RESEARCH ARTICLE

KNOWLEDGE, ATTITUDE AND BARRIERS TOWARD COVID-19 VACCINE AMONG ADULTS IN EASTERN PROVINCE, KINGDOM OF SAUDI ARABIA, 2021,WEB-BASED STUDY

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Manuscript Info

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Abstract

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Introduction: The World Health Organization (WHO) stated that coronavirus disease 2019 is considered as a pandemic on March 11, 2020.As the vaccination globally has proven its efficacy to prevent 2-3 million deaths per year and in order to control the spread of COVID-19 infection throughout the world, scientists exerted efforts and developed COVID-19 vaccine. This study aimed to assess the knowledge, attitude, and barriers toward COVID-19 vaccine among Saudi adults in Eastern Province.

Methods: This is a cross-sectional study conducted through a self-administered questionnaire adapted from a published study in Jeddah titled "effectiveness of influenza vaccination in elderly diabetic patients" and was validated by the researchers. The questionnaires were distributed among adults who live in eastern part of Saudi Arabia during the period 2020 -2022. Data were entered and analyzed using SPSS program version 26.

Results: sample size was calculated and found to be 462. The vast majority of the participants received 2 doses of COVID-19 vaccine (95.9%). Almost two-thirds (63.2%) have good level of knowledge about the COVID-19 vaccine. While the remaining one-third of the participants (36.8%) have poor knowledge about COVID-19 vaccine. Most of the participants will recommend COVID-19 vaccine for their friends and family members. Moreover, significantly higher percentage of high-income respondents (95%) were willing to accept the vaccine in comparison to 87.8% of low-income respondents.

Conclusion: Overall, there is low level of COVID-19 vaccine knowledge among participants. However, their attitude toward vaccination is positive. The majority of respondents has no barriers toward acceptance of COVID-19 vaccine.

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Introduction:-

The World Health Organization (WHO) stated that Coronavirus Disease 2019 (COVID-19) is considered as a pandemic on March 11,2020. The new virus is a member of the family of coronaviruses that showed highly infectious nature. According to the WHO reports, the number of COVID-19 cases worldwide is increasing daily, and it reached up to 70 millions with the number of fatalities reached up to 1.6 million cases by the mid of December 2020. There were up to 220 countries, areas and territories over the globe involved in this pandemic. [1]

Coronavirus disease (COVID-19 or called SARS-CoV-2) is an illness caused by a new coronavirus that spread rapidly throughout the world. The data reported that the virus can be transmitted from person to person causing a wide range of symptoms from mild or asymptomatic to severe illness. [2] Signs and symptoms of COVID-19 are similar to other viral respiratory infections, which mainly includes cough, shortness of breath, fever, and sore throat. [3]Severity of COVID-19 symptoms and death rate were found to have strong correlation with the patients' age, gender and health status. Elderly individuals and patients with comorbidities are more prone to develop more serious illnesses and complications. [4]

As the vaccination globally has proved its efficacy to prevent 2-3 million deaths per year and in order to control the spread of COVID-19 infection throughout the world, scientists and investigators are exerting efforts to find out a long-term solution against the new virus and hencethe vaccine for COVID-19 infection has emerged. These efforts started early in China and then continued all over the world. [5,6]

Vaccine's development usually takes many years, therefore, approving a vaccine for distribution before the end of 2020 would be a challenge. On the other hand, new manufacturing platforms, computational biology, gene synthesis, and protein engineering have provided the access to develop COVID-19 vaccine with fast pace and delicacy. [7]

While reviewing the literature, the current researchers found that there are fears and hesitancy toward taking the newly discovered coronavirus (COVID-19) vaccine among the adult population. This study aims to measure the level of awareness and to identify the barriers toward COVID-19 vaccination among adults in Eastern Province in the Kingdom of Saudi Arabia.

In the literature, there were few studies concerning knowledge, attitude, and barriers toward COVID- 19 vaccine worldwide.

A cross-sectional study was conducted in March 2020 to investigate the acceptance of COVID-19 vaccination among Chinese adults. The study concluded that the majority of the respondents (91.3%) had a positive attitude toward the new vaccine especially male gender, married population, and those who took influenza vaccine in the past season. In addition, the same study highlighted that health education and communication from authoritative sources will be important to alleviate public concerns about vaccine safety. [8] Similar study was carried out in May 2020 to assess the acceptability of COVID-19 vaccine among adults in the United States with sample size 2006 participants. The study concluded that the vaccine acceptability may differ by several demographic characteristics as well as personal beliefs, for example non-Latin blacks were less likely to be willing to accept COVID-19 vaccine, however, many participants showed a high level of acceptance to get the vaccine if it becomes available. [9]

