	117	48.0	159	65.2	<0.001**
Diarrhea	105	42.9	123	50.2	0.126	1269	65.4	1598	82.4	<0.001**	98	40.2	144	59.0	<0.001**
Nausea& Vomiting	112	45.7	74	30.2	0.000**	1664	85.8	1117	57.6	<0.001**	74	30.3	107	43.9	0.002**
Arm Pain	189	77.1	216	88.2	0.001**	1750	90.2	1844	95.1	<0.001**	221	90.6	230	94.3	0.169
Alergic reaction	12	4.9	7	2.9	0.362	200	10.3	195	10.1	0.878	24	9.8	21	9.1	0.879

P value 1, 2, and 3: Comparison between 1st dose &2nd dose After 3 weeks in both sinopharm and Sinovac vaccines and after 3 months in AstraZeneca vaccine.

Table (4):- Distribution of Critical care nurses Attitude toward COVID-19 vaccines for Study sample (n=2429)

	Strongly disagree		Disagree		Uncertain		Agree		Strongly agree	
	No	%	No	%	No	%	No	%	No	%
I am worried about vaccines side effects.	89	3.7	161	6.6	369	15.2	1456	59.9	354	14.6
I think that vaccine not effective.	137	5.6	476	19.6	786	32.4	937	38.6	93	3.8
I reject the vaccines because of the faster production of them.	169	7.0	647	26.6	681	28.0	807	33.2	125	5.1
Short period of clinical trials decrease acceptability of vaccine.	118	4.9	372	15.3	541	22.3	1187	48.9	211	8.7
Taking COVID-19 vaccine is the best way for protection.	119	4.9	414	17.0	818	33.7	923	38.0	155	6.4
Masks and antiseptic provide sufficient protection from covid-19.	261	10.7	752	31.0	769	31.7	602	24.8	45	1.9
More sufficient information about vaccine lead to increase trust.	112	4.6	139	5.7	398	16.4	1409	58.0	371	15.3
Pregnancy and lactation are the most reason for refusing vaccine.	91	3.7	166	6.8	250	10.3	1420	58.5	502	20.7
Covid -19 vaccine was safe and effective.	152	6.3	402	16.6	1226	50.5	607	25.0	42	1.7
Taking vaccine considered personal freedom.	225	9.3	328	13.5	275	11.3	1351	55.6	250	10.3
Trusted production company increase acceptance of the vaccine.	183	7.5	170	7.0	636	26.2	1246	51.3	194	8.0
The Ministry of health increases public awareness for the necessary of taking vaccine.	54	2.2	140	5.8	507	20.9	1582	65.1	146	6.0
Infection with COVID-19 provide natural immunity.	390	16.1	925	38.1	668	27.5	398	16.4	48	2.0
Suggested side effects of vaccine more than its benefits.	149	6.1	428	17.6	1013	41.7	687	28.3	152	6.3
Vaccine provide protection for health teams.	155	6.4	374	15.4	888	36.6	852	35.1	160	6.6
COVID-19 infection leads acceptance of its vaccine.	178	7.3	322	13.3	568	23.4	1233	50.8	128	5.3
Increase of types of vaccine lead to increase trust level.	403	16.6	711	29.3	878	36.1	386	15.9	51	2.1
Obligation with specific type of vaccine lead to decrease acceptance of vaccine.	291	12.0	570	23.5	575	23.7	880	36.2	113	4.7
Total attitude Mean ± SD	**58.20 ± 7.96**									

Figure (3): **shows that 44.8 % of the studied nurses had negative attitude toward COVID-19 vaccines. While, 55.2% of them had positive attitude toward COVID-19 vaccines.**

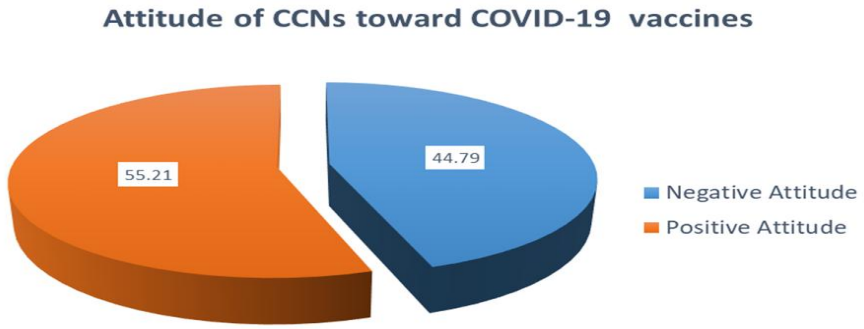

Table (5):- Correlation between critical care nurses ' total level attitude and their perception toward COVID-19 vaccines Level (n=2429)

