Knowledge and Attitude of Healthcare Workers Regarding COVID 19 Vaccination

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Abstract

Background: Coronavirus disease (COVID-19) is a deadly virus that continues to afflict many countries worldwide. The development of a COVID-19 vaccine to combat the disease's spread. Health Care Workers are major influencers in vaccination, thus their acceptance or hesitancy to tcovid-19 vaccine would either aid its acceptance among the populace. **Aim of the study:** Assess knowledge and attitude of healthcare workers regarding COVID 19 vaccination. **Design:** A descriptive study was utilized in this study. **Setting:** The current study was conducted in Ashmoun General Hospital, which is affiliated to the Ministry of Health and Population in Menoufia Governorate. **Subjects of the study:** The study subjects include 266 health care workers including physician, anaesthetist, nursing staff, pharmacist, dentist, physiotherapist, labs scientist, radiographer and housekeeping in the previous mentioned setting. **Tools of data collection: Tool I.** Self-administrated Questionnaire Sheet: It was developed by the investigator after reviewing the recent related literature included. **Part I:** It was concerned with demographic characteristics such as age, gender, marital status, educational level, job title, years of working experience etc...) **Part II:** It was used to assess level of knowledge of healthcare workers regarding COVID 19 vaccination. **Tool II:** It was used to assess level of attitude of healthcare workers regarding COVID 19 vaccination. **Results of the study:** Represents that two third of the studied sample had good total knowledge, nearly one quarter of them had average level but one tenth of them had poor total knowledge, and more than two third of studied sample had positive attitude regarding COVID-19 vaccination, one third of them had negative attitude. **Conclusion:** In the light of present study findings, the health care workers were very knowledgeable with positive attitude to COVID-19 vaccination. **Recommendations:** Continuous evaluation of health care workers knowledge and attitude regarding COVID 19 vaccination is essential to identify their needs.

Key words: Knowledge, Attitude, Healthcare Workers, COVID 19 vaccination

Introduction

Coronavirus disease (COVID-19) is a global pandemic that is highly contagious and has led to increased morbidity and mortality. It is a respiratory tract infection that is caused by a novel coronavirus (SARS-CoV-2). The virus has now affected virtually every country across the world and the number of deaths continues to rapidly increase with Over 244.9 million confirmed cases of COVID-19 and 4.97 million deaths until (October 28, 2021), as reported by World Health Organization **(Dong et al., 2020).**

The pandemic has resulted in a devastating impact worldwide, which prompted the need for mitigation policies to contain the pandemic the ground strategy followed by most countries around the world was to reduce the transmissibility of the disease, often by non-pharmaceutical interventions (NPIs), including enforcing masks policy, hands sanitization, social distancing, travel restrictions, schools' closures, and partial or complete lockdowns. So far, NPIs were able to slow down the progression of the disease, but the most promising strategy to confine the pandemic and providing hope to reduce the mortality and morbidity rates remains within the capacity of medical technology. Such medical technology includes effective, safe, and affordable antiviral agents and vaccines **(Nicola et al.، 2020).**

The world's hopes are attached to a successful preventive measure that is the

vaccination which has proved its capability to stop infections and save lives over the years. Near the end of 2020, several vaccines started to arise; there are about 100 candidate vaccines. Several vaccines are in the clinical trial phases, and few have already gained. The most distributed 6 candidate vaccines are currently in the 3rd phase trial. They differ in composition, storage requirements, and effectiveness (70.4%-95%). No serious adverse effects were reported from those vaccines. As a result of the variability in COVID-19 vaccines, there are different directions, perceptions, and attitudes toward the vaccine. Those differences symbolize challenges for governments and public health experts **(WHO, 2021).**

To overcome the expected upcoming challenge of vaccination hesitancy, we have to measure it and know the exact reasons behind it. In this study, we are targeting the healthcare workers to measure their knowledge and attitude toward the COVID- 19 vaccines **(WHO, 2019)**.

