COVID-19 Vaccination and Predictors of Vaccine Hesitancy: A Community-Based Research in Zagazig City

[1]Samia Farouk Mahmoud, and [2]Asmaa Ali Elsayed Ali

[1] Assistant Professor Community Health Nursing department, Faculty of Nursing, Zagazig University

[2] Lecturer Community Health Nursing department, Faculty of Nursing, Zagazig University

Abstract

Background: Vaccines are vital in containing the COVID-19 epidemic and may be an essential tool in re-establishing "normalcy". **The aim** of the research was to investigate COVID-19 vaccination and predictors of vaccine hesitancy in Zagazig City. **Research design:** A descriptive, cross-sectional design was used. **Setting**: The research was carried out in Zagazig City and Shaybah Village, Egypt. **Subjects:** A multistage systematic random sample involving 997 participants. **Tools:** Three questionnaires were used for data collection. **I.** The interview questionnaire consists of three tools: socio-demographic data, individual factors, and knowledge about the COVID-19 vaccine. **II**. Attitude assessment toward vaccine, and **III**. Application of the Health Belief Model regarding COVID-19 vaccination. **Results:** Only 10% of studied subjects had taken the vaccine, and 24.2% of them had the intention to take the vaccine. In addition, 75.8% of them have vaccine hesitancy. Moreover, 54.0% of the studied subjects had adequate knowledge about the COVID-19 vaccine. The highest percentage of the studied subjects did not know the difference between types of vaccine (40.9%). In addition, 60% of subjects have positive attitudes about the COVID-19 vaccine. Furthermore, 40.3% of subjects have a neutral health belief model regarding the COVID-19 vaccine. **Conclusion:** The study presented that more than three-quarters of study participants had vaccine hesitancy. In general, more than half of the subjects examined have enough knowledge. Moreover, three-fifths of them have a positive attitude toward the COVID-19 vaccine. Furthermore, two-fifths of the studied subjects had a neutral health belief model about the COVID-19 vaccine. **Recommendation:** Health awareness about the importance of vaccines to protect from severe infection and deadly complications of COVID- 19 virus.

Keywords: COVID-19 vaccination, Vaccine Hesitancy predictors, Community Study.

Introduction:

COVID-19 is a virus infection that is induced by a severe acute respiratory illness. Coronavirus illness, which the World Health Organization has termed a "pandemic," has spread to all nations and has infected over 111 million individuals and taken over 2.4 million innocent lives as of February 20,

2021. COVID-19's emergence has had a disastrous effect on worldwide healthcare systems, with ramifications affecting every element of human existence **(Mahmud et al., 2021).** The initiation of the COVID-19 immunization campaign was a ray of hope for a return to regular living. They did, however, spark debate about vaccine hesitancy since the success of any immunization program is contingent on public uptake **(Soares et al., 2021).**

The World Health Organization defines vaccine hesitancy as "a delay in accepting or refusing to vaccinate notwithstanding the availability of vaccination services." Numerous variables have been identified as contributing to rising vaccination reluctance. These include worries regarding a vaccine's safety and effectiveness. A lack of concern for the severity of an illness also contributes to hesitancy **(Dorman et al., 2021)**.

Community health nurses play critical roles in introducing new vaccines, including planning, target group identification, community engagement and mobilisation, service delivery, and tracking and follow-up **(WHO, 2021a).** They are uniquely positioned to increase COVID-19 vaccine uptake, given their position as the nation's most trusted professionals and their critical role in caring for COVID-19 victims. Nurses might derive "take-home lessons" from previously performed vaccination uptake studies. Successful vaccine uptake campaigns include a variety of techniques, including direct targeting of unvaccinated and under-vaccinated populations, increasing knowledge and awareness, making vaccination more convenient, and including religion or other significant community leaders in the effort **(Enriquez, 2021).**

Significance of the study

COVID-19 infection can present various symptoms, ranging from asymptomatic infection to acute respiratory distress syndrome and death **(National Institutes of Health, 2019).** Between January 3 2020, and October, 13th 2021, Egypt reported 314,116 confirmed COVID-19 cases and 17,765 deaths to the World Health Organization (WHO) **(WHO, 2021b).** It is crucial to have a firm grasp of the elements that contribute to COVID-19 vaccine hesitancy. Vigorous public health campaigns must be devised and supported **(Ruiz & Bell, 2021).** The challenge now is to convince individuals to get immunizations.

The aim of the research was to investigate COVID-19 vaccination and predictors of vaccine hesitancy in Zagazig City through:

- Measure the percentage of people who have already been vaccinated and those who had vaccine hesitancy.
- Assess knowledge, and attitude of people about the COVID-19 vaccination.
- Explore predictors of vaccine uptake versus vaccine hesitancy among people already vaccinated versus people with vaccine hesitancy
  Research questions
- What is the percentage of people who have already been vaccinated and those who had vaccine hesitancy?
- What is the knowledge, and attitudes of people about the COVID-19 vaccination?
- What are the predictors of vaccine uptake versus vaccine hesitancy among people already vaccinated versus people with vaccine hesitancy?

Subjects and Methods

1. Technical Design
A) Research Design

A descriptive, cross-sectional study was used in this study

B) Setting

The investigation was conducted in Zagazig City and Shaybah Village. **Zagazig** is the capital of Sharkia Governorate, located in the east of the Nile Delta, in which there are Zagazig University, and faculties of Al-Azhar University. Zagazig is one of the largest cities located on.

Shaybah Village: It is one of the villages of Minya Al-Qamh Center in Sharkia Governorate in the Arab Republic of Egypt. The total population of Shaybah Qash was 94.68 people, of whom 49.178 were men and 45.502 were women **(Central**

Agency for Public Mobilization and Statistics, 2017).

C) Subjects

A multistage systematic random sample involving 997 participants was selected under the following inclusion criteria; age 18- 60 years, both sexes, and agree to participate in the study exclusion criteria included pregnant women, lactating women, and newly married couples.

