RESEARCH ARTICLE

PUBLIC SELF-PERCEPTION, KNOWLEDGE AND PRACTICE ABOUT COVID-19 IN SAUDI ARABIA

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Abstract

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Background And Aim: COVID-19 is a devastating pandemic which seriously affected population health and world's economy. With all advances to diagnose, treat and prevent COVID-19, public knowledge about COVID-10 and adoption of healthy behaviors to avoid infection remain the cornerstone of effective disease control. This study aims to explore public knowledge, adherence to protection practices and self-perception about COVID-19 during the pandemic in Saudi Arabia.

Materials And Methods: This cross-sectional study was conducted in Saudi Arabia from June to September 2020. People aged 18 years or older were invited to participate in an online questionnaire modified from the survey tool of the World Health Organization. The survey consisted of a total of 37 items assessing the demographics, knowledge, attitude and practice towards COVID-19.

Results: The average COVID-19 knowledge score was 58.8%. More than two-third of participants were adherent to guidelines avoiding the infection. There was a positive moderate correlation between total knowledge score and total adherence score of protection. Majority reported very poor or poor level of knowledge. Most of participants reported that they have good knowledge on how to protect themselves. knowledge level was significantly higher among highly educated, younger male individuals with suspected or confirmed diagnosis of COVID-19.

Conclusion: Saudi people with high educational level, younger age, males and individuals suspected or diagnosed to have COVID-19 were more likely to have higher knowledge score. Good COVID-19 knowledge is related with positive attitudes and appropriate COVID-19 practices, implying that health education programs focused at increasing COVID-19 knowledge can help encourage a positive attitude and promote safe practices. As the worldwide threat of COVID-19 continues to emerge, efforts through educational campaigns

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aimed at the public, particularly the undereducated, older females are important.

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Introduction:-

COVID-19 pandemic is a recent catastrophic disaster that has had devastating effects on all societies around the world, resulting in a substantial number of cases and fatalities in a short period of time [1]. The primary challenges in this pandemic are mostly connected to individuals' behavior and lifestyle, as well as managing health services to counteract disease transmission. However, such achievement needs collaborative efforts, and the public must be alert and effectively adjust attitudes and practices to coincide with the health authorities' efforts [2].

In Saudi Arabia, the Ministry of Health (MOH) has responded to the declared pandemic and set out specific measures to prevent and mitigate the COVID-19 transmission, these includes suspending all inbounds and outbounds flights, suspending Umrah visas (suspending issuing visa for visiting the country for religious reasons), closing all malls and shops in the country, social distancing, using protective medical or fabric masks, hand washing, and limits on gatherings [1, 2].

Because of the disease's novelty, as well as its uncertainty, the characteristic rapid transmission of the COVID-19 and the lack of definite therapy or cure for the disease, prevention plays an important role in avoiding it's spread. Health officials must devise suitable measures to prepare and manage the population to combat this disease. Therefore, assessing the knowledge, attitude perception and practice of general population towards the pandemic is critical.[2, 3].

Rapid online surveys are a potential technique for assessing and tracking knowledge and attitudes during fast developing infectious disease epidemics. Such evaluations are crucial because ensuring that the general population is adequately educated about a condition like COVID-19 may decrease unnecessary worry as well as disease transmission, eventually saving lives.

This study aims to explore public knowledge, adherence to protection practices and self-perception about COVID-19 during the pandemic in Saudi Arabia. This will help to give insights for policymakers in designing prevention and control strategies.

Material And Methods: -

Study design and population

This cross-sectional study was conducted among the general population of Saudi Arabia, during the period from June to September 2020. Convenience and snowball sampling were used. People aged 18 years or older with access to internet were invited to respond to the online survey.

Sample size was calculated using a sample size calculator by CDC/US EPI INFO ver.7 [4]. The total population of 34 million including all residence of Saudi Arabia. To calculate the sample size, we used different parameters which included the excepted prevalence of good knowledge and practice which was around 50%, confidence interval that was 99%, marginal error that was 5%. The calculated sample size was 1513 participants. Considering the possibility of 20% invalid questionnaires, we targeted more participants which reached up to 2787 participant in the final sample.