Health care professionals who are at the front line of the COVID-19 outbreak fight are at high risk of contracting the infection. In Egypt, there have been 329136 confirmed cases of COVID-19, with 18535 deaths till now October, 2021. The Egyptian government exerts great efforts to provide the COVID-19 vaccines and sort the vaccination as a priority for healthcare workers (HCWs) and older people, especially with chronic diseases. In a study from China, the rate of transmission to health professionals found was 29%. In Italy, 20% of responding healthcare workers were infected, Healthcare workers are among the priority groups for COVID-19 vaccination (**WHO، 2021).**

Nurses can utilize what is known about effective vaccine uptake strategies and inform interventions and outreach programs in their own communities. The nurse has the power, experience, and the skills to reach a community and provide the COVID-19 vaccine uptake message so that Nurses play a key role in patient care, and guidance about vaccinations. It is critical for nursing professionals to keep themselves well-informed about current immunization, safety concerns, and current data about vaccinations from fact-based sources. Communication is a huge part of patient care to ensure understanding, reduce fear, and support compliance so that the role of nursing is integral to the success of the COVID-19 vaccines **(Jarrett et al., 2020).**

Significance of the study:

Healthcare workers who are at the front line of the COVID-19 outbreak fight are at high risk of contracting the infection. In Egypt, there have been 329136 confirmed cases of COVID-19, with 18535 deaths till now October, 2021. So that there are major influencers in vaccination, thus their knowledge, attitude and acceptance or hesitancy to the COVID-19 vaccine would either aid its acceptance among the populace **(Elsaid, et al., 2022).**

Also, healthcare workers represent the guidance and the trusted source of information of the vaccine for the general population. They can shield against misleading and confusing information. So, their knowledge and attitude will impact their and others' health so that. This study represents a guide for health authorities and public health experts in Egypt to highlight the expected challenges for COVID-19 vaccination **(Fares, et al., 2021).**

Aim of the study

This study aimed to assess knowledge and attitude of healthcare workers regarding COVID 19 vaccination through the following:

1-Assess level of knowledge of healthcare workers regarding COVID 19 vaccination.

2- Assess attitude of healthcare workers regarding COVID 19 vaccination.

Research Questions: -

1-What are the levels of knowledge healthcare workers regarding COVID 19 vaccination?

2- What are the attitudes of healthcare workers regarding COVID 19 vaccinations?

Subjects and Methods

Subjects and methods of the study are illustrated in the following four designs:

   I. Technical Design.
  II. Operational Design.
 III. Administrative Design.
 IV. Statistical Design.

I. Technical design:

This design included the research design, setting, subjects and tool of data collection.

Research Design:

A descriptive study was utilized in this study; Descriptive research design is a type of research design that aims to systematically obtain information to describe a phenomenon, situation, or population. More specifically, it helps answer the what, when, where, and how questions regarding the research problem rather than the why. Aims also to adequately describe the events as they occurred in their natural settings.

Research Settings:

The current study was conducted in Ashmoun General Hospital, which is affiliated to the Ministry of Health and Population in Menoufia Governorate. The hospital contains emergency department, triage for suspected case of Covid 19, isolation room for conformed cases, ICU for Covid 19 cases, ward for suspected and conformed Covid 19, operation rooms, NICU, outpatient clinic, laboratory department and radiology department.

Research Subjects:

The study subjects were A convenient sample included 266 health care workers including physician, anesthetist, nursing staff, pharmacist, dentist, physiotherapist, labs scientist, radiographer and housekeeping in the previous mentioned setting based on power analysis.

	Specialist	Number
1	Physician	105
2	Anesthetist	9
3	Nursing staff	112
4	Pharmacist	13
5	Dentist	4
6	Physiotherapist	3
7	Labs Scientist	6
8	Radiographer	6
9	Housekeeping	8

$$n = \frac{N \times p(1-p)}{\left[\left[N-1 \times \left(d^2 \div z^2\right)\right] + p(1-p)\right]}$$

While;
P= 0.5
N= Total population
Z= Z value "1.96"
D= Standard Error
n= sample size

Tools of the study:

Two tools were used in this study: -

I. Self-administrated Questionnaire Sheet:

It was developed by the investigator after reviewing the recent related literature **(French et al., 2020 & WHO, 2020).**

It was be written in an Arabic language for gathering data related to the following parts:

Part I:
It was concerned with demographic characteristics such as age, gender, marital status, educational level, job title, years of working experience, working in COVID 19 isolation hospital and dealing directly with patient with COVID 19.

Part II:

It was used to assess level of knowledge of healthcare workers regarding COVID 19 vaccination.