	Attitude of CCNs toward COVID-19 vaccines						P value
	Negative Attitude N=(1088)		Positive Attitude N=(1341)		Total N=(2429)		
	No	%	No	%	No	%	
Did you know that taking COVID -19 vaccine provide protection?							
Yes	170	15.6	328	24.5	498	20.5	<0.001**
No	918	84.4	1013	75.5	1931	79.5	
Having chronic conditions							
Yes	405	37.2	676	50.4	1081	44.5	<0.001**
No	683	62.8	665	49.6	1348	55.5	
Did you know the risk level of COVID-19 infection among Upper Egypt population?							
Minor risk	98	9.0	83	6.2	181	7.5	
Moderate risk	530	48.7	530	39.5	1060	43.6	<0.001**
major risk	460	42.3	728	54.3	1188	48.9	
Did you infected with COVID-19?							
Yes	586	53.9	738	55.0	1324	54.5	0.564
No	502	46.1	603	45.0	1105	45.5	
Did your family infected with COVID-19?							
Yes	645	59.3	829	61.8	1474	60.7	0.203
No	443	40.7	512	38.2	955	39.3	
Did you involvement in the care of patients with COVID-19 ?							
Yes	599	55.1	795	59.3	1394	57.4	0.036*
No	489	44.9	546	40.7	1035	42.6	
Identify the type of receiving COVID-19 vaccine among critical care nurses in Upper Egypt population?							
Choosing	231	21.2	185	13.8	416	17.1	
Obligatory	751	69.0	936	69.8	1687	69.5	<0.001**
In case of dealing with infected person	106	9.7	220	16.4	326	13.4	
Information sources about COVID-19 vaccines							
Health care teams	730	67.1	648	48.3	1378	56.7	
Medical information sites	152	14.0	275	20.5	427	17.6	<0.001**
Internet news sites	36	3.3	125	9.3	161	6.6	
Social media	170	15.6	293	21.8	463	19.1	

Chi square test for qualitative data between the two groups or more *Significant level at P value < 0.05, **Significant level at P value < 0.01.

Discussion

COVID-19 vaccines are an important way in controlling the pandemic, unwillingness with COVID-19 immunization has been reported worldwide. The acceptability of the COVID-19 vaccine among the health team especially nurses in critical care units is an important step in determining the success of any new vaccination program. Vaccines are an important tool for halting the spread of the COVID-19 pandemic **(Al Awaidy, et al., 2022).** Up to now, more than 267 COVID-19 vaccine candidates are in different phases of pre-clinical and clinical development with 13 vaccines accepted and being used under Emergency Use Authorization (EUA) in diverse countries worldwide **(Tadesse, et al., 2020)**. This present study was conducted to understand perception level of COVID-19 vaccine and its side effects, when available, by Critical Care nurses staff in Upper Egypt.

Demographic characteristics: The study recruited 2429 critical care nurses in Upper Egypt including five Governorates (Minia, Assiut, Sohage, Qena and Aswan) through webpage survey over a three-month period. In the term of nurses characteristics, the study sample overall was predominantly under the age of twenty nine years, more than half had a technical institute of nursing, the majority of the nurses had less than one year of experience and almost half of the nurses did not have a chronic illness. This suggests that the consecutive selection of subjects for participation in this study, and the random assignment of participants to treatment groups, did not introduce any observable biases **(Anwar, 2010)**.

Critical care nurses' knowledge toward COVID-19 vaccines: The current study shows that the majority of the surveyed CCNs believed that taking COVID-19 vaccine did not provide protection from infection but it should be obligatory for all Egyptian and especially the health care staff. This result may be related to the fast production of the vaccine and the less its experimental trial. Also the less information level about the vaccine and increase vaccine discussion at the social media. On the other hand more than half of critical care nurses included in the study were technical institute of nursing, the majority of the nurses had less than one year of experience and more than half were from rural areas which affect their information level and less experience about importance of vaccination. Similar to previous studies**, (Rhodes, et al, 2020 and Machida, et al 2021)** which revealed that people with lower educational level and wealth were more liable to uncertain or unwilling to get the COVID-19 vaccine. This is also the same reasons which lead to increase the perceived risk of COVID-19 in Upper Egypt; additionally, more than half of nurses and their families were infected. In addition population in Upper Egypt still have lack of information about COVID-19 and vaccines.