Sampling:

Sampling technique: A multistage systematic random sample technique was used.
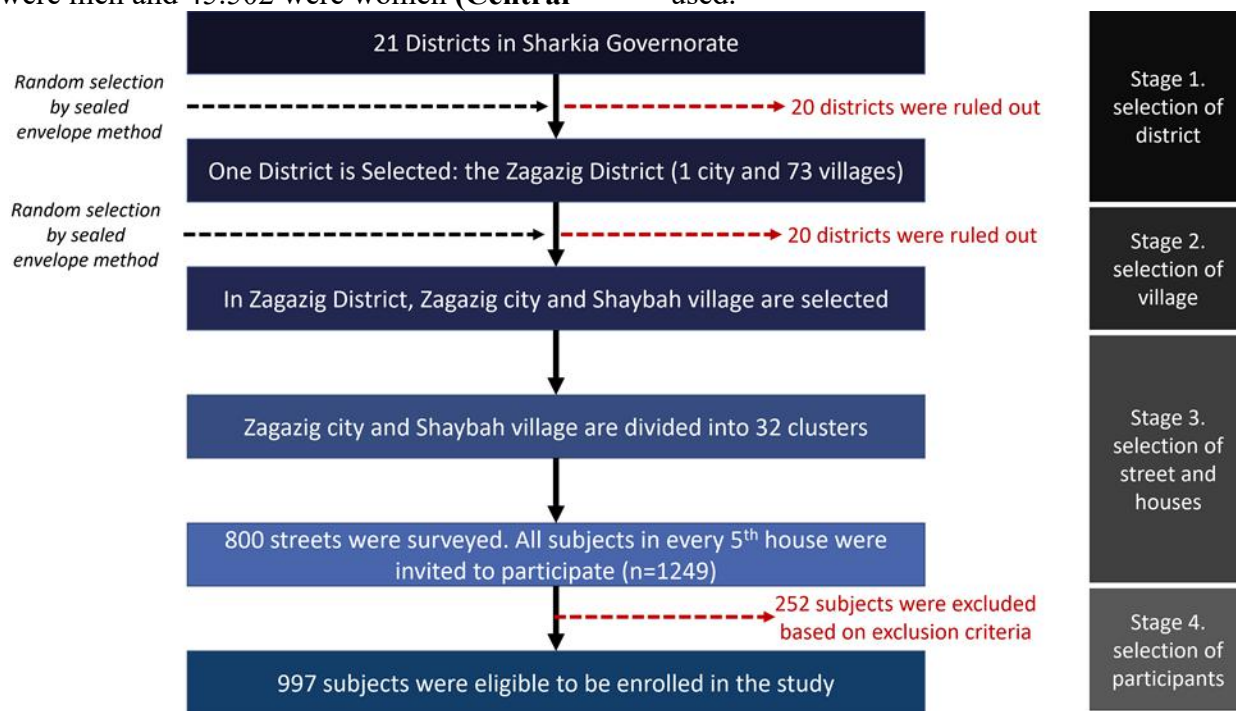
Sample size

A multistage systematic random sample, the estimated sample size is at least 734 people, at confidence level 99% and the precision rate at 0.05 by using Steven equation, 2012 since the total number was 7719000 persons.

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

While;

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

Tools for data collection

Three questionnaires were used for data collection. **I.** Interview questionnaire socio-demographic data, individual factors, and knowledge about corona vaccine, **II.** Attitude toward vaccine, and **III.** Health Belief Model regarding COVID-19 vaccination.

Tool I: This tool was developed by the researchers and guided by **Cordina et al. (2021), Saied et al. (2021),** and **Soares et al. (2021); it** consisted of the following parts:

▪ **Part A-** This involved a collection of seven questions concerning the socio-demographic data of the population as age, sex, residence, marital status, occupation, education, and income.

▪ **Part B- Individual factors** such as; the previous infection with COVID-19, the intention of taking the flu vaccine this year, and perception of the health status.

▪ **Part C.** Knowledge about COVID-19 vaccination**.** It is composed of five questions**: dangerous** disease, preventive measures, preferred vaccination, reasons for vaccination, and information source about COVID-19.

▪ **Scoring**

The Knowledge tool is formed of 8 items. The response for each item is either incorrect (score 1) or correct (score 2). The total score is categorized as unsatisfactory (<70% of the total score) or satisfactory (≥70% of the total score).

Tool II: This tool for assessing the attitude of community people about COVID-19 vaccination was prepared by the researchers and guided by **Hossain et al. (2021) and Saied et al. (2021).** It has nine items on a 3-point Likert Scale: ''Agree, Neutral, and Disagree'' such as the importance of the vaccine, compulsory vaccination; need to take the vaccine, effectiveness of the vaccine, and testing COVID vaccine for sufficient time

▪ **Scoring:**

People were asked to respond by any of 3 options: "Agree," "Disagree," or "Neutral," for each statement. Composed of 9 attitude statements, it is considered positive if ≥60% and negative if 60% based on statistical analysis.

Tool III. This tool adopted by **Hossain et al. (2021)** to apply the health belief model regarding COVID-19 vaccination includes four domains:

▪ **1st Perceived susceptibility** as being concerned about the possibility of getting COVID-19, high risk of getting COVID-19 due to health issues.

▪ **2nd Perceived severity as** will be extremely ill if infected with COVID-19 and fearful of dying from COVID-19.

▪ **3rd Perceived benefits** as believing the vaccine are beneficial as it will alleviate my concerns about COVID-19 believe vaccination will reduce my chance of contracting COVID-19, believe vaccination will reduce the problems of COVID-19 if vaccinated and then infected

▪ **4th Perceived barriers as** worried about the possible COVID-19 vaccination's side-effects that could affect the usual activities, the efficacy vaccine**,** and obtain faulty/fake vaccine.

Scoring:

People were asked to respond by any of 3 options: "Agree," "Disagree," or "Neutral," for each statement. Composed of 14 statements, it is considered strong if >70%, Neutral if 50 - 70% and poor if <50% based on statistical analysis.

II. Operational design: It comprises the preparatory phase's content, validity, and reliability, as well as the pilot research, fieldwork, and ethical considerations.

- **Preparatory phase:** To become familiar with the research subject and establish study instruments, a review of historical and present related literature and theoretical understanding of many areas of the study was conducted utilising accessible books, papers, journals, magazines, and the internet.

- **Content validity**: A team of three professionals from nursing and medical academics assessed the instruments and determined their clarity, relevance, comprehensiveness, and usefulness.

- **Content reliability**: The tools' reliability was Internal consistency and test-retest dependability. The researchers determined test-retest reliability by administering the same instruments to the same people twice or more under identical settings. Cronbach's Alpha test statistics were used to assess the reliability of proposed tools, and the results were **0.79**, **0.81,** and **0.89** for tools (I), (II), and (III).