This tool was developed by the researcher based on reviewing of scientific related literatures. It

consisted of 37 questions for medical staff that consist 7 section which include Covid 19 vaccine production, Covid 19 vaccine nature types and action of work, Covid 19 vaccine doses and effects, Covid 19 vaccine facts and myth, Covid 19 vaccine efficiency and effects, Covid 19 vaccine side effects, Covid 19 vaccine indication and contraindication. 28 questions for paramedical staff that consisted of 6 section which include Covid 19 vaccine production, Covid 19 vaccine doses and effects, Covid 19 vaccine facts and myth, Covid 19 vaccine efficiency and effects, Covid 19 vaccine side effects, Covid 19 vaccine indication and contraindication. 13 questions for housekeeping that consisted of 7 section which include Covid 19 vaccine production, Covid 19 vaccine nature types and action of work, Covid 19 vaccine doses and effects, Covid 19 vaccine facts and myth, Covid 19 vaccine efficiency and effects, Covid 19 vaccine side effects, Covid 19 vaccine indication and contraindication in the form of multiple-choice questions (MCQs) to assess knowledge of health care workers regarding covid 19 vaccination.

Scoring system:

A scoring system was classified as the following: The correct answer was scored as one mark and the incorrect answer was scored as a zero point. A total score of the questionnaire for medical staff was 35 grades, for paramedical staff was 28 grades and for housekeeping was 14 grades.

These scores were summed and converted into a percent score and categorized as the following:

Good knowledge if total score $\geq 80\%$.

Average knowledge if total score from $70 < 80\%$.

Poor knowledge if total score $< 70\%$.

Tool II: Health care worker attitude scale:

It was modified by the investigator after reviewing the recent related literature (**French et al., 2020 & El-Elimat et al.,2021).** It was used to assess attitude of health care workers regarding COVID 19 vaccination.

The scale consisted of 34 statements (20 positive and 14 negative) to assess health care workers attitude they, were asked to respond to statements on a 3-point Likert scale (agree, uncertain and disagree) included; Covid-19 vaccine protection, safety and future protection against covid 19 infection, Covid-19 vaccine priority for health care workers, Covid-19 vaccine effectiveness and efficiency, Covid-19 vaccine availability for all doses, Covid -19 vaccine side effects and future risks, intended to receive all covid-19 vaccine doses, Facts and myths regarding covid 19 vaccine, Covid 19 vaccine reduce the duration and severity of covid 19 disease, Covid 19 vaccine can protect myself, close to me, family and friends from serious infection with the coronavirus.

Scoring system:

Health care workers responses was classified as "agree", "uncertain", "disagree" and was respectively scored 3, 2 and 1. The scoring was reversed for negative statements; the scores of the items were summed up and were be converted into a percentage score.

A scoring system was followed to assess health care workers attitudes toward COVID 19 vaccination. Each statement was assigned a score according to health care workers responses; that were classified accordingly into positive and negative attitude.

These scores were summed and converted into a percentage score, and accordingly the total scoring was classified into 2 categories:

Positive attitude if score $\geq 70\%$.
Negative attitude if score $< 70\%$.

II- Operational Design:

The operational design included preparatory phase, content validity, tool reliability, pilot study and field work.

The preparatory Phase:

It included reviewing of related literature and theoretical knowledge of various aspects of the study using books, articles, scientific journals, internet's periodicals and magazines to develop tools for data collection then translated into Arabic language. During this phase the researcher also visited the selected places to get acquainted with the personnel and study settings. Development of the tools does under supervisors' guidance and experts' opinion.

Validity and reliability:

Tool validity:

Testing validity of the proposed tools to determine whether the tools measure what supposed to measure. The tools revised by a jury of seven experts from different academic categories include 3 Professors, 4 Assistant Professors from medical surgery Nursing Department and Critical Nursing Department, Faculty of Nursing, Ain Shams University. The expert reviewed the tools and its content for clarity, relevance, comprehensiveness, accurateness, logical consequences, application and simplicity. Modification was done according to their recommendation.

Tool reliability:

Testing reliability of the proposed tools was done statistically by using Coronbach alpha test. It was used to examine whether questionnaire had an internal consistency. The knowledge and attitude tools had an internal consistency alpha test reached 0.805 for knowledge "good reliability" and alpha test reached 0.822 for attitude "good reliability".