The prospect of requiring the COVID-19 vaccine has been raised by certain employers, government bodies, and governments **(Rothstein, 2020).** This viewpoint is consistent with our findings, which demonstrate that the majority of Upper Egyptians believed that the vaccine should be made mandatory for all individuals. Legally, this is a complex topic with numerous elements that can be debated. Most legal experts think that it might be considered to be "experimental" as long as it is still under "Emergency Use Authorization," and that it would be stuck in the courts for a long period; (**Flood, 2021& Khullar, 2021)**. Governments, in our opinion, should establish uniform standards for required vaccination by health-care professionals in all public and private settings, rather than leaving it to the discretion of individual employers.

The current study represent that the critical care nurses realize that health care teams are the most prevalent source of knowledge about COVID-19 and its vaccines. This result may relate to the fact that the health care teams have accurate information which depends on scientific evidence and high level of educations. Furthermore, population seeks expert medical advice and care from health care providers, including vaccine recommendations, as opposed to other sources such as social media, which allows for constant sharing of inaccurate

information from any source with a voice and a message, most of which lack scientific evidence (**Grossman, 2021)**. This finding was consistent with a study conducted in Japan, which found that the level of trust in all sources of information regarding COVID-19 was statistically substantially different across the three vaccine intention groups; physicians and nurses were the most trusted sources of information **(Nomura, et al., 2021).**

To provide self-protection and families also protected, about half of the nurses believe that medical professionals should acquire COVID-19 vaccine. The finding were in line with previous study **(Nguyen, et al, 2020)** that showed self-protection and a desire to protect family, friends, and patients were the driving forces for health team decision to be vaccinated. Vaccination is a critical approach for combating the COVID-19 epidemic. Although vaccination campaigns are well underway in the United States, vaccine can only stop the SARS-CoV-2 virus from spreading and reducing the disease's overall severity if widespread adoption and herd immunity are established **(Kuter, et al 2021).**

The present research also found that the majority of CCNs were worried about the vaccine's side effects, then the effectiveness of the vaccine and the speed of its production, all of this are the reasons of concern. This result related to the enormous online information about COVID-19 vaccines and its quality can potentially influence decision-making and recommendation-making behaviors of CCNs. The World Health Organization (WHO) recognized vaccine hesitancy among the top ten fears for worldwide health in 2019 **(Al Awaidy, et al., 2022).**

This finding is comparable to that of a research conducted in two large hospitals in Philadelphia to assess hospital personnel' willingness to be vaccinated **(Kuter, et al, 2021).** Overall, more than half of employees expected to receive a COVID-19 vaccine, more than quarter of the sample were unsure, and only lower percent did not plan to be vaccinated. The majority of those who were unsure or unwilling to be vaccinated voiced concerns about vaccine side effects and the newness of the vaccines. This could be related to the fact that the effectiveness of these vaccines is unknown. If the COVID-19 vaccine looks like an influenza vaccination, its efficacy could be as low as 50%. People may have significant preferences for highly effective vaccines, and a vaccine with a low efficiency estimate may have an impact on people's willingness to be vaccinated. Individuals may also view a pandemic vaccination as being less safe due to its newness or apparent lack of testing. Vaccine acceptability may also be influenced by public views of safety **(Harapan, 2020)**.

Vaccines are one of the most successful approaches for eradicating COVID-19, saving millions of lives each year. Furthermore, the best option remains an effective, safe vaccination with no major side effects **(Petousis-Harris, 2021)**. Our study shows that Sinovac vaccine was the most prevalent form of vaccine utilized in all Upper Egypt Governorates of the study. This related to that this type of vaccine made in Egypt and adopted by the Ministry of Health then introduced to population in most Governorates for free. Regarding to the vaccines side effects, fever and soreness at the injection site were the most common adverse effects. Sinovac vaccine is similar to Sinopharm COVID-19 vaccine, which is an inactivated vaccine that uses a two-dose schedule to introduce a dead copy of SARS-CoV-2 into the body.