  - **Pilot study**

  Pilot research was conducted with 10% of the study individuals (100 participants). The pilot study's objective was to eliminate ambiguity in the questions and evaluate the tools' practicability and viability. Additionally, it assisted the researchers in estimating the time required to complete the forms. Participants in the pilot research were not included in the main study sample.

  - **Fieldwork**

  After obtaining authorization to proceed with the study, the researchers began developing a timetable for data collection. The researchers started the collection of data through face-to-face interviews with each participant individually; the average time to complete the interview questionnaires ranged from 25-30 minutes. Work continued for three days per week: Sundays, Mondays, and Wednesdays from 9.00 a.m. to 12.00 noon. Data were collected through 5 months, starting from February 2021 to the end of June 2021.

  - **Ethical Considerations: -**

  The research ethics committees of Zagazig University's Faculty of Nursing granted consent for the study's conduct. After a thorough description of the study's objective, participants verbally consented to participate. Participants were informed that they might withdraw at any moment without giving a reason and that any information obtained would be kept secret and used solely for the research.

III. Administrative Design: -

An official letter stating the study's aim was sent to the responsible from the Faculty of Nursing, Zagazig University, to establish the researcher's identity.

IV. Statistical Design

The acquired data was edited, coded, and entered using Microsoft Excel and Statistical Package for Social Sciences (SPSS) version 26.0 to perform statistical analyses. The data were described in the form of frequencies, percentages, and Mean±SD. Chi-square test statistics are used to investigate the relationship between category data. A correlation coefficient, often known as a "Pearson correlation," is a numerical representation of certain sorts of correlations, which are statistical relationships between two variables.

Significance of the results:

- Highly significant was considered at p-value < 0.01.

- Statistically significant was considered at p-value < 0.05
- Insignificant was considered at p-value ≥ 0.05

Results

Table 1 shows the distribution of studied subjects according to their vaccine hesitancy and intention to take it. It was observed that only 10.1% of the studied subjects had taken the vaccination, and 24.2% of them had the intention to take the vaccine. In comparison, an equal percentage (2.9%) of them felt tired and had headache and arthritis as side effects of the vaccine. In addition, 75.8% of them have vaccine hesitancy.

Table 2 reveals the distribution of studied subjects according to their knowledge about the covid-19 vaccine. The table displayed that 707(70.9%), 597(59.9%), 380(38.1%), and 515(51.7%) of the studied subjects had correct knowledge about the concept of covid-19, ways of prevention spreading covid-19, side effects of covid-19 vaccine and complications of COVID-19, respectively.

Figure 1 illustrates the distribution of studied subjects according to their total knowledge above the COVID-19 vaccine; it showed that 54.0% of the studied subjects had sufficient knowledge.

Figure 2 presents the distribution of studied subjects according to the type of vaccine chosen; it was observed that the highest percentage of the studied subjects did not know the difference between types of vaccine (40.9%), and 23.7% of them chose Pfizer biotech vaccine.

Figure 3 displays the distribution of studied subjects according to their motivator for receiving the vaccine. It presented that 37.1% of the studied subjects received vaccines due to fear of being infected and infecting their families. On the other hand,

only 1.9% of them received vaccines due to the availability of free vaccines.

Figure 4 reveals the distribution of studied subjects according to their source of information about the COVID-19 vaccine. It shows that, the most source of information about COVID 19 was media and then physician (48.2% & 37.2% respectively).

Table 3 demonstrates distribution of studied subjects according to their attitude toward COVID-19 vaccine. It was observed that 676 (67.8%) of the study sample agreed that vaccine is important, and 553(55.5%) of the study sample agreed that the best preventive measure for COVID-19 is getting vaccinated. Moreover, the same table revealed that 552(55.4%) of the study participants agreed that the vaccine was not tested for enough time. In addition, 60% of subjects have positive attitude.

Table 4 portrays the distribution of according to their health believe model about COVID-19 vaccine. Concerning perceived susceptibility, it showed that 68.1% of the studied subjects agree to be worried about the likelihood of getting infected by COVID-19, while 45.9% of them disagree to be very concerned that they could die from COVID-19. Concerning perceived benefits, 64.9% of them agree that vaccination is good because it will make them less worried about COVID-19. Regarding perceived barriers, 68.7%, 70.7%, and 69% of the studied subjects agreed that worried that the possible side effects of the COVID-19 vaccination, concerned about the genetic long-term side effects of the COVID-19 vaccination and insufficient information about COVID-19 vaccination. Moreover, 40.3% of subjects that neutral attitude toward health belief model regarding COVID-19 vaccine.

Table 5 shows that there were highly statistically significant relations between subjects' residence and occupation with their

Intention to take the vaccine at p- value <0.01, while, there was a slight significant relation between subjects' educational level with their intention to take the vaccine at p-value <0.05. Meanwhile, there were no significant relations with age, gender, marital status, and income at p value >0.05.

Table 6 shows that there were highly statistically significant relations between subjects' previous infection with COVID-19, intention of taking the flu vaccine this year, and perception of the health status with their intention to take the vaccine at p value <0.01. However, there was slight significant relation between subjects' presence of chronic diseases with their intention to take the vaccine at p value <0.05.

Table 7 present the relation between total knowledge, attitude and health believe model with their intention. It revealed that there were highly statistically significant relations between total knowledge, attitude, and health belief model with their intention to take vaccine at p value <0.01.

Table 8 revealed that the model is high significant (F=7.118 and P value= 0.004), this model explains 52% of the variation in intention to take the vaccine detected through R2 value 0.52. also presented that, Intention of taking the flu vaccine this year, Total knowledge, Total Attitude, Health believe model had high positive effect on risk taking at p value <0.01**, while urban residence, high education level and history of infected COVID19 had slight positive effect on Intention to Take the Vaccine with p value <0.05*.

Table (1): Distribution of Studied Subjects According to Their Vaccine Hesitancy and Intention (n=997)

Items	N	%
Previous of vaccine Hesitancy	**n**	**%**
Take corona vaccine: Yes No	101 896	10.1 89.9
Side Effects: **Did not Take Vaccine** **Pain And Redness** **Tumour In Place** **Fever** **Tiredness And Headache** **Arthritis**	896 12 13 18 29 29	89.9 1.2 1.3 1.8 2.9 2.9

Intention to take the vaccine: (n=896)
    1. Yes
    2. No
    3. I don't decide
	217
	477
	202
		24.2
		53.2
		22.6

Total vaccine hesitancy	679	75.8

Table (2) Distribution of studied subjects according to their knowledge about COVID-19 VACCINE (n=997)

Items	Correct		Incorrect	
	No	**%**	**No**	**%**
Concept of COVID-19	707	70.9	290	29.1
Ways of prevention spreading COVID-19	597	59.9	400	40.1
Side effect s of COVID-19 vaccine	380	38.1	617	61.9
Complications of COVID-19	515	51.7	482	48.3

Figure (1): Distribution of Studied Subjects According to Their Total Knowledge About COVID-19 Vaccine (n=997).