Pilot study:

A pilot study carried out on 10% of each healthcare workers categories sample size which represented (13) medical staff, (13) paramedical staff and (1) housekeeping from total sample size to test and this size included in total study sample size. Based on the results of the pilot study, no modifications were done in study sample. Application of the contracted tools and the clarity of questions. The pilot has also served to estimate the time needed for each subject to fill in questionnaire.

Ethical considerations:

Approval of the study protocol was obtained from Ethical Committee in the Faculty of Nursing at Ain Shams University before starting the study. The researcher clarified the objective and aim of the study to the health care workers included in the study. Oral consent was obtained from the health care workers before engaging in the study. The researcher assured maintaining anonymity and confidentiality of the subjects' data. They were informed that they allowed choosing to participate or not in the study and that they have the right to withdraw from the study at any time without giving any reasons.

Field work:

The purpose of the study was to assess knowledge and attitude of health care workers regarding COVID 19 vaccination through collecting the data using the study tools after confirming its validity and reliability and the aim of study was simply explained to the health care workers who agreed to participate in the study prior to data collection. The actual work of this study started and completed within six months from the beginning of May (2022) to the end of October (2022). Data were collected by the researcher through two days per week (Saturday and Sunday) in Ashmon general hospital from (8:00-2:00 pm) to complete daily shift work which usually starts on (8:00 am). Total time to complete the knowledge questionnaire form took 30 minutes and 20 minutes for attitude scale for each health care workers. About 5 to 6 health care workers was interviewed per day

III- Administrative Design:

To carry out this study, the necessary approval was obtained from the hospital directors. A letter was issued from the Faculty of Nursing, Ain Shams University explaining the purpose of the study to obtain the permission for conducting this study. Collect

the necessary data for current study after a brief explanation of the purpose of the study and its expected outcome. Using proper channel of communication from authorized personnel.

IV- Statistical Design:

Statistical Analysis

Data collected from the studied sample was revised, coded and entered using Personal Computer (PC). Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 22. Data were presented using descriptive statistics in the form of frequencies, percentages and Mean SD. A correlation coefficient "Pearson correlation" is a numerical measure of some type of correlation, meaning a statistical relationship between two variables. Chi-square to assess the relations between variables and their characteristics.

Significance of the results:

− Highly significant at p-value < 0.01.
− Statistically significant was considered at p-value < 0.05
− Non-significant at p-value ≥ 0.05

Results

As shown in **table (1)**, this study is conducted on 266 health care workers. Regarding their socio-demographic characteristics, near half of them (46.6%) ranged in age from 30 to less than 40 years old with mean 37.45±0.86 years. In addition, almost two thirds of them (63.5%) were females. As well, near three quarters of them (72.9%) were married. As regard to their years of experience in work field, about two fifth of them (40.6%) had from 5 to less than 10 years with mean 8.15±1.63 years. Concerning job, almost two fifth of medical staff (39.5%) were physician, whilst more than two fifth of paramedical staff (42.1%) were nursing staff. Additionally, most of them (89.1%, 80.8%) were working in COVID-19 isolation hospital and are dealing directly with patients having COVID 19.

Table (2) indicates that more than three quarters of the studied medical staff (78.6%) had good level of total knowledge regarding COVID-19 vaccination. Also, more than half of the studied paramedical staff (56.7%) had good level of total know whilst nearly two thirds of the studied housekeeping (62.5%) had poor level of total know.

Figure (1) represents that, about two thirds of total studied samples (66.2%) had good level of total knowledge regarding COVID-19 vaccination, nearly one quarter of them (22.90%) had average level but about one tenth of them (10.9%) had poor level.

Figure (2) shows that more than two thirds of health care workers (67.7%) had positive attitude, but almost one third of them (32.3%) had negative attitude

Table (3) illustrates that there is a highly statistically significant relation between total knowledge of the studied healthcare workers about COVID-19 vaccination and their educational level, Job, Working in COVID 19 isolation hospital and dealing directly with patient having COVID 19 with (p=0.002, p=0.008, p=0.009, p=0.005) respectively. As well, a statistically significant relation is found with their Age, and Years of experience with (p=0.015, p=0.012) respectively. No statistically significant relation exists with their Gender and Marital status (p>0.05).

Table (4) indicates that there is a highly statistically significant relation between total attitude of the studied healthcare workers about COVID-19 vaccination and their educational level, Job, Working in COVID 19 isolation hospital and dealing directly with patient having COVID 19 with (p=0.000, p=0.008, p=0.002, p=0.002) respectively. Additionally, a statistically significant relation is found with their Age, gender and Years of experience with (p=0.012, p=0.014, p=0.025) respectively. No statistically significant relation exists with their Marital status (p>0.05).