Another study was done in Turkey during the period June-July 2020 aimed to assess the adult population's attitude regarding receiving COVID-19 vaccine while the vaccine is still under development. The study found a good acceptance level among the participants to be vaccinated and to vaccinate their children (49.7%,38.4%, respectively). Fears of adverse effects and uncertainties about the new virus and its vaccine were listed as barriers against COVID-19 vaccine intake. Therefore, the researchers recommended that media, politicians, healthcare professionals should follow up vaccine development and consider public concerns to prevent failure of COVID-19 vaccination campaign. Several factors might influence taking the vaccine like having children, anxiety, health insurance, gender, occupation. [5]

A cross-sectional study was done in France, published in September 2020, aimed to evaluate the intention to get vaccinated against COVID-19 among the general population and healthcare personnel, in the context of the current pandemic. The study concluded that there is a high level of population (around 75% and 48% of respondents) are going to either accept the vaccination or intend to participate in the COVID-19 vaccination clinical trial,

respectively. Specifically, male gender, health care worker and high-risk participants. One of the listed major barriers that may prevent the participants from taking COVID-19 vaccine is the vaccine hesitancy. [10]

One of the studies conducted among the adult population in the US, in November 2020 aimed to assess the willingness to get the COVID-19 vaccine with and without emergency use authorization. Around 788 participants were involved in the study. The study highlighted that many factors may affect the acceptance to get COVID-19 vaccine such as education, insurance, age, and race\ethnicity. Therefore, the researchers recommended that communication campaigns alone are not enough. They must also focus on re-establishment of public trust in government agencies. [11]

Another study of determinants of COVID-19 acceptance in Saudi Arabia which was a web-based national survey published in November 2020. The study was aimed to assess the prevalence of the acceptance of COVID-19 vaccine and their determinants among people in Saudi Arabia. The study showed a good acceptance rate among elderly, married, post graduated. [12]

A cross sectional study took place in Saudi Arabia aimed to assess the beliefs and barriers associated with COVID-19 vaccination among Saudi population. The study found that, the major barrier for the vaccine acceptance among the papulation was because of the concerns about the side effects of COVID-19 vaccine itself. In addition, if more studies confirmed safety and effectiveness of the vaccine, the acceptance among papulation might increase. [13] Another cross-sectional study was done among Saudi papulation studied the factors affecting COVID-19 vaccination concluded that there is a decline in refusal and hesitancy toward COVID-19 vaccine in Saudi Arabia and they thought that young Saudi men should be targeted by the national campaign. [14]

One of the studies done in Bangladesh among 1658 participants. It aimed to investigate community knowledge, attitude and perception toward COVID-19 vaccination. They found that there was insufficient knowledge but more positive attitude regarding COVID-19 vaccine among Bangladeshi population. For this reason, the researchers recommend that, before vaccination started and in the purpose of improving knowledge, instant health education program must be established. [15]

An online study in Malaysia measured the knowledge, acceptance and perception on COVID-19 vaccine among Malaysians and found that most of the population are willing to be vaccinated even though they do not have adequate knowledge about the vaccine. [16]

Survey based study conducted online aimed at evaluating the knowledge, attitude and perception of COVID-19 vaccine among Saudi population. This study showed that Saudis have significant knowledge and positive attitude. Awareness program has major role in delivering information about safety and efficacy of vaccines to different groups of people so these programs must be continued. [17]

Up to the researchers' knowledge, few national studies were done to emphasize on the level of awareness and to detect the barriers against COVID-19 vaccination among Saudi Adults. While the COVID-19 vaccination plan and strategies are clearly declared by the Saudi Ministry of Health (MOH) and the vaccination is started to take place in December 2020 on a targeted population according to their risk, therefore, measuring their level of knowledge, evaluating their attitude and identifying the barriers against getting the vaccine are of great importance to assess the needs for further educational campaigns in order to raise the awareness among the Saudi population.

This research is critical to prepare our population to accept vaccinations in case of future pandemics.

By the end of the current study, the following research question will be answered: What are the levels of knowledge, attitude and barriers toward COVID-19 vaccine among adults in Eastern Province in Saudi Arabia?

Aim:
To assess the knowledge, attitude and barriers toward COVID-19 vaccine among adults in Eastern Province, Saudi Arabia

Objectives:-
1. To assess knowledge toward COVID-19 vaccine among adults in Eastern Province, Saudi Arabia
2. To determine attitude toward COVID-19 vaccine among adults in Eastern Province, Saudi Arabia
3. To identify the barriers against taking COVID-19 vaccine among adults in Eastern Province, Saudi Arabia

Part 3
Methodology:-
-   **Study Design**

Cross-sectional study.

-   **Study Setting and Time**

This study was conducted in Eastern Province of the Kingdom of Saudi Arabia during the period December-2020 until July- 2021.

-   **Study Population**

All adults, male and female, living in Eastern Province of the Kingdom of Saudi Arabia.

-   **Inclusion Criteria**

All adults, male and female, living in Eastern Province of the Kingdom of Saudi Arabia.