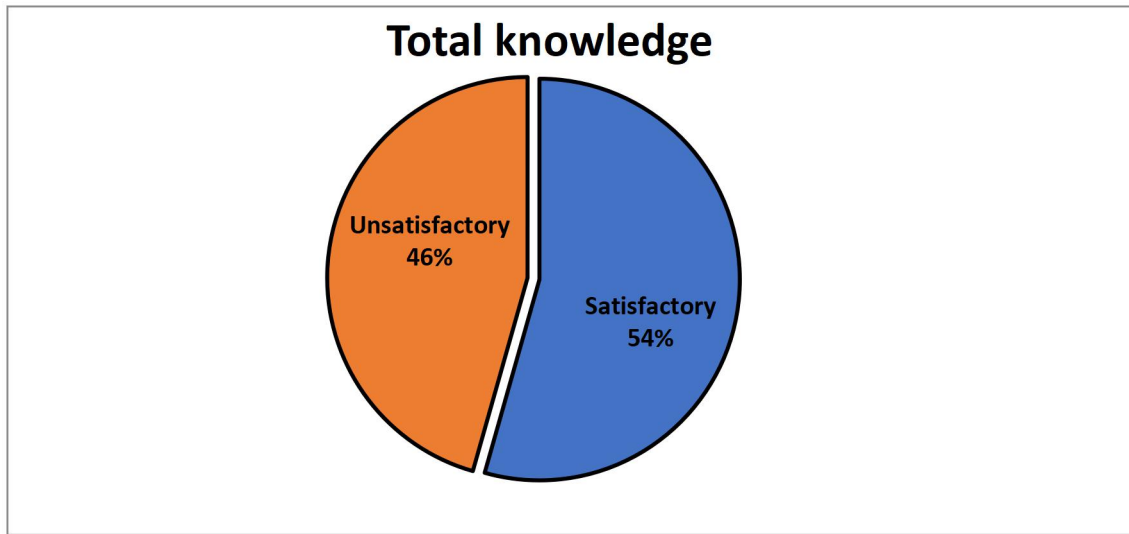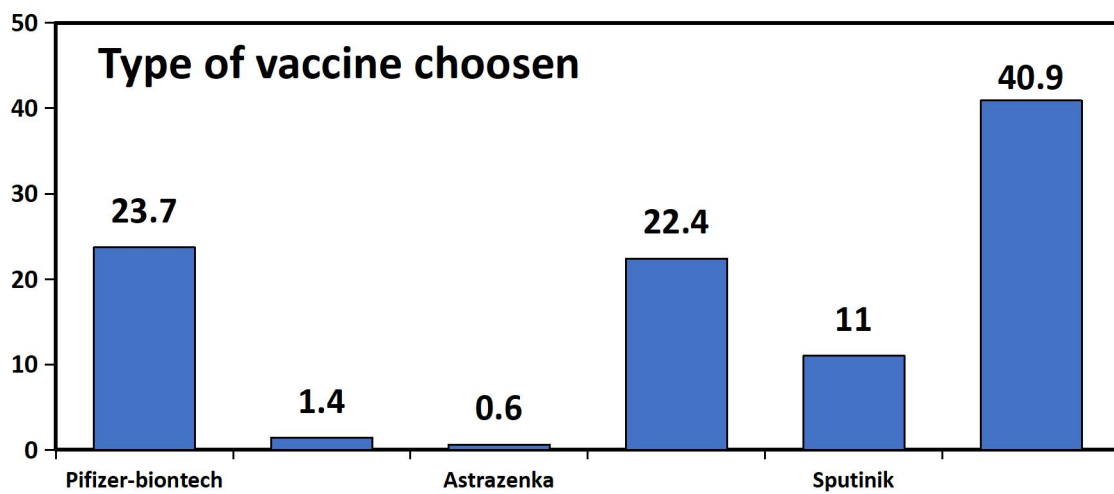**Figure (2): Distribution of studied subjects according to type of vaccine chosen (n=997)**
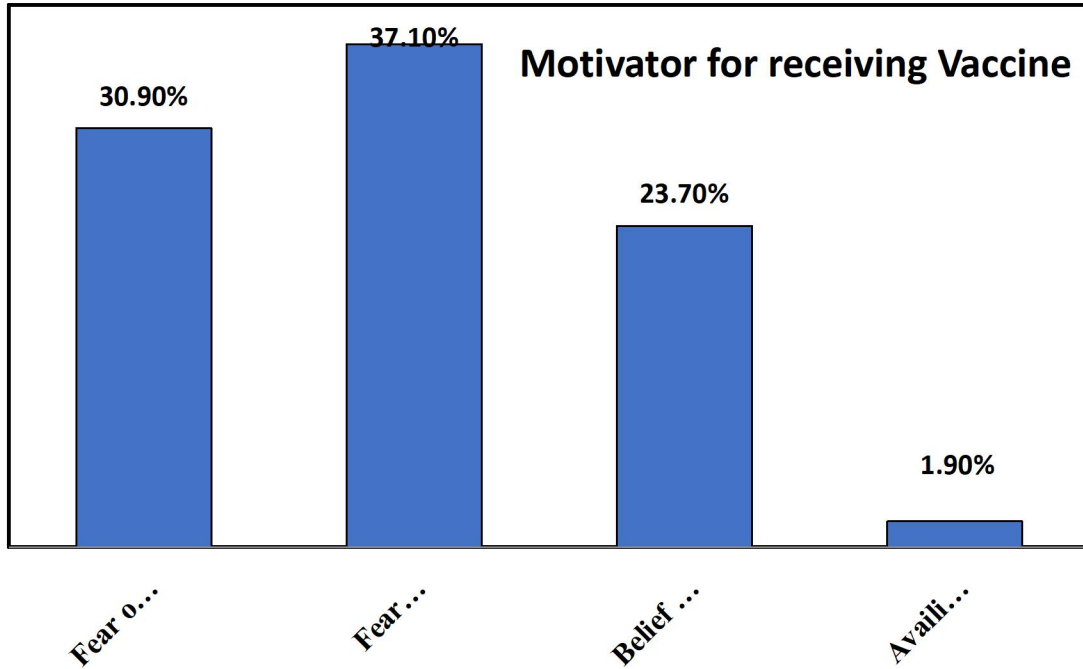
Figure (3) Distribution of Studied Subjects According to Their Motivator for Receiving Vaccine (n=997)
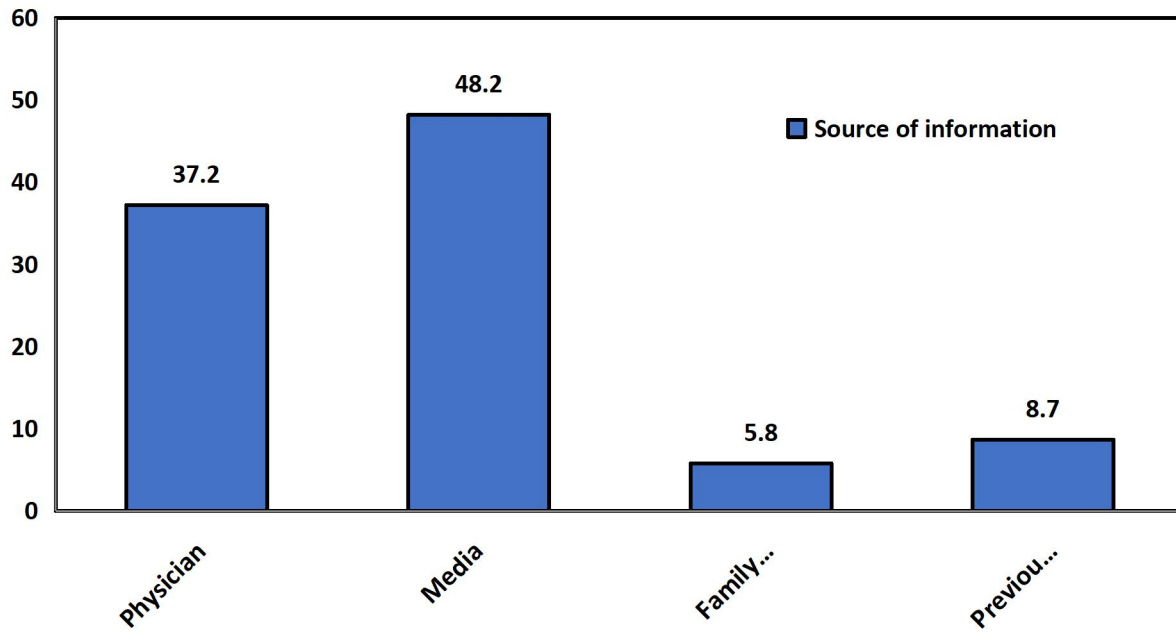