Table (5) declares that there is a highly significant positive correlation between Total knowledge and total attitude regarding COVID-19 vaccination (p=0.000).

Table (1): Number and percentage distribution of the studied health care workers according to their demographic characteristics (n=266).

Personal information	N	%
Age		
18 < 30	56	21.1
30 < 40	124	46.6
40 < 50	45	16.9
50<60	41	15.4
$\overline{X}$ **S.D** 37.45±0.86		
Gender		
Male	97	36.5
Female	169	63.5
Marital Status		
Single	72	27.1
Married	194	72.9
Years of experience in work field		
<5	63	23.7
5 <10	108	40.6
≥10	95	35.7
$\overline{X}$ **S.D** 8.15± 1.63		
Job		
Medical staff		
Physician	105	39.5
Anesthetist	9	3.4
Pharmacist	13	4.8
Dentist	4	1.5
Paramedical staff		
Nursing staff	112	42.1
Physiotherapist	3	1.1
Labs technician	6	2.3
Radiologist	6	2.3
Housekeeping	8	3.0
Working in COVID-19 isolation hospital		
Yes	237	89.1
No	29	10.9
Dealing directly with Patient having COVID -19		
Yes	215	80.8
No	51	19.2

Table (2): Number and percentage distribution of the studied health care workers according to their total knowledge regarding COVID-19 vaccination (n=266).

Total knowledge	No	%
Medical staff n=131		
Good	103	**78.6**
Average	25	19.1
Poor	3	2.3
Paramedical staff n=127		
Good	72	**56.7**
Average	34	26.8
Poor	21	16.5
Housekeeping n=8		
Good	1	12.5
Average	2	25.0
Poor	5	**62.5**

Figure (1): Percentage distribution of the studied health care workers according to their total knowledge regarding COVID-19 vaccination (n=266).
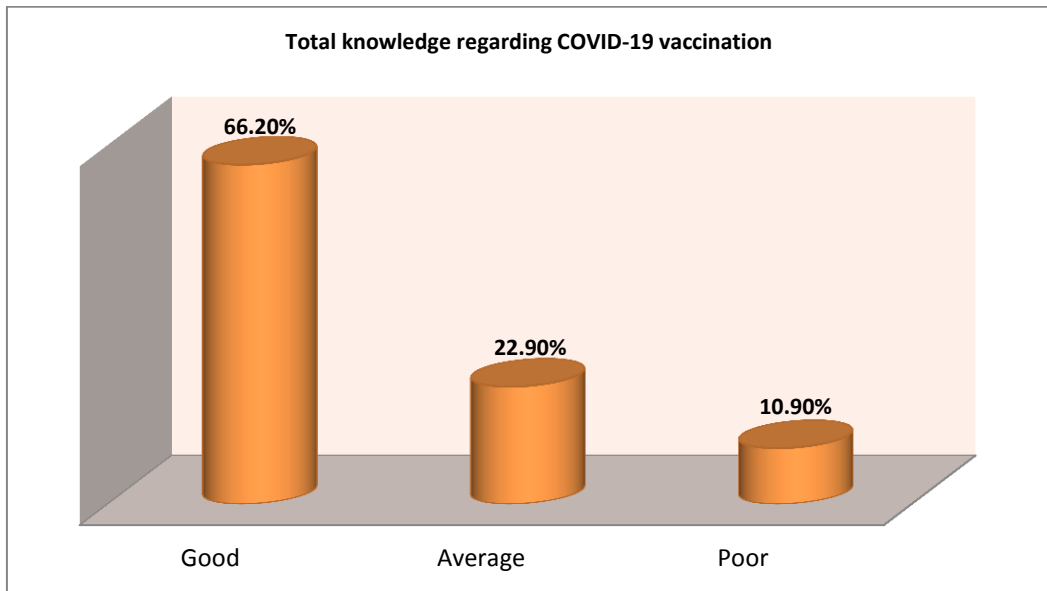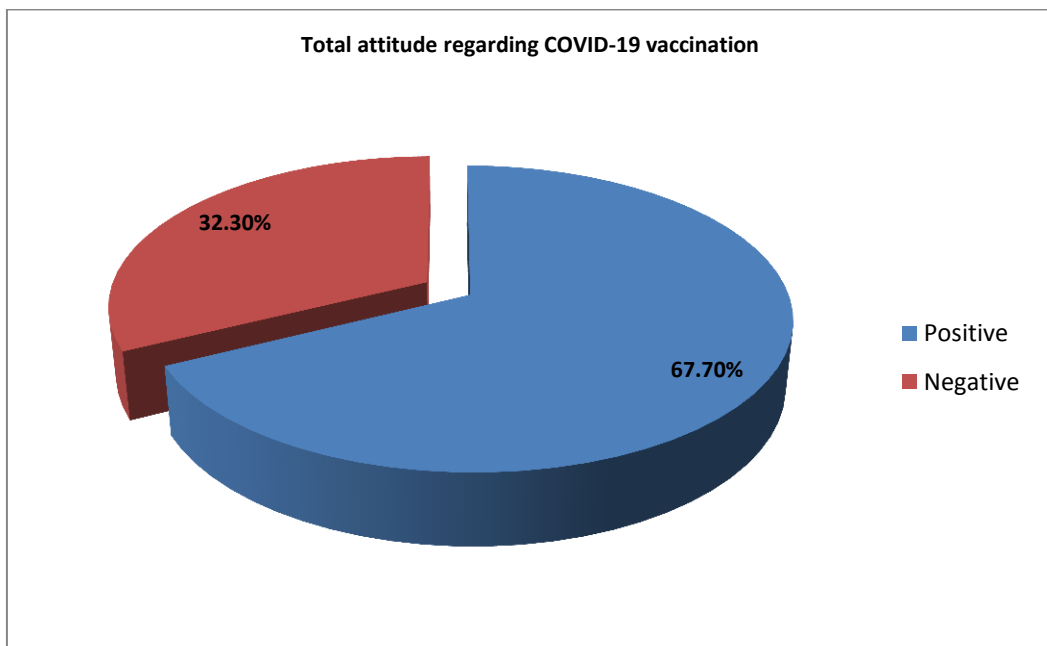