Questionnaire Design

We designed an online questionnaire by referring to the survey tool and guidance manual of coronavirus disease published by the World health organization[5]. The online questionnaire was produced through the Research Electronic Data Capture (RED cap) electronic platform. The questionnaire was conducted in Arabic language. On the first page of the online questionnaire, respondents were clearly informed about the background and objectives of the study. Respondents were informed that they were free to withdraw at any time. Online informed consent was obtained before proceeding with the questionnaire. The survey consisted of a total of 37 items. The first part was about the demographic information, such as age, gender, educational level, medical history of chronic illnesses, occupation, area of residence (urban or rural) and number of people living in his/her household. It also assessed current or previous history of COVID-19 infection of participants and/or his immediate social environment. The

second part was assessing knowledge, practice and self-perception towards COVID-19 knowledge, risk, disease severity, and avoidance of infection. The knowledge dimension included 13 items on clinical symptoms, incubation period, treatment, prevention and control, questions were coded as 1 for correct answers and zero for wrong answers. The practice dimension covered 12 items on protective measures respondent has taken for prevention, questions were coded as one for adherence to protective measures and zero for non-adherence. Self-perception questions were five questions formatted in 5-point Likert scale. We also included questions to assess the source of information and population trust in information sources about COVID-19 during the pandemic.

Data Collection
Due to the epidemic and social distancing instruction by MOH of Saudi Arabia, participants could not be reached in person. Instead, we collected data by sharing the online questionnaire on several social networking platforms (e.g., WhatsApp, twitter…). The response was received from all Saudi Arabia regions.

Statistical Analysis
The data were analyzed by SPSS version 21. Qualitative data were summarized as frequencies and percentages, and quantitative data were presented as mean and SD. The total knowledge score was computed using the 10 questions inquiring about COVID-19 symptomatology.The total adherence score was computed using 11 questions related to practices adopted to avoid COVID-19 infection. Total scores of knowledge and adherence were standardized to 100.The correlation between knowledge and adherence scores was tested by Pearson correlation. We conducted multiple linear regression to explore the association between total knowledge score and adherence to protection measures, while adjusting for sociodemographic factors including age, educational level, gender, and place of residence. Results were considered significant if P was <0.05.

Ethical Consideration
Permission to conduct the study was obtained from the Institutional Review Board (IRB) committee of Princess Nourah Bint Abdulrahman University. Approval was obtained on September13,2020 under number 20-0334

Results:-
The study included 2787 individuals, male participants amounted to 63.3%; overall, more than 50% were university educated, while only 5.7% were below high school education. Age categories below 20 and 20-40 years represented 42.5% and 40.5% respectively, compared to 11.7% for the age category above 40 years. Majority of participants lived in urban areas, and the highest proportion of participants lived in the Central region, followed by Western and Eastern regions of Saudi Arabia. Only 8% of participants had chronic diseases (Table1).

Table 2 displays the public knowledge about COVID-19. For disease symptoms, more than 80% of participants answered correctly for fever, shortness of breath, and 91.4% answered that loss of smell/taste are symptoms of COVID-19. For the other symptoms the percent of correct answer ranged from 30.9% to 68.6%. Less than 50% of participants answered correctly about the availability of medications and vaccines against COVID-19, and 71.3 % responded that the maximum incubation period of the disease is 14 days. The mean and the median of all correct answers were equal (58.8%).

Table 3 summaries public adherence to guidelines of protection measures during quarantine. Home self-isolation, washing hands appropriately, avoiding touching mouth and nose with uncleaned hands, physical distancing, use of hand sanitizers, and wearing masks were followed by more than 70% of participants. Only 63% of participants followed cough etiquette. About half of the sample used surface disinfectants for places, cellular phones, and they opened letters with caution. Interestingly, more than 90% of participants reported using herbal remedies and only 11 % got the flu vaccine. In total, more than two-third of participants were adherent to guidelines avoiding the infection. Of note, there was a positive moderate correlation between total knowledge score and total adherence score of protection measures using Pearson correlation, r =0.38, P <0.001 (figure 1).