Figure (4): Distribution of Studied Subjects According to Their Source of Information About COVID-19 Vaccine (n=997)

Table (3) Distribution of Studied Subjects According to Their Attitude about COVID-19 Vaccine (n=997)

Items	Disagree		Neutral		Agree	
	No	**%**	**No**	**%**	**No**	**%**
How important do you perceive the COVID-19 vaccine to be?	64	6.4	257	25.8	676	**67.8**
How important you think that everyone in the community should get the COVID-19 vaccine once available?	72	7.2	246	24.7	679	68.1
Vaccination of COVID-19 should always be compulsory once it is available	194	19.5	240	24.1	563	56.5
Vaccination of COVID-19 should always be compulsory for health care workers once it is available	77	7.7	167	16.8	753	75.5
I think that approval of the vaccine guarantees its safety	77	7.7	232	23.3	688	69
The best preventive measure for COVID-19 is getting vaccinated	111	11.1	333	33.4	553	**55.5**
I think that the vaccine was not tested for enough time	86	8.6	359	36	552	**55.4**
I think that a COVID vaccine probably will not work necessary immunity	247	24.8	433	43.4	317	31.8
I don't need a COVID vaccine because I'm healthy and low risk of infection	488	48.9	238	23.9	271	27.2
Total attitude score of COVID-19 vaccine						
Positive	600			60		
Negative	397			40		

Table (4) Distribution of Studied Subjects According to Their Health Believe Model about COVID-19 Vaccine (n=997)

Items	Disagree		Neutral		Agree	
	No	**%**	**No**	**%**	**No**	**%**
Perceived Susceptibility						
I am worried about the likelihood of getting infected by COVID-19	169	17	149	14.9	679	68.1
I am at high risk of COVID-19 because of my health conditions	480	48.1	246	24.7	271	27.2
Perceived Severity						
I will be very sick if I get infected by COVID-19	242	24.3	257	25.8	498	49.9
I am very concerned that I could die from COVID19	458	45.9	262	26.3	277	27.8
Perceived Benefits						
I think vaccination is good because it will make me less worried about COVID-19	144	14.4	206	20.7	647	64.9
I believe vaccination will decrease my risk of getting infected by COVID-19	143	14.3	221	22.2	633	63.5
I think the complications of COVID-19 will decrease if I get vaccinated and then get infected by COVID-19	149	14.9	286	28.7	562	56.4
Perceived Barriers						
I am worried that the possible side effects of the COVID-19 vaccination would interfere with my usual activities	123	12.3	189	19	685	**68.7**

I am concerned about the efficacy of the COVID-19 vaccine	169	17	219	22	609	61.1
I have a concern that I may receive faulty/fake COVID-19 vaccine	207	20.8	211	21.2	579	58.1
I am concerned about the genetic long-term side effects of the COVID-19 vaccination	126	12.6	166	16.6	705	**70.7**
Insufficient information about vaccine	135	13.5	174	17.5	688	**69**
I'm afraid of injection	449	45	171	17.2	377	37.8
I have bad experiences with vaccines	532	53.4	164	16.4	301	30.2
Total health belief model score about COVID-19 vaccine	207	20.8	402	40.3	388	38.9

Table (5) Relation between Characteristic of Studied Subjects and Their Intention to Take the Vaccine (n=997)