- **Exclusion Criteria**

Any participant below the age of 18-year-old wasexcluded. Any participant lives outside Eastern Province of Saudi Arabia was excluded.

-   **Sample Size and Technique**

The sample size was calculated using Rao soft sample calculator. The total population who lived in Eastern Province in mid of 2018 was 5 million [18].

By assuming that the margin of error is 5%, confidence level is 95%, population size is 5 million, response distribution 50%, sample size was calculated to be 385. Adding 20% non-response, the sample size was 462 adults and we collected 609.

Accessible samples of adults were included through an online survey.

-   **Data Collection Tool and Technique:**

The data was collected through a web-based self-administered questionnaire adapted from a published study in Jeddah titled "effectiveness of influenza vaccination in elderly diabetic patients: A retrospective cohort study" [19] and the researchers were contacted for permission.

The questionnaire was modified by the current researchers and reviewed by **eight** family medicine consultants and experts to ensure the importance of each item included as a part of content validity.

A pilot study was conducted to ensure the clarity of the questionnaire. It was done among 40 participants, and they were not included in the main study to test the validity of the questionnaire. The modification was done based on the feedback taken immediately after the pilot study.

The questionnaire consists of a total of 33 questions. It is divided into 4 main parts as follow:
·   **Part I:** measures demographic information (age, gender, marital status, education, employment, and history of chronic disease).

· Part**II:**measuresthe level of knowledge about COVID -19 Vaccine (administration, doses and their intervals, side effects, and target population).

.   **Part III:** measures attitude toward COVID -19 vaccine (awareness, believe on COVID -19 vaccine, and intention to get the vaccine).

·   **Part IV:** measures barriers of COVID -19 vaccine (side effects, effectiveness, safety, cost, fears of injections, and availability).

. The researchers will distribute an online self- administered questionnaire.

. For any inquiries the researchers will be contacted through email provided in the questionnaire.

-    **Study Variables**
1) Independent variable
Age, gender, marital status, educational level, employment status, and history of chronic disease.

2) Dependent variable
Knowledge, attitude and barriers toward COVID-19 vaccine.

-    **Pilot Study**
A pilot study will be conducted among 40 Saudi population living in Eastern Province who are not included in the study to test understandability, language, and the reliability of the questionnaire. Modification was performed on the questionnaire according to the result of pilot study.

-    **Data Management and Analysis Plan:**
Data was entered into a personal computer and it was analyzed using the Statistical Package of Social Services (SPSS) software version 26. All variables coded before entry and checked before analysis.

One score was given to each correct answer, while zero score was given to incorrect or I don't know answers. A total score of knowledge was calculated and dichotomized into good knowledge and poor knowledge based on the mean score.

Descriptive: all continuous data presented in mean, median, and standard deviation. Categorical data presented in percentage. Applying suitable statistical tests to the data and P-value less than 0.05 will be considered significant.

-    **Study Strength**
To our knowledge this is the first study in the Eastern Province of Saudi Arabia emphasizing on the knowledge, attitude and barriers toward COVID-19 vaccination among the adult population.

-    **Study Limitation**
This is cross-sectional study, that is why it has limitations in evaluation temporality and causality of observed relationships with no follow up of the sequence of events.

-    **Ethical Consideration**
1.   Approval of the research was taken from both Alahsaa and Dammam Institutional Review Board (IRB) research committee and local committee in Saudi Board Family Medicine prior to implementation of the study.
2.   All the information from the questionnaire kept confidential.
3.   By answering the questionnaire, informed consent taken.

-    **Work Plan and Duties**

Activity	December 2020	January 2021	February 2021	March2021	April 2021	May 2021	June 2021	July 2021
Finalize Research Proposal								
Research Committee Approval								
Pretest &Refining Instruments (Pilot)								

Recruitment of Data Collectors							
Training of Research Staff							
Data Collection							
Data Entry &Analysis							
Final report Writing							
Dissemination of Findings							
Publication							

- **Study Implication**

This study will help to assess the knowledge and attitude and to identify the barriers toward COVID-19 vaccine among adult population which will assess the needs for further educational campaign in order to raise the awareness among adult population in Eastern Province of Saudi Arabia and it will help in preparing the population to accept vaccination in future pandemic.

- **Study Reporting and Implementation**

A scientific paper will be written at the end of the study for publication in national and international journals.

- **Budget**

It is self-funded.

Conflict of Interest

There was no conflict of interest.

Part 4
Results:-

Online questionnaires were distributed among Saudi adults who lives in Eastern Province of Saudi Arabia, sample size was calculated and found to be 462. Among the distributed surveys, 609 were returned giving a good response rate.