Figure (2): Percentage distribution of the studied healthcare workers according to their total attitude regarding COVID-19 vaccination (n=266).

Table (3): Relationship between demographic characteristics of studied healthcare workers and their total knowledge about COVID-19 vaccination (n=266).

Items		Good N=176		Average N=61		Poor N=29		X^2	P-Value
		N	%	N	%	N	%		
Age	18 < 30	41	23.3	10	16.4	5	17.2	6.733	0.015*
	30 < 40	92	52.3	19	31.1	13	44.8		
	40 < 50	27	15.3	15	24.6	3	10.4		
	50 < 60	16	9.1	17	27.9	8	27.6		
Gender	Male	60	34.1	26	42.6	11	37.9	1.147	0.085
	Female	116	65.9	35		18	62.1		
Marital status	Single	42	23.9	21	34.4	9	31.0	1.235	0.985
	Married	134	76.1	40	65.6	20	69.0		
Educational level	Post graduated	25	14.2	3	4.9	1	3.4	14.69	0.002**
	Bachelor's degree	116	65.9	7	11.5	5	17.2		
	Technical institute	23	13.1	20	32.8	6	20.7		
	Professional diploma	12	6.8	29	47.5	11	37.9		
	Basic education	0	0	2	3.3	6	20.7		
Years of experience	<5	37	21.0	12	19.7	14	48.3	4.901	0.012*
	5 <10	99	56.3	5	8.2	4	13.8		
	≥10	40	22.7	44	72.1	11	37.9		
Job	Medical staff	122	69.3	9	14.7	0	0	12.73	0.008**
	Paramedical staff	54	30.7	50	82.0	23	79.3		
	Housekeeping	0	0	2	3.3	6	20.7		
Working in COVID 19 isolation hospital	Yes	173	98.3	59	96.7	5	17.2	6.719	0.009**
	No	3	1.7	2	3.3	24	82.8		
Dealing directly with patient having COVID 19	Yes	171	97.2	40	65.6	4	13.8	9.254	0.005**
	No	5	2.8	21	34.4	25	86.2		

Table (4): Relationship between demographic characteristics of studied healthcare workers and their total attitude about COVID-19 vaccination (n=266).