Socio-demographic Characteristics	Take vaccine N=101		Had intention N=217		Hadn't intention N=477		Don't know N=202		Chi square P-value
	n	%	n	%	n	%	n	%	
Age:									
18 - <32	70	69.3	130	59.9	387	81.1	107	52.9	1.870
32 - <46	17	16.8	60	27.6	59	12.3	70	34.7	>0.05
46 - <60	14	13.9	25	11.5	26	5.4	5	2.5	
60 – 74	0	0	2	0.9	5	1.2	20	9.9	
Gender:									
Male	61	60.4	130	59.9	300	62.9	132	65.3	2.071
Female	40	39.6	87	40.1	177	37.1	70	34.7	>0.05
Residence:									
Rural	20	19.8	52	24	307	64.4	163	80.7	15.600
Urban	81	80.2	165	76	170	35.6	39	19.3	<0.01**
Marital status:									
Single	60	59.4	124	57.1	308	64.6	120	59.4	1.360
Married	39	38.6	89	41	163	34.2	81	40.1	>0.05
Divorced	0	0	1	0.5	2	0.4	0	0	
Widow	2	2	3	1.4	4	0.8	1	0.5	
Educational level:									
Illiterate	0	0	0	0	0	0	2	1	
Read and write	0	0	1	0.5	6	1.3	2	1	8.662
Primary	0	0	0	0	2	0.4	1	0.5	<0.05*
Preparatory	0	0	2	0.9	5	1	3	1.5	
Secondary	2	2	20	9.2	5	1	5	2.5	
University student	4	4	89	41	452	94.8	186	92	
Postgraduate	17	16.7	70	32.2	7	1.5	3	1.5	
Faculty member	74	73.3	32	14.7	0	0	0	0	
Institute member	4	4	3	1.4	0	0	0	0	

Occupation:									
Student	4	4	100	46.1	326	68.3	97	48	
Employee	3	3	70	32.3	144	30.2	100	49.5	19.450
Professional	4	4	4	1.8	1	0.2	0	0	<0.01**
University staff	74	73.3	32	14.7	0	0	0	0	
Manual worker	1	1	2	0.9	4	0.8	2	1	
Businessman	15	14.7	8	3.7	0	0	2	1	
Farmer	0	0	1	0.5	2	0.4	1	0.5	
Income:									
Insufficient	20	19.8	32	14.7	34	7.1	27	13.4	1.058
Sufficient	59	58.4	145	66.8	417	87.4	136	67.3	>0.05
Sufficient and save	22	21.8	40	18.5	26	5.5	39	19.3	

Table (6) Relation Between Individual Influences and Their Intention to Take the Vaccine (n=997)

	Take vaccine N=101		Had intention N=217		Hadn't intention N=477		Don't know N=202		Chi square P value
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Previous infection with COVID 19:									
No	6	5.9	128	59	473	99.2	200	99	19.003
Yes	95	94.1	89	41	4	0.8	2	1	<0.01**
Intention of taking the flu vaccine this year									
No	10	9.9	152	70	462	96.9	194	96	18.771
Yes	91	90.1	56	30	15	3.1	8	4	<0.01**
Presence of chronic diseases:									
No	86	85.1	197	90.8	430	90.1	190	94.1	1.909
Yes	15	14.9	20	9.2	47	9.9	12	5.9	>0.05
Perception of the health status:									
Excellent	51	50.5	161	74.2	55	11.5	15	7.4	17.102
Very good/Good	40	39.6	43	19.8	377	79	20	9.9	<0.01**
Reasonable	10	9.9	9	4.1	37	7.8	161	79.7	
Bad/Very bad	0	0	4	1.9	8	1.7	6	3	

Table 7: Relations between Total Knowledge, Attitude and Health Believe Model with Their Intention to Take Vaccine (n=997)

Items	Take vaccine N=101		Had intention N=217		Hadn't intention N=477		Don't know N=202		Chi square P value
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	
Total knowledge:									
Satisfactory	92	91.1	200	92.2	228	47.8	22	10.9	18.965
Unsatisfactory	9	8.9	17	7.8	249	52.2	180	89.1	<0.01**
Total attitude:									26.300
Positive	97	96	198	91.2	289	60.6	18	8.9	<0.01**
Negative	4	4	19	8.8	188	39.4	184	91.1	
Health believe model:									21.240
Strong	81	80.2	169	77.9	106	22.2	32	15.8	<0.01**
Neutral	15	14.9	41	18.9	288	60.4	58	28.7	
Poor	5	4.9	7	1.5	83	17.4	112	55.5	

Table (8): Best fitting linear regression model for Intention to Take the Vaccine

Variables	Unstandardized Coefficients		standardized Coefficients	T	P. value
	B		β		
Residence (urban)	0.218		0.416	3.164	.019*
Education level (High)	0.146		0.265	2.771	.041*
Previous infection with COVID 19 (Yes)	0.197		0.301	4.976	.016*
Intention of taking the flu vaccine this year (Yes)	0.345		0.487	7.080	.009**
Total knowledge	0.364		0.499	8.665	.006**
Total Attitude	0.278		0.390	6.967	.009**
Health believe model	0.301		0.400	7.560	.007**
ANOVA					
Model	R^2		F	P. value	
Regression	0.52		7.118	0.004**	

a. Dependent Variable: Intention to Take the Vaccine
b. Predictors: (constant): Residence, Education level, Previous infection with COVID 19 Intention of taking the flu vaccine this year, Total knowledge, Total Attitude and Health believe model

Discussion

Various studies were performed for exploring COVID-19 vaccine hesitancy revealed that demographic, socio-economic parameters, constructs of health belief models, knowledge levels, attitude, conspiracy beliefs concerning the vaccine origin, behavioural practices of COVID-19, its safety and side effects was of great hesitancy worldwide **(Hossain et al., 2021)**.

Regarding answering research question, the percentage of people has already been vaccinated and those had vaccine hesitancy, the present study result reveals that, only one tenth of participants reported being vaccinated already. There is a need for systematic treatments to minimise vaccination hesitancy and increase vaccine acceptability. This finding disagrees with those of **Kecojevic et al. (2021)**, in **New Jersey**, **United States**, who found that 23% of participants reported being vaccinated already. This percentage is higher than that of this study results which is due to that a vaccination campaign in **United States** started first before the vaccination campaign in Egypt.