Table (1):- Demographic Characteristics of the Respondents:

Characteristics	Frequency	Percent (%)
Gender		
Male	219	36.3
Female	384	63.7
Age		
18-25	99	16.4
26-35	177	29.4
36-45	125	20.7
46-55	115	19.1
56-65	67	11.1
>65	20	3.3
Characteristics	**Frequency**	**Percent (%)**
Marital Status		
Single	109	18.1
Married	467	77.4
Divorced	15	2.5
Widowed	12	2.0
Residence		

Dammam	193	32.0
Al-khober	17	2.8
Al-Qatif	167	27.7
Al-hasa	192	31.8
Others	34	5.6
Educational Level		
High school	107	17.7
University degree	401	66.5
Postgraduate studies	69	11.4
Other	26	4.3
Characteristics	**Frequency**	**Percent (%)**
Employment		
Unemployed	117	19.4
Student	87	14.4
Employed in governmental sector	171	28.4
Employed in private sector	105	17.4
Retired	96	15.9
Businessman	27	4.5
Monthly Income (SR)		
<5,000	115	19.1
5,000-10,000	157	26.0
10,001-15,000	129	21.4
15,001-20,000	91	15.1
>20,000	111	18.4

Table 1 shows Demographic Data of the Participants:
Majority of our participants are female, adults, have university degree and married (63.7%,97.7%,66.6%,77%.4% respectively). Half of them were employed (governmental sector: 28.4%, private sector: 17.4%, and businessman: 4.5%). Two-thirds of the participants has < 15,000 SR monthly income (66.5%), on the other hand, the remaining one-third has > 15,000 SR monthly income (33.5%). Around 91.5% of the participants lives in Dammam, Qatif and Alhassa.

Table (2):- Distribution of Clinical Factors Related to COVID-19 among the Respondents.

Characteristics	Frequency	Percent (%)
Do you have a chronic illness?		
Yes	141	23.4
No	462	76.6
Have you got sick with COVID-19?		
Yes	189	31.3
No	401	66.5
I am not sure	13	2.2
Characteristics	**Frequency**	**Percent (%)**
Have you taken the COVID-19 vaccination?		
Yes, I took two doses	578	95.9
Yes, I took one dose	18	3.0
No	7	1.2

Table 2 Presents Distribution of the Clinical Factors Related to COVID-19
The result revealed that 23.4% of the respondents has chronic diseases. Moreover, the proportion of those who got infected with COVID-19 is 31.3% and 2.2 was not sure if they got infected before. The vast majority of the participants received 2 doses of COVID-19 vaccine (95.9%).
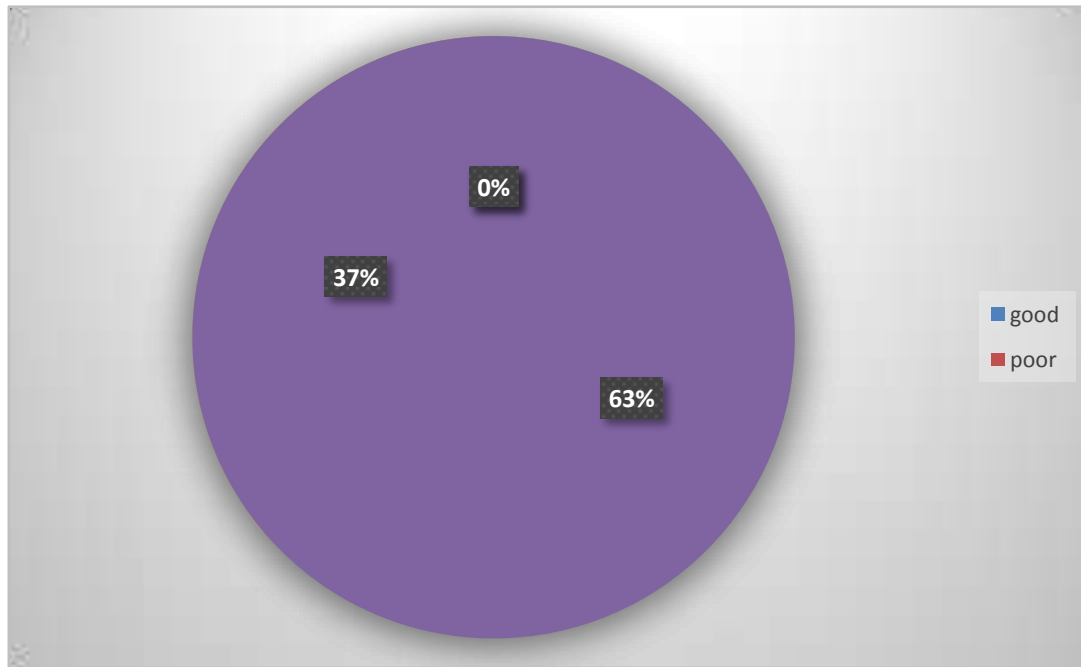
Figure (1):- Knowledge about COVID-19 Vaccine among the Respondents:

Figure 1 demonstrates that almost one-third of the participants (36.8%) have poor knowledge about COVID-19 vaccine. While the remaining two-thirds (63.2%) have good level of knowledge about the COVID-19 vaccine.