Items		Total attitude				X^2	P-Value
		Positive N=180		Negative N=86			
		N	%	N	%		
Age	18 < 30	48	26.7	8	9.3		
	30 < 40	113	62.8	11	12.8	13.91	0.012*
	40 < 50	14	7.8	31	36.0		
	50 < 60	5	2.7	36	41.9		
Gender	Male	27	15.0	70	81.4	14.27	0.014*
	Female	153	85.0	16	18.6		
Marital status	Single	33	18.3	39	45.3	5.261	0.081
	Married	147	81.7	47	54.7		
Educational level	Post graduated	26	14.4	3	3.5	15.08	0.000**
	Bachelor's degree	126	70.0	2	2.3		
	Technical institute	11	6.1	38	44.2		
	Professional diploma	15	8.3	37	43.0		
	Basic education	2	1.1	6	7.0		
Years of experience	<5	55	30.6	8	9.3	11.52	0.025*
	5 <10	99	55.0	9	10.5		
	≥10	26	14.4	69	80.2		
Job	Medical staff	119	66.1	12	14.0		
	Paramedical staff	60	33.3	67	77.9	13.69	0.008**
	Housekeeping	1	0.6	7	8.1		
Working in COVID 19 isolation hospital	Yes	170	94.4	67	77.9	15.85	0.002**
	No	10	5.6	19	22.1		
Dealing directly with patient having COVID 19	Yes	167	92.8	48	55.8		
	No	13	7.2	38	44.2	16.27	0.002**

Correlation between the studied variable

Table (5): Correlation between the studied variable (n=266).

		Total attitude
Total knowledge	R	.754
	P	.000**

Discussion

Concerning socio-demographic characteristics of studied health care workers, the result of present study referred almost two thirds of them were female. This finding in same line with study by **Elhadi, et al., (2021)** who conducted study entitled "Knowledge, attitude, and acceptance of healthcare workers and the public regarding the COVID-19 vaccine" and showed the most of them were female. This may be due to that this result explained as nursing has traditionally been female dominated industry and in medical filed.

As regards to years of experience in work field, about two fifth of them had from 5 to less than 10 years with mean 8.15±1.63 years. This finding in same line with study by **Kabamba Nzaji, et al., (2020)** who conducted study entitled "Acceptability of vaccination against COVID-19 among healthcare workers in the Democratic Republic of the Congo" and showed more than half of health care workers were less than 10 years from experience.

Regarding age of the studied nurses, near half of them ranged in age from 30 to less than 40 years old with mean 37.45±0.86 years. This finding in same line with study by **Ledda et al., (2021)** who conducted study about " Attitudes of Healthcare Personnel towards Vaccinations before and during the COVID-19 Pandemic" and showed

that about one third of the studied nurses ranged in age from 30 to less than 40 years old.

As regards to marital status, the result of present study showed that near three quarters of the studied nurses were married. This finding disagreed with study by **Azizoğlu et al., (2022)** who conducted study entitled "The attitudes of healthcare professionals in Turkey toward the coronavirus vaccine" and showed that majority of the studied healthcare professionals were single. from researcher point view, this difference between studies might be due to healthcare professionals worked on isolation hospital worked for long duration and difficult to leave their children long time.

As regards to total knowledge regarding COVID-19 vaccination, the result of present study indicated that more than three quarters of the studied medical staff had good level of total knowledge regarding COVID-19 vaccination. Also, more than half of the studied paramedical staff had good level of total knowledge whilst nearly two thirds of the studied housekeeping had poor level of total knowledge regarding vaccination. This result matched with **Albahri et al., (2021)** who conducted study about " Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in primary healthcare centers in Dubai" and found more than half of the studied medical and paramedical staff had good level of total knowledge regarding COVID-19 vaccination. On other hand, this finding disagreed with study by **Shukla et al., (2021)** entitled "The other corona warriors: A KAP study on COVID-19 among janitors and housekeeping staff from a tertiary care hospital in Eastern India" and found that more than half of the studied Housekeeping had adequate knowledge regarding COVID-19 vaccination.

Regarding total knowledge of health care workers regarding COVID-19 vaccination, the result of current study represented that, about two thirds of total studied health care workers had good level of total knowledge regarding COVID-19 vaccination. From researcher point view, this result might be due to role of mass media and continuing in services education to improve

knowledge of health care workers. This result consistent with study by **Adane et al., (2022)** entitled " Knowledge, attitudes, and perceptions of COVID-19 vaccine and refusal to receive COVID-19 vaccine among healthcare workers in northeastern Ethiopia" who showed that less than two thirds of the studied healthcare workers had good level of knowledge bout COVID-19 vaccine.