In the current study, results showed that slightly less than quarter of the studied subjects have intention to take vaccine and less than one quarter of them wait and don't decide, on the other hand more than half of them refuse to receive vaccine. The rational might be due to doubts in effectiveness and side effects of vaccine. This finding matched with those of the study done by **El-Elimat et al. (2021),** in **Jordan**, who found that the public acceptability of COVID-19 vaccines was low (37.4%), while 26.3% were neutral to receive COVID-19 vaccines. Similarly, in a study carried out by **Wang et al. (2020),** in **China**, who mentioned that 47.8% would delay the vaccination until the vaccine's safety.

Considering side effects of COVID vaccine, in the present study, minorities of participants had simple tiredness and headache, and arthritis. The researchers' point of view is that any vaccine making immunity for the body might have side effects which are normal signs that the body is building protection against infection. This finding was supported by **Hatmal et al. (2021),** who carried out a study in Jordan and reported post-vaccination side effects; of these, some reported mild (39%) to moderate (21%) side effects.

Concerning answering the research question related to knowledge, and attitudes of people toward vaccine, the study results revealed that overall, more than half of the studied subjects had satisfactory knowledge, while less than three quarters of population knew the concept of COVID-19 is dangerous disease, and slightly less than three fifths of them answered questions regarding ways of prevention spreading of COVID- 19. This might be due to that COVID 19 is a dangerous disease that threatens worldwide, and mass media has important role in this knowledge. Moreover, there is no drug to cure the disease, focusing on improving community knowledge related to ways of prevention spreading the disease as prevention methods are crucial. This finding is in the same line with that of **Huynh et al. (2021)**, in **Vietnam**, who found that the total knowledge reported being relatively good with a mean score of 7.11 ± 1.77, and over 80% responded correctly to the question related to dangers of COVID-19, a slightly lower level of knowledge was reported, 74.6% in relation to COVID-19 preventive measures.

The study results revealed that the highest percentage representing almost two fifths of the studied subjects did not know difference between types of vaccine, and about one quarter of them chose Pfizer biotech vaccine. This might be due to lack of information about types of different vaccines introduced for them Therefore, it is extremely important to provide an

adequate level of education to health professionals and to provide the public with access to accurate information related to different types of vaccine. This result is in accordance with that of a study done in **Egypt** by **Saied et al. (2021),** who observed that the highest percentage of the studied subjects did not know difference between types of vaccine, and less than one quarter (22%) of them chose Pfizer biotech vaccine.

According to motivators for receiving vaccine, the study presented that less than two fifths of the studied subjects receive vaccine due to fear of being and infected their families. On other hand, the lowest percentage representing a minority of them received vaccine due to availability of free vaccine. This might be due to nature of human being to maintain their lovely persons and those who present support for them. Similarly, a study done in **Egypt** by **Saied et al. (2021)**, revealed that 77.7% of people received vaccine due to fear of being infected and infect their families, especially parents. As well, 35.1% of them mentioned that they received vaccine due to fear of being infected themselves.

The present study results showed that the highest source of knowledge of COVID 19 vaccination is media accounting for almost half of subjects under study. This reflects that media plays an important role in coronavirus disease tracking and updating through live updates dashboard and enabling a rapid and widespread reaching public health communications. This finding was in accordance with that of **Dhanashree et al. (2021)**, in their study that aimed to assess the role of mass media and its impact on public during coronavirus disease 2019 pandemic in **North India**: An online assessment. They found that mass media is playing a very important role in the dissemination of the COVID-related information to the public in **North India**. As well, the same study reported that

media is a powerful tool to provide information to the public and to promote positive environment during COVID pandemic. This finding matched with that of **Sharma et al. (2020),** among **Indian** population which reported that, mass media has played a very important role in the dissemination of the COVID-related information to the public and to follow safe practices. Individuals who rarely read, watch, or listen to the news regularly before COVID-19 are now using it in routine.

As regards attitudes toward COVID-19 vaccines, the study results demonstrated that three fifths of the studied subjects had positive attitude toward COVID-19 vaccine, which more than two thirds of the study sample agreed that vaccine is important and around a quarter of all respondents were neutral regarding most attitudes. The rational might be due to that attitude toward vaccine that protects health and raises immunity against diseases. As well, the COVID-19 vaccine has been framed as the perfect solution for halting the current pandemic. Similarly, in **Jordan**, by **El-Elimat et al. (2021)**, who found that almost two-thirds (66.5%) of the participants strongly agreed that it is important to get a vaccine to protect people from COVID-19, importantly, around a quarter of all respondents were neutral regarding most attitudes.

The study results noticed that more than half of the study sample agreed that the best preventive measure for COVID 19 is getting vaccinated. This result might be due to the concept that infected diseases can be eradicated by vaccines. In the same line, a Eurobarometer survey by the **European Commission (2021)** which conducted at the end of May 2021 showed that, 75% agree that COVID-19 vaccines are the only way to end the pandemic. Moreover, the study result revealed that more than half of the study participants agreed that the vaccine was not tested for

enough time. This finding is consistent with **Saied et al. (2021)**, in **Egypt** who found that most of study sample agreed that the vaccine was not tested for enough time and this result is higher than that of this study result might be due to that most of study sample was health workers.

Concerning The Health Belief Model, the study results showed that two fifths of the studied subjects had neutral health belief model about COVID-19 vaccine. Regarding perceived susceptibility, the study results revealed that more than two thirds of study sample agreed that they are worried about the likelihood of getting infection by COVID-19. The rational of this phenomenon might be due to that corona is an infected respiratory disease that transmits rapidly through coughing or sneezing, the virus spreads more easily indoors and in crowded settings, so they are worried and have fears of getting infection. This finding in the same context in **Egypt**, by **Wahed et al. (2020)** found that about 83.1% of participants reported that they were afraid of being infected with COVID-19. Assessment the perceived severity, revealed that about half of this study sample agreed that they will be very sick if they are getting infection by corona virus. This reflects that corona is dangerous disease with serious or deadly complications if not treated in some cases. In the same line, in **Malaysia**, a study carried out by **Wong et al. (2020),** revealed that more than three quarters of the study sample agreed that they will be very sick if they are getting infection by corona virus. On the other hand the study result showed that more than two fifths of participants under study didn't believe that they could die from COVID- 19 if getting infection. The researchers view that this phenomenon might be due to a strong relationship with God which plays an important role in thinking about death. The previous finding was supported by **Bechard et al. (2021)**, in **Canada**, who revealed that compared to young adults,

middle-aged and older adults had greater concerns about COVID-19 death.