Table (3):- Knowledge about COVID-19 Vaccine Based on the Correct Answers among the Respondents.

Item	Frequency of correct answers	Percent (%)
Should COVID-19 vaccine be given as intramuscular injection?	526	87.2
Should two doses of COVID-19 vaccine be given to those who have not been infected before?	539	89.4
Does sterility is considered as a side effect of COVID-19 vaccine?	367	60.9
Does facial palsy is considered as a side effect of COVID-19 vaccine?	332	55.1
According to MOH recommendations, pregnant women are eligible to take COVID-19 vaccine?	466	77.3
Item	**Frequency of correct answers**	**Percent (%)**
According to MOH recommendations, elderlies (above 65) are eligible to take COVID-19 vaccine?	586	97.2
According to MOH recommendations, people with chronic diseases (such as CVD, DM and renal diseases) are eligible to take COVID-19 vaccine?	520	86.2
According to MOH recommendations, lactating women are eligible to take COVID-19 vaccine?	438	72.6
If you get vaccinate, do you need to keep following protective measures such as masks and hand washing?	567	94.0
Should people who previously infected with corona virus, based on MOH recommendations, wait for 6 months before	260	43.1

they take the vaccine?		
Item	**Frequency of correct answers**	**Percent (%)**
Is the presence of allergy, for food, medicine or others, a potential contraindication for taking the COVID-19 vaccine?	165	27.4

Table 3 Describes the Percentage of the Correct Answers about COVID-19 Vaccine:
There is an obvious knowledge gap in the question asking about food and medicine as contraindications as only 27.4% answered it correctly. On the other hand, less than 50% of the participants answered the question about the duration between getting coronavirus infection and COVID-19 vaccine correctly. It was found that 97.2% aware that elderly persons are eligible to receive the vaccine.

Table (4):- Distribution of Attitudes towards COVID-19 Vaccine among the Respondents.

Item	Frequency	Percent (%)
I am willing to take COVID-19 vaccine.		
Disagree	16	2.7
Neutral	43	7.1
Agree	544	90.2
I think that there is a need for raising public awareness regarding the vaccine.		
Disagree	21	3.5
Neutral	69	11.4
Agree	513	85.1
I think that COVID-19 vaccine is useful.		
Disagree	29	4.8
Neutral	129	21.4
Agree	445	73.8
Item	**Frequency**	**Percent (%)**
I will regret taking COVID-19 vaccine, if I develop side effects later on.		
Disagree	249	41.3
Neutral	221	36.7
Agree	133	22.1
I will take COVID-19 vaccine because everyone will take it.		
Disagree	127	21.1
Neutral	132	21.9
Agree	344	57.0
COVID-19 vaccine should be obligatory for all people who are eligible to take the vaccine.		
Disagree	76	12.6
Neutral	117	19.4
Agree	410	68.0
Item	**Frequency**	**Percent (%)**
I will recommend COVID-19 vaccine for my friends or family members.		
Disagree	23	3.8
Neutral	89	14.8
Agree	491	81.4

Table 4 Describes Distribution of Attitudes towards COVID-19 Vaccine among the Respondents:
The majority of the participants are willing to take the vaccine and believe that there is need for raising public awareness (90.2%, 85.1% respectively). More than three-quarters of the respondents will regret taking the vaccine if

side effects happen (78%). Most of the participants will recommend COVID-19 vaccine for their friends and family members (81.4%).

Table (5):- Distribution of Barriers towards Acceptance of COVID-19 Vaccine.

Item	Frequency	Percent (%)
I refuse to take the vaccine because corona virus is not harmful		
Strongly disagree	410	68.0
Disagree	103	17.1
Neutral	45	7.5
Agree	34	5.6
Strongly agree	11	1.8
I refuse to take the vaccine because it has serious side effects.		
Strongly disagree	337	55.9
Disagree	135	22.4
Neutral	88	14.6
Agree	43	7.1
Strongly agree	0	0.0
Item	**Frequency**	**Percent (%)**
I refuse to take the vaccine because it is not effective against COVID-19.		
Strongly disagree	334	55.4
Disagree	133	22.1
Neutral	71	11.8
Agree	41	6.8
Strongly agree	24	4.0
I refuse to take the vaccine because it is not safe.		
Strongly disagree	339	56.2
Disagree	135	22.4
Neutral	82	13.6
Agree	24	4.0
Strongly agree	23	3.8
I refuse to take the vaccine because I am afraid of injections		
Strongly disagree	478	79.3
Item	**Frequency**	**Percent (%)**
Disagree	64	10.6
Neutral	51	8.5
Agree	5	0.8
Strongly agree	5	0.8
I refuse to take the vaccine because I that vaccine doses will not be available for other people in need		
Strongly disagree	415	68.8
Disagree	89	14.8
Neutral	78	12.9
Agree	9	1.5
Strongly agree	12	2.0

Table 5 presents the barriers towards acceptance of COVID-19 vaccine. The majority of respondents had no barriers toward acceptance of vaccine.