Table 4 presents participants self-perception about COVID-19 knowledge. Surprisingly, 81.6% perceived that they have very poor or poor level of knowledge, compared to 16.9 % for average knowledge, while only 1.5 % perceived that they have good or very good knowledge. In contrast, 77.8 % of participants perceived that they have good knowledge on how to protect themselves from COVID-19. Regarding susceptibility to get infected with COVID-19, about one-fifth of the sample perceived that they are not susceptible, while 60% perceived minimal or moderate susceptibility and 19.2% perceived great susceptibility to get COVID-19; likewise, only 14.1 % perceived that the

probability of getting the infection is likely or extremely likely. Of note, 48.3% underestimated the severity of COVID-19, while only 11.7% perceived the genuine severity of the disease. More than 90% of participants perceived that avoiding infection with COVID-19 is possible compared to 18.3% who perceived difficulty in avoiding the infection.

Table 5 shows factors associated with the knowledge score using linear regression. The level of knowledge decreased significantly in females and in education below university; for example, the knowledge score decreased by 0.48, 95% CI (-0.879, -0.083) in below secondary school education compared to university education. Total prevention score demonstrated significant positive association with knowledge score, while age was negatively associated with knowledge score. Of note, individuals diagnosed to have COVID-19 or suspected to have the infection were more likely to have higher knowledge score by 0.7-unit, 95% CI (0.415, 0.984), Meanwhile, individuals living in rural and urban communities show no statistical difference in their level of knowledge.

Figures 2&3 show source of information and public trust in information sources during the pandemic. MOH ranked the first source of information followed by official governmental press release, then social media, while families and friends and the daily newspapers were the least sources of information. Likewise, MOH was the most trusted source of information.

Table 1:- Demographic characteristics of the study sample, (n=2787).

	Frequency	Percent
Gender		
Male	**1783**	**63.3**
Female	**1004**	**35.7**
Education level		
Below high school	**160**	**5.7**
High school	**1102**	**39.1**
university and above	**1530**	**54.3**
Age groups		
≤ 20	**1197**	**42.5**
21-40y	**1141**	**40.5**
>40 y	**329**	**11.7**
Living		
rural	**236**	**8.4**
urban	**2552**	**90.6**
Chronic diseases		
yes	**226**	**8.0**
no	**2563**	**91.0**
Areas		
Central region	**1300**	**46.1**
Eastern region	**395**	**14.0**
Western region	**704**	**25.1**
Northern region	**165**	**5.9**
Southern region	**214**	**7.7**

Table 2:- Public knowledge about COVID-19 in Saudi Arabia, (n=2787).

Knowledge items		Responses		Percent of correct answer
		Yes	**No**	
Disease Symptoms	Fever	2428	359	87.1
	Cough	1642	1144	59.0
	SOB	2280	507	81.8
	Sore throat	1191	1596	42.7
	Runny nose	862	1925	30.9
	Muscle ache	1323	1464	47.5

	Headache	1912	875	68.6
	Fatigue	1556	1231	55.8
	Diarrhea	1070	1717	38.4
	Loss of taste/smell	2547	240	91.4
Medication	Availability of medication	2211	1576	43.5
Vaccines	Availability of vaccines	1482	1305	46.8
Incubation period	Maximum incubation period (14 days)	1987	800	71.3
Average, (SD) of total knowledge score		**60.3 (20.1)**		
Median & (IQR) of total knowledge score		**60.0(40.0)**		
Percentage of participants scored ≥ 60 of the standardized score		**61.7**		

Average and median scores knowledge was calculated of the total score standardized to 100.

Table 3:- Public adherence to practices protecting against COVID-19 in Saudi Arabia.