Regarding total attitude of the studied healthcare workers regarding COVID-19 vaccination, the result of present study demonstrated that more than two thirds of them had positive attitude. This finding agreed with study by **Hajure et al., (2021)** entitled "Attitude towards COVID-19 vaccination among healthcare workers" and reported that more than half of the studied healthcare workers had positive attitude.

Regarding relationship between demographic & their total knowledge regarding COVID 19 vaccination the present study illustrated that there is a highly statistically significant relation between total knowledge of the studied healthcare workers about COVID-19 vaccination and their educational level and job. This can be explained as highly educated participants, medical and paramedical staff had high level of knowledge about COVID-19 vaccination.

This finding was in same line with study by **Jairoun et al., (2022)** entitled "Assessing public knowledge, attitudes and determinants of third COVID-19 vaccine booster dose acceptance" who found that that there was a statistically significant relation between total knowledge of the studied healthcare workers about COVID-19 vaccination and their educational level and Job.

In addition, the current study illustrated that there was a highly statistically significant relation between total knowledge of the studied healthcare workers about COVID-19 vaccination and their working in COVID 19 isolation hospital. This can be interpreted as participants who worked at COVID 19 isolation hospital gained more knowledge about COVID 19 vaccination. This result was in accordance with **Napolitano et al., (2019)** who conducted a

study about "Healthcare workers' knowledge, beliefs, and coverage regarding vaccinations in critical care units in Italy" and mentioned that there was significant relation between level of knowledge and experience of working in isolation hospital

As well, the present study declared that there was a highly statistically significant relation between total knowledge of the studied healthcare workers about COVID-19 vaccination and their dealing directly with patient having COVID 19. This can be explained as participants who dealing directly with patient having COVID 19 have more knowledge about COVID 19 vaccination by experienced.

This result was supported by **Adejumo et al., (2021)** who conducted a study entitled "Perceptions of the COVID-19 vaccine and willingness to receive vaccination among health workers in Nigeria" and mentioned that there was significant relation between the study subjects' level of knowledge and caring with COVID-19 patients.

Regarding relationship between demographic characteristics of studied healthcare workers and their total attitude about COVID-19 vaccination, the result of current study indicated that there was a highly statistically significant relation between total attitude of the studied healthcare workers about COVID-19 vaccination and their educational level and job. From researcher point view, this finding might be due to effect of in-services training and the sense of responsibility as they represent the white army against COVID 19 and they were acting as role model.

This result in same line with study by **Iguacel et al., (2021)** entitled "Attitudes of healthcare professionals and general population toward vaccines and the intention to be vaccinated against COVID-19 in Spain" who revealed statistically significant relation between attitude and their educational level and job.

Furthermore, the current study declared that there was a highly statistically significant relation between total attitude of the studied healthcare workers about COVID-19 vaccination and their working in COVID 19 isolation hospital. This can be explained as the study subjects who worked at isolation hospital have positive attitude towards COVID-19 vaccination.

This result matched with a study performed by **Alle & Oumer, (2021)** about "Attitude and associated factors of COVID-19 vaccine acceptance among health professionals in Debre Tabor Comprehensive Specialized Hospital, North Central Ethiopia" and found that there was significant association between the studied health professionals' attitude and their experience of working in COVID 19 isolation hospital.

Finally, the current study declared that there was a highly significant positive correlation between total knowledge and total attitude regarding COVID-19 vaccination. From researcher point view, this finding might be due to people who are committed to community health and have a greater understanding of the impact of protective measures, are also more likely to be vaccinated. this finding supported with study by **Ciardi et al., (2021)** who conducted study about "Knowledge, attitudes and perceptions of COVID-19 vaccination among healthcare workers of an inner-city hospital in New York" and found a strong correlation between participants' knowledge about COVID-19 infection and positive attitude towards receiving COVID-19 vaccination.

Conclusion:

In the light of present study findings, the health care workers were very knowledgeable with positive attitude to COVID-19 vaccination. The good knowledge with positive attitude to COVID 19 vaccine.

Recommendations:

Continuous evaluation of health care workers knowledge and attitude regarding COVID 19 vaccination that essential to identify their needs.

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