Table (6):- Association between Knowledge about COVID-19 Vaccine and Respondents' Characteristics.

Characteristics	Knowledge about COVID-19 vaccine		Chi-square	P value
	Poor knowledge	Good knowledge		
Gender				
Male	87	132	1.3	0.263

	39.7%	60.3%		
Female	135	249		
	35.2%	64.8%		
Marital Status				
Single	51	58	8.9	0.030*
	46.8%	53.2%		
Married	164	303		
	35.1%	64.9%		

Characteristics	Knowledge about COVID-19 vaccine		Chi-square	P value
	Poor knowledge	**Good knowledge**		
Divorced	2	13	8.9	0.030*
	13.3%	86.7%		
Widowed	5	7		
	41.7%	58.3%		
Age				
≤35	139	262	2.4	0.123
	34.7%	65.3%		
>35	83	119		
	41.1%	58.9%		
Educational Level				
High school	47	60	16.3	0.001*
	43.9%	56.1%		

Characteristics	Knowledge about COVID-19 vaccine		Chi-square	P value
	Poor knowledge	**Good knowledge**		
University degree	141	260	16.3	0.001*
	35.2%	64.8%		
Postgraduate studies	17	52		
	24.6%	75.4%		
Other	17	9		
	65.4%	34.6%		
Employment				
Unemployed	77	136	3.8	0.150
	36.2%	63.8%		
Student	40	47		
	46.0%	54.0%		

Characteristics	Knowledge about COVID-19 vaccine		Chi-square	P value
	Poor knowledge	**Good knowledge**		
Employed	105	198	3.8	0.150
	34.7%	65.3%		
Income				
≤15,000 SAR	160	241	4.9	0.027*
	39.9%	60.1%		
>15,000 SAR	62	140		
	30.7%	69.3%		

Association between knowledge about COVID-19 vaccine and respondents' characteristics is illustrated in tables 6. Marital status, educational level and income were significantly associated with the level of knowledge of the participants about COVID-19 vaccine ($p \leq 0.05$). A significantly higher percentage of single respondents (46.8%), respondents with monthly income ≤15,000 SAR (39.9%) and low level of education (65.4%) had poor knowledge.

Other factors such as age, gender, and employment were not significantly associated with knowledge about COVID-19 vaccine.

Table (7):- Association between Respondents' Characteristics and Willingness to Take COVID-19 Vaccine.

Characteristics	I am willing to take COVID-19 vaccine		Chi-square	P value
	Disagree or neutral	**Agree**		
Gender				
Male	13	206	5.8	0.016*
	5.9%	94.1%		
Female	46	338		
	12.0%	88.0%		
Marital Status				
Single	13	96	1.6	0.670
	11.9%	88.1%		

Characteristics	I am willing to take COVID-19 vaccine		Chi-square	P value
	Disagree or neutral	**Agree**		
Married	43	424	1.6	0.670
	9.2%	90.8%		
Divorced	1	14		
	6.7%	93.3%		
Widowed	2	10		
	16.7%	83.3%		
Age				
≤35	42	359	0.65	0.422
	10.5%	89.5%		
>35	17	185		
	8.4%	91.6%		

Characteristics	I am willing to take COVID-19 vaccine		Chi-square	P value
	Disagree or neutral	**Agree**		
Educational Level				
High school	15	92	4.6	0.202
	14.0%	86.0%		
University degree	39	362		
	9.7%	90.3%		
Postgraduate studies	3	66		
	4.3%	95.7%		
Other	2	24		
	7.7%	92.3%		

Characteristics	I am willing to take COVID-19 vaccine		Chi-square	P value
	Disagree or neutral	**Agree**		
Employment				
Unemployed	23	190	0.54	0.763
	10.8%	89.2%		
Student	9	78		
	10.3%	89.7%		
Employed	27	276		
	8.9%	91.1%		
Income				

≤15,000	49	352	8.0	0.001*
	12.2%	87.8%		
>15,000	10	192		
	5.0%	95.0%		

Table 7 shows association between respondents' characteristics and willingness to take COVID-19 vaccine. Gender and income were significantly associated with the willingness towards the vaccine (p≤0.05). Male is significantly associated with willingness towards the vaccine as 94.1% of males were willing to accept the vaccine in comparison to 88% of females. Moreover, significantly higher percentage of high-income respondents (95%) were willing to accept the vaccine in comparison to 87.8% of low-income respondents. Other factors, such as age, marital status, employment, and educational level were not significantly associated with acceptance of COVID-19 vaccine.