	Frequency of adherent individuals	Percent of adherence
Hand washing for at least 20 seconds	2139	76.7
Avoiding touching your eyes, nose, and mouth with unwashed hands	2102	75.4
Use of disinfectants to clean hands when soap and water was not available for washing hands	2003	71.9
Staying home when you were sick or when you had a cold	1990	71.4
Herbal supplements	2538	93.2
Covering your mouth and nose when you cough or sneeze	1755	63.0
Using caution when opening letters	1402	50.3
Getting the flu vaccine	312	11.2
Wearing a face mask	2161	77.5
Using antibiotics	2441	87.6
Using homeopathic remedies	2517	90.3
Physical distancing	2046	73.4
Self-isolation	1605	57.6
Disinfecting surfaces	1494	53.6
Disinfecting the mobile phone	1360	48.8
Eating garlic, ginger, lemon	755	27.1
**Average, (SD) of total adherence score	**62.2 (28.2)**	
**Median, (IQR) of adherence score	**63.6 (36.4)**	
Percentage of participants scored > 60 of the standardized score	**60**	

**Average and median score of adherences were calculated of the total score standardized to 100, *questions not included in the total adherence score.

Table 4:- Self-perception of knowledge, risk, and avoidance of COVID-19 among Saudi population.

		Frequency	Percentages
Level of knowledge	**Very poor knowledge**	1229	44.1
	Poor knowledge	1046	37.5
	Average	470	16.9
	Good knowledge	34	1.2
	Very good knowledge	8	0.3

Probability of getting COVID-19	**Extremely unlikely**	762	27.3
	Unlikely	698	25.0
	May be	932	33.4
	Likely	196	7.0
	Extremely likely	198	7.1
Susceptibility to infection	**Not susceptible at all**	572	20.5
	Minimally susceptible	687	24.7
	Moderately susceptible	992	35.6
	Susceptible	286	10.3
	Very susceptible	250	8.9
Perceived disease severity	**Not very severe at all**	619	22.2
	Minimally severe	727	26.1
	Moderately severe	950	34.1
	Severe	327	11.7
	Very severe	164	5.9
Knowledge about self-protection	**I don't know at all to protect myself against COVID-19**	121	4.3
	I don't know to protect myself against COVID-19	99	3.6
	I have limited knowledge to protect myself against COVID_19	399	14.3
	I have good knowledge to protect myself against COVID_19	846	30.4
	I have very good knowledge to protect myself against COVID_19	1322	47.4
Ease of avoiding infection	**Avoiding infection is very difficult**	193	6.9
	Avoiding infection is difficult	319	11.4
	Avoiding infection is possible	1145	41.1
	avoiding infection is easy	604	21.7
	Avoiding infection is so easy	526	18.9

Table 5:- Factors associated with total knowledge score about COVID-19 using multilinear regression.

	Coef.	Std. Error.	t	*P*	95% CI
(Constant)	4.466	0.239	18.698	<0.001	(3.998, 4.935)
Age in years	-0.010	0.005	-2.230	0.026	(-0.019, -0.001)
Female gender	-0.222	0.105	-2.111	0.035	(-0.429, -0.016)
Below secondary education	-0.469	0.202	-2.315	0.021	(-0.865, -0.072)
Secondary education	-0.203	0.096	-2.118	0.034	(-0.390, -0.015)
Rural versus urban residence	-0.009	0.162	-0.053	0.958	(-0.326, 0.309)
Previous history of infection	0.700	0.145	4.820	<0.001	(0.415, 0.984)
Practice score	0.299	0.015	19.880	<0.001	(0.269, 0.328)