COVID-19, a vaccine as any vaccine type has side effects and the fast development of it has increased it and somehow decreased safety issues as reported by **(Petousis-Harris, 2021)**. In the current study, the majority of the sample in 1st and 2nd dose respectively of Sinopharm vaccine and Sinovac vaccine (CoronaVac) had insertion sit pain, Swelling and redness, while, AstraZeneca vaccine vast majority of the sample in both doses had the same side effects, This is in line with guidelines and Standard operating procedure of the Government of Pakistan (2021), and AstraZeneca Canada Inc. (2021) which revealed that the very common local adverse reaction at injection site for Sinovac vaccine (CoronaVac) and AstraZeneca were pain, swelling and erythema.

Regarding, headache & fatigue, AstraZeneca vaccine had the highest percentage than Sinopharm and Sinovac in both doses. This is similar to the observational study about vaccine side-effects and SARS-CoV-2 infection after vaccination, found that systemic adverse effects, including headache and fatigue, affected one in four people and also it show that individuals vaccinated with the AstraZeneca (ChAdOx1 nCoV-19) vaccine were more likely to experience systemic side-effects than those who had been given the Pfizer-BioNTech (BNT162b2) vaccine or Sinovac (**Menni, et al, 2021**).

Attitude of critical care nurses toward COVID-19 vaccines: Vaccines are one of the most important medical discoveries for time, resulting in a significant reduction in the occurrence of diseases that have long afflicted humanity. But there has been skepticism, if not downright hostility, against vaccination as a medical technology for as long as there have been vaccines **(Trogen, et al., 2021).** According to the current study, less than quarter of the critical care nurses polled were concerned about vaccine side effects, and its safety for pregnant and lactated women, which were the most common reasons for vaccine rejection. This is not surprising because females have been found to be less likely to accept a COVID-19 vaccine in many previous studies. This has been speculated to be due to concerns about side effects such as infertility, serious side effects that make them unable to care for their families, or greater susceptibility to misinformation **(Khubchandani, et al 2021 & Courage, 2021).**

Public authorities, as well as scientists, are primarily responsible for delivering public health messages **(Wilson, et al., 2020).** In the present study more than half of the studied critical care nurses agreed that the Ministry of health play an important role in raising awareness about the importance of vaccination. But half of CCNs were also unsure whether the vaccine was safe and effective. Many psychological qualities of individuals, such as perceived risks, perceived norms, and trust, have been confirmed to be connected with vaccine intention, similar to the **(Murphy, et al, 2021)** findings.

In relation to total attitude of critical nurses toward COVID-19 vaccines; the current study shows more than half of CCNs had positive attitude toward COVID-19 vaccines. This indicates that most of the critical nurses in the Upper Egypt were supportive to the ministry of health idea of receiving COVID-19 vaccine and also were immunized to decrease the infection rate and provide protection. The present result were in line with **(Biswas, et al, 2021)** they reported that healthcare workers have a moral obligation to help the public and their healthcare colleagues adopt COVID-19 vaccine because they were the source of trust and knowledge.

According to the findings of this study, there is a highly substantial positive association between CCNs' attitudes about COVID-19 vaccines and their knowledge of COVID-19 vaccines. Even among the most sceptics who believe that vaccines cause autism and have few demonstrable benefits – 24 % would "definitely" like to be vaccinated, and another 31% would probably do so, according to a two-leg representative survey conducted in the United Kingdom **(Blanchard-Rohner, et al., 2021).**Finally the current study prove CCNs perception toward the vaccine were affected by its side effects and their knowledge. Most side effects of the three types of COVID-19 vaccines (Sinopharm, Sinovac & AstraZeneca) were insertion sit- pain, swelling, fever, fatigue, muscle pain and headache. This side effect did not prevent their vaccine uptake.

Conclusion:

The research had concluded that more than half of critical care nurses had positive attitude but hesitated to be vaccinated because of the fear from the vaccine side effects. Also critical care nurse believe that COVID-19 vaccine should be obligatory to provide protection for self and others.

Recommendations

Based on the result of the current study it can concluded that.

- Provide continuing education regarding the importance of COVID-19 vaccines for all health care team.
- Future research evaluating the side effects of COVID-19 vaccines in all Egypt

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