As regards perceived benefits of health belief model the study results revealed that about two thirds of the studied samples agreed that vaccination is good, and it will decrease the risk of getting infection. This reflects the role of beliefs as predictor in receiving or refusing the vaccine. As well, the COVID-19 vaccine offers a ray of hope for the future. Similarly, in **Saudi Arabia**, **Mahmud et al. (2021)**, who found that two thirds of the study participants (66%) perceived benefits of getting COVID-19 vaccine, (vaccination will decrease my chances of getting COVID-19).

Regarding perceived barriers of vaccines, the study results revealed that more than two thirds of study participants had worries about their possible side effects, and genetic long term side effects. The rational of this phenomenon might be due to the attitude of people about rapid discovery of vaccines and little studies about them. As well, they believe that vaccinations may have more harm than benefits **(Hussain et al., 2018)**. This result is in the same line with those of a study done by **Islam et al. (2021)**, in **Bangladesh**, who mentioned that 89% of participants assumed that the recently discovered COVID-19 vaccine could have some side-effect, which is also like those of a study in the United States, by **Callaghan et al. (2020).** A study in **China** found that 48% of respondents postponed vaccination before confirmation of the safety of the vaccine **(Wang et al., 2020),** which shows their doubt regarding vaccine safety. Worryingly, the exceptionally rapid pace of vaccine development, the skepticism of certain groups of science and health experts might elevate doubt about COVID-19 vaccine **(Chou & Budenz, 2020).**

The study results revealed that more than two thirds of study participants agreed about insufficient information about

vaccine. This reflects that awareness about vaccine plays an important role in receiving or refusing it. This finding is consistent with that of **Guljaš et al. (2021)**, in **Baranja** Country, who reported that most of all participants still do not have a strong opinion about COVID-19 vaccination, mainly because they find that there is not enough information about the vaccine.

Concerning answering the research question related to predictors of vaccine intake versus vaccine hesitancy, in relation to socio-demographic data, the study results revealed that highly statistically significant relation was detected between receiving and intention to take vaccine and residence. The result might be due to that urban people, as having more exposure to online and offline resources of information that increase awareness about vaccine. Similarly, studies on the COVID-19 context have also found that rural inhabitants are more likely to experience vaccine-related hesitancy than the urban counterparts **(Khubchandani et al., 2021)**. Moreover, a statistically, significant relation was found between receiving and intention to take vaccine and educational level. This result might be due to that educated people are aware of dangerousness of COVID 19 and its deadly disease. Additionally, it might be that those with a high level of education (university or higher) have more access to information, and comprehension abilities that will help them to know and react towards COVID-19 vaccine. This finding was in accordance with that of **Guljaš (2021**), who carried out study in the Mid-**Atlantic U.S.** and found that a significant predictor of COVID-19 vaccine uptake intentions was education. As well, in the same line, in **Northwest Ethiopia** by **Handebo et al. (2021),** who reported that bachelor's degree educational status was significantly associated with the intention to receive COVID-19 vaccine. Furthermore, the regression results showed that location (urban/rural), and level of education, were significantly associated

with the acceptance of COVID-19 vaccines **(Mahmod et al., 2021).** Additionally, a highly statistically significant relation between receiving and intention to take vaccine and occupation. The result might be due to that most of study sample were university staff and who are at risk for infection that result matched with that of **Malik (2020)**, in **US**. who reported that unemployed participants reported lower COVID-19 vaccine acceptance when compared to those employed or retired?

Concerning individual influences, the study results showed that a highly statistically significant relation was detected between receiving and intention to take vaccine and previous infection with COVID-19. The rational of this phenomenon might be due to fear of people from recurrent infection. However, this finding contradicted with that of a study done in **Poland**, by **Konopi et al. (2021)**, who found that the previous severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection ($p = 0.05$) as their reason for not vaccinated. This discrepancy might be due to differences in culture, attitudes, and beliefs. A highly statistically significant relation was found between receiving and intention to take vaccine and take flu vaccine this year. This might be due to that commitment of participants with any vaccine strengthens immune system especially during corona infection period. In the same line, **Shmueli (2021),** who reported that respondents who had received the seasonal influenza vaccine in the previous year (OR=3.31, 95% CI 1.22–9.00) stated higher intention to receive COVID-19 vaccine. Additionally, a highly statistically significant relation was found between receiving and intention to take vaccine and perception of the health status. The results might be due to that taking vaccine will increase immunity and maintain level of health for them. Similarly, individuals who perceived their health status as reasonable compared to good or very good had lower

odds of refusal of vaccine **(Soares et al., 2021).**

Regarding relations with knowledge, attitudes and beliefs, results revealed that satisfactory knowledge, positive attitude, and strong health belief were statistically significant in people receiving or having intention to take vaccine compared to people who had vaccine hesitancy. This reflects the importance of good knowledge, positive attitudes, and beliefs as important predictors for intention take vaccine. Additionally, intention of taking the flu vaccine this year, total knowledge, total attitude, health believe model had high positive effect on risk taking at p value <0.01**, while urban residence, high education level and history of infected COVID19 had slight positive effect on Intention to take the Vaccine with p value <0.05*On the same way, in Bangladesh, **Hussain et al. (2021),** declared that the vaccine hesitancy tended to decrease with increasing knowledge about the vaccine, hesitancy increased with the increased negative attitudes towards vaccine, perceived severity of the COVID-19 and perceived benefits of COVID vaccination were negatively associated with hesitancy, while perceived barriers were positively associated, and this is significant

Conclusion

The study showed that more than three quarters of study participants had vaccine hesitancy. Additionally, only one tenth of participants reported being vaccinated already, and slightly less than quarter of the studied subjects have intention to take vaccine. Overall, more than half of the studied subjects had satisfactory knowledge. Moreover, three fifths of them have positive attitudes. Furthermore, about two fifths of the studied subjects had neutral health belief model about COVID vaccine. Additionally, predictors of vaccine hesitancy were residence, educational level, occupation, previous infection with COVID-19

intention to take flu vaccine this year and perception of health status and low knowledge, negative attitudes, and beliefs about vaccine.

Recommendations

- Health awareness about importance of corona vaccine to protect from infection and deadly complications of COVID- 19 virus.
- Health education program to improve knowledge, attitudes, and beliefs for people with vaccine hesitancy.
- Further studies should be carried on a larger scale for generalization of results.
- Health education program to decrease hesitation among rural, less educated people especially for benefits of vaccination, seriousness of disease.

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