Figure 1:- Correlation between total knowledge and adherence score.
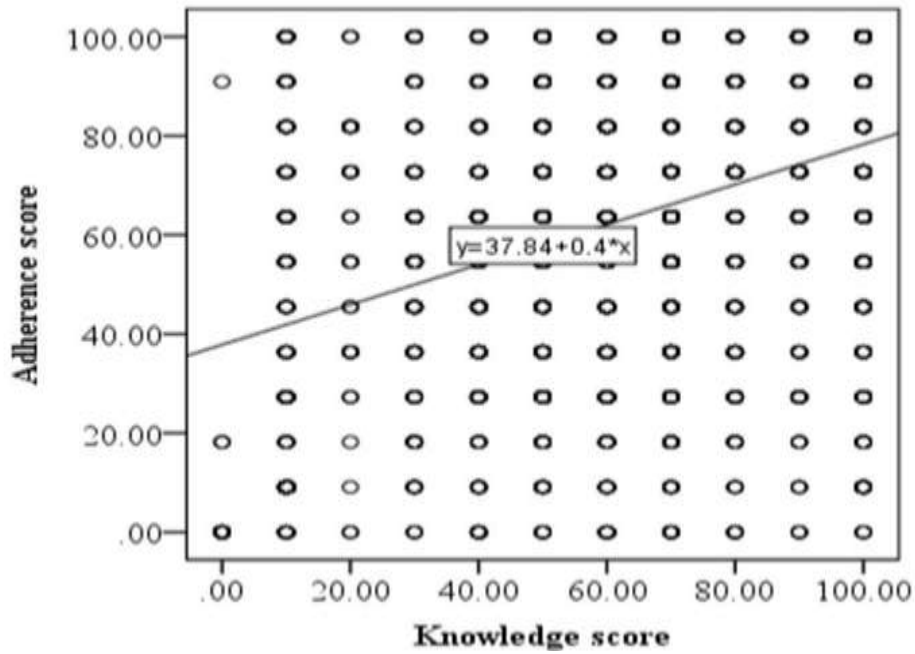