Table (8):- Association between Respondents' Characteristics and Safety Barrier towards COVID-19 Vaccine.

Characteristics	I refuse to take the vaccine because it is not safe.		Chi-square	P value
	Disagree or neutral	**Agree**		
Gender				
Male	211	8	8.2	0.004*
	96.3%	3.7%		
Female	345	39		
	89.8%	10.2%		
Marital Status				
Single	104	5	3.1	0.376
	95.4%	4.6%		
Married	428	39		
	91.6%	8.4%		

Characteristics	I refuse to take the vaccine because it is not safe		Chi-square	P value
	Disagree or neutral	**Agree**		
Divorced	14	1	3.1	0.376
	93.3%	6.7%		
Widowed	10	2		
	83.3%	16.7%		
Age				
≤35	369	32	0.06	0.811
	92.0%	8.0%		
>35	187	15		
	92.6%	7.4%		
Educational Level				
High school	96	11	5.4	0.147
	89.7%	10.3%		

Characteristics	I refuse to take the vaccine because it is not safe		Chi-square	P value
	Disagree or neutral	**Agree**		
University degree	371	30	5.4	0.147
	92.5%	7.5%		
Postgraduate studies	67	2		
	97.1%	2.9%		
Other	22	4		
	84.6%	15.4%		
Employment				
Unemployed	189	24	7.6	0.023*
	88.7%	11.3%		

| Student | 85 | 2 | | |
| | 97.7% | 2.3% | | |

Characteristics	I refuse to take the vaccine because it is not safe		Chi-square	P value
	Disagree or neutral	Agree		
Employed	282	21	7.6	0.023*
	93.1%	6.9%		
Income				
≤15,000	363	38	4.7	0.030*
	90.5%	9.5%		
>15,000	193	9		
	95.5%	4.5%		

Association between respondents' characteristics and barriers towards COVID-19 vaccine are presented in table 8. Gender, income and employment were significantly associated with perceiving safety as a barrier for COVID-19 vaccine (p≤0.05). Female, having low income, and unemployment were significantly related to perceiving safety as a barrier for COVID-19 vaccine.

Part 5
Discussion:-
COVID-19 vaccine plays an essential role in controlling the spread of coronavirus infection worldwide. Therefore, it is important to evaluate the level of awareness and determine the barriers against receiving COVID-19 vaccine. While reviewing the literature, there were several studies concerning knowledge, attitude, and barriers toward COVID-19 vaccine on both international and national levels. Up to the authors' knowledge, there were no studies conducted among adult population living in Eastern Province in the Kingdom of Saudi Arabia. One of these national studies was done to assess the prevalence of COVID-19 vaccine acceptance in four main cities in Saudi Arabia and showed a good acceptance rate among participants especially elderly, married, and post graduated ones [12]. Similarly, a cross-sectional study took place in Saudi Arabia to assess the beliefs and barriers associated with COVID-19 vaccination among Saudi population. This study found that, the major barrier for the vaccine acceptance among the population was the concerns about the side effect of COVID-19 vaccine itself [20]. While many are aware of the high likelihood of getting the infection, the efficacy and safety of the COVID-19 vaccine were reported as barriers to vaccination.[21] Another study was done in Bangladesh reported insufficient level of knowledge among the participants and surprisingly more positive attitude regarding COVID-19 vaccine among Bangladeshi population.[15] In addition, many studies conducted among US adult population highlighted many factors that may affect the acceptance to get COVID-19 vaccine. The most listed factors are education, insurance, age, and race/ethnicity. [11]

The current study aimed to measure the level of awareness and to identify the barriers toward COVID-19 vaccination among adults in Eastern Province in the Kingdom of Saudi Arabia.

The results of the present study will be discussed as the following:
A. The level of awareness (Knowledge and attitude) toward COVID-19 vaccine.
B. Perception of barriers against receiving COVID-19 vaccine.

The level of Awareness (Knowledge and Attitude) toward COVID-19 Vaccine:
Regarding the knowledge, we found that almost one-third of the participants (36.8%) have poor knowledge about COVID-19 vaccine, while the remaining two-thirds (63.2%) have good level of knowledge about the COVID-19 vaccine. This poor knowledge can be attributed to several reasons such as that coronavirus infection is still new and most of the individuals are getting their information from social media resources which could be not accurate. On the other hand, the good knowledge among the participants can be explained by the educational level among the participants as two-third of them have university degree (66.5%) and 11.4% have postgraduate studies. These findings came in agreement with**Al-Zalfawi et al.,** that was conducted among Saudi population in 2021and found adequate level of knowledge among the participants. This agreement can be attributed to the nature of the target population in both studies which was Saudi population [15]. Another corresponding studyby**Al-Qerem&Jarab et al.,** which was done in Jordan in 2021 and reported that, overall knowledge regarding COVID-19 symptoms,

transmission means, protective measures, and availability of cure were high among the participants (median of knowledge score = 17 out of 21) [22]. This similarity can be expected as the majority of the Jordanian participants have high educational degrees, in addition to that both Saudi Arabia and Jordan are sharing similar culture.