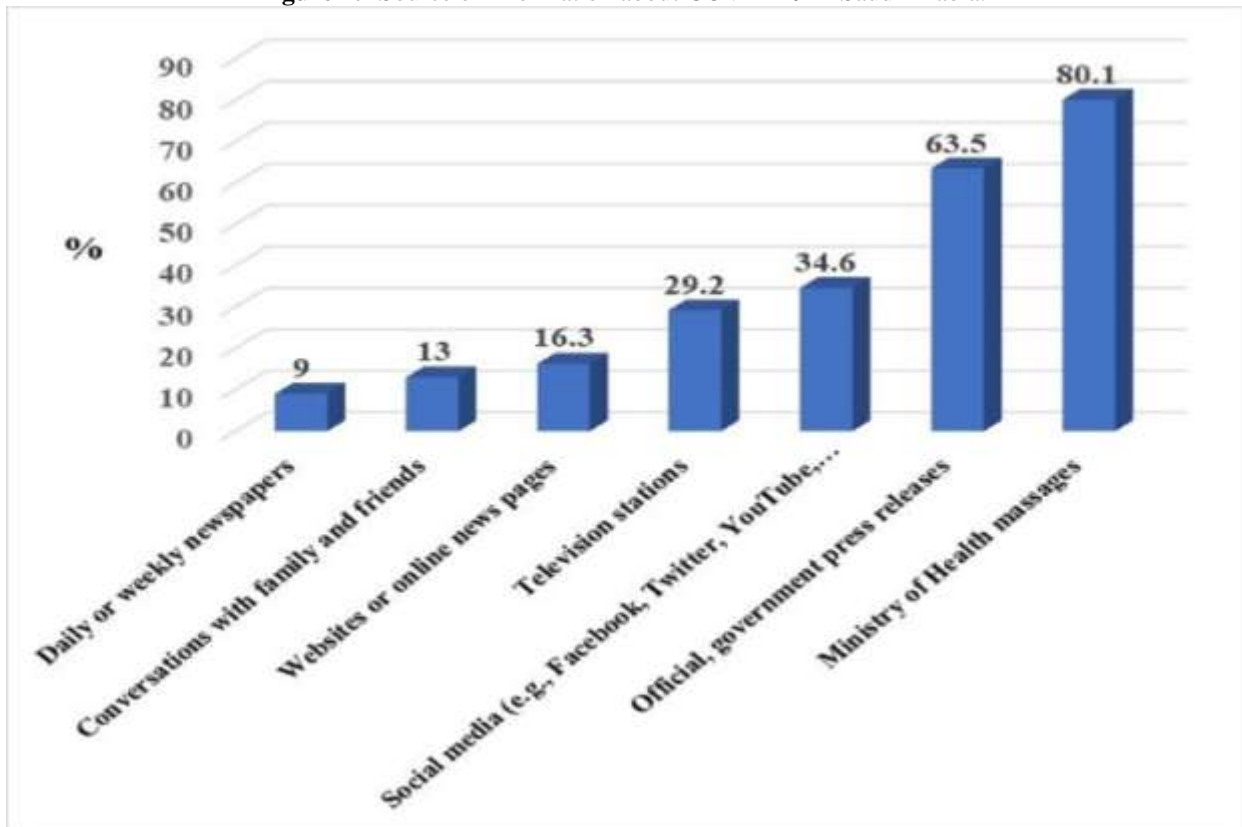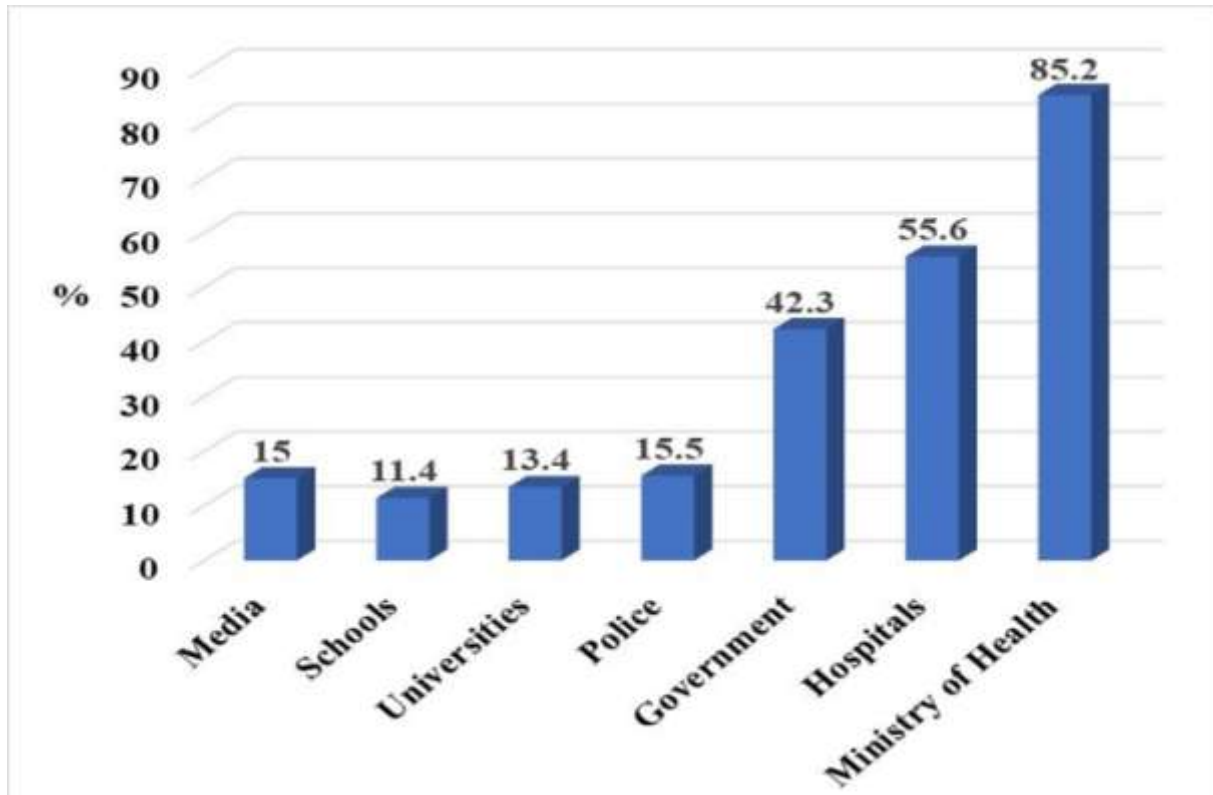**Figure 2:-** Source of information about COVID-19 in Saudi Arabia.