There was statistically significant association between being married, having high educational level and high-income with the level of knowledge among participants about COVID-19 vaccine ($p \leq 0.05$). A significantly higher percentage of single respondents (46.8%), respondents with monthly income $\leq 15,000$ SR (39.9%) and low level of education (65.4%) had poor knowledge. Similar findings were reported in many studies. [23][26]

Regarding the attitude, the majority of the participants in this study showed favorable attitude toward taking the vaccine and they believed that there is an essential need for raising the public awareness (90.2%, 85.1% respectively). More than three-quarters of the respondents will regret taking the vaccine if side effects happen (78%). Most of the participants will recommend COVID-19 vaccine for their friends and family members (81.4%). The willingness to get the vaccine might be explained by the level of education in our population as two-third of the respondents have good level of knowledge about the COVID-19 vaccine (63.2%). This outcome came in agreement with **Sharun et al., 2020,** which concluded that, most of the participants (86.3%) were planning to get COVID-19 vaccination, whereas only 13.7% admitted hesitancy. However, only 65.8% of the participants responded that they will receive vaccination as soon as possible whenever the vaccine is available [24]. Another study conducted by**Alobaidi, 2021** also concluded that, many of the subjects responded positively to COVID-19 vaccine intent (71.9%), while less than one-third of them responded in the negative (28.1%) [23]. The resemblance between our study and Alobaidi's study results could be due to both studies were conducted in Saudi Arabia. Additionally, COVID-19 vaccine was free, easily accessible and available to all population. Government has made COVID-19 vaccination mandatory to access works, restaurants and malls. On the other hand, most of the population of Sharun's study were well educated which is similar to our population. [24]

Male gender and high-income were significantly associated with the willingness towards the vaccine ($p \leq 0.05$). Male is significantly associated with willingness towards the vaccine as majority of them were willing to accept the vaccine (94.1%) in comparison to females (88%). Moreover, significantly higher percentage of high-income respondents (95%) were willing to accept the vaccine in comparison to low-income respondents (87.8%). These associations came in agreement with many studies in the literature. [25][26][23]

Perception of Barriers against Receiving COVID-19 Vaccine:
Regarding the barriers towards the acceptance of COVID-19 vaccine. The majority of respondents had no barriers toward acceptance of vaccine. Many studies were found to have similar outcomes such as **Altulahi et al., 2021,Al-Qerem&Jarab, 2021,** andonly small percentage (10.8%) concerned about the effectiveness of COVID-19 vaccine in our study. [27][22]

In the investigators' opinion, the few barriers listed in the current study might be attributed to several reasons, majority of the population already took the vaccine, most of them educated, and the vaccine is available and free of charge. Different populations across the world share the same point of view toward the importance of COVID-19 vaccine and believe that the vaccine proven its efficacy toward eradication of pandemics over previous decades.

Altulahi et al., 2021 reported that, hesitant participants reported concerns about vaccine side effects and safety as the main barriers to accepting the COVID-19 vaccine. Some refusers (26.1%) declared that they would reconsider vaccination only if the safety and effectiveness of the vaccine were reported by more studies. [27]

Al-Qerem&Jarab, 2021 also reported that, the majority of their participant don't have barriers. The main reasons for the participants' vaccination refusal or hesitancy were concerns regarding the use of vaccines and a lack of trust in them. [22]

In our study Female gender (63.7%), low-income (19.1%) and unemployment (19.4%) were significantly associated with perceiving safety as a barrier for COVID-19 vaccine ($p \leq 0.05$). Female (50.8%), having low income (8.3%) and unemployment (16.8%) were significantly related to perceiving safety as a barrier for COVID-19 vaccine, which came in agreement with **Al Naam et al., 2022.**[20]

In conclusion, low level of education, being single, and participants having monthly income < 15,000 SR had poor level of knowledge among Saudi population. However, the attitude level was good toward taking COVID-19 vaccine. Although Female gender, having low income and unemployment were significantly related to perceiving safety as a barrier for COVID-19 vaccine, the majority of the participants had no barriers toward vaccine acceptance.

Therefore, we recommend further educational campaign in order to raise the awareness among adult population in Eastern Province of Saudi Arabia targeting population who have a low level of education and unemployed status to help in preparing them to accept vaccination in future pandemics.

Further studies with different methodology are required to measure the association between the level of awareness toward COVID-19 vaccine with respondents' characteristics and to explore other barriers against taking COVID-19 vaccine, therefore a clear plan is required to overcome these barriers.

Additionally, we recommend that media, politicians, healthcare professionals should follow up vaccine development and consider public concerns to prevent the failure of COVID-19 vaccination campaign and instant health education program must be established.

Part 6
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