Figure 3:- Public trust in information sources about COVID-19 during the pandemic.

Discussion:-

The COVID-19 pandemic is a global disaster having a catastrophic consequence on all countries globally, with a large number of cases and fatalities occurring in a very short time. Given the significant risks presented by COVID-19, the lack of proper treatment and the relatively low number of a COVID-19 vaccinated people, public adherence to preventative measures are critical in decreasing infection rates and limiting disease transmission. The primary problems associated with combating this pandemic are mostly linked to issues concerning people's behavior and lifestyle choices in preventing disease transmission. This was demonstrated to be highly related to people's knowledge, attitudes, and practices[1, 2]. Our study aimed to assess the knowledge, attitude and practice of the Saudi population towards the novel coronavirus disease 2019, COVID-19.

Results of the present study revealed that the percent of correct answers for the triad of disease specific symptoms including loss of taste/smell, fever and SOB was high, exceeding 80%. Also, most of participants responded correctly for the COVID-19 incubation period. Nevertheless, the average percent of correct answer was only 58.8%, and the average percent of total knowledge score was 60.3 ± 20.1. This is due to misinformation considering irrelevant symptoms for COVID-19, for example diarrhea and sore throat. Considering the average percent of correct answer, these results are lower than two previous studies conducted in Saudi Arabia and one study in Malaysia whish reported that the knowledge score was satisfactory and ranged between 80.5-81.6%[1, 2, 6]. Another study in China in a predominantly well-educated female population scored around 90% [7]. However, global research including 1,208 participants and performed in the three Middle Eastern nations of Saudi Arabia, Kuwait, and Jordan found that the total knowledge score across the three countries was 66.1 %. The highest score was 70.3 % among Jordanians, while the level of public knowledge in Saudi Arabia was less than 70.3 % [4, 5, 8, 9]. The observed difference between previous studies and our study might be related to variation in the survey tool measuring the level of knowledge. In addition, most of survey studies used convenient sampling technique due to difficulty in conducting random sampling technique in survey designs leading to variability of results.

Surprisingly, the participants self-perception about COVID-19 knowledge was lower than reality. 81.6% perceived that they have very poor or poor level of knowledge, compared to 16.9 % for average knowledge, while only 1.5 % perceived that they have good or very good knowledge. In contrast, 77.8 % of participants perceived that they have good knowledge on how to protect themselves from COVID-19. This might be explained by the fact that most of the awareness campaign contents are directed towards raising the awareness about how to protect against the disease

rather than about the nature of the virus and the information about the disease itself. Accordingly, most of participants perceived that avoiding infection with COVID-19 possible. This optimistic attitude might be attributed to the extraordinary COVID-19 control measures throughout Saudi Arabia during the countrywide curfew which was effective during the duration we conducted this study. The regulations were so strict suspending all domestic and international flights, preventing prayers in mosques, and cancelling onsite education in schools and colleges.

Regarding susceptibility to get infected with COVID-19, our results revealed that about one-fifth of the sample perceived that they are not susceptible, while 60% perceived minimal or moderate susceptibility and 19.2% perceived great susceptibility to get COVID-19.; The impression of infection vulnerability for a person and their family was high, and most participants accurately reported preventive actions such as handwashing. likewise, only 14.1 % perceived that the probability of getting the infection is likely or extremely likely. These results are comparable to recent results in Saudi Arabia and China.

Of note, 48.3% of the participants in our study underestimated the severity of COVID-19, while only 11.7% perceived the genuine severity of the disease. This is contradictory to results obtained from a previous study in China in which the seriousness of the disease was recognized by all participants [10].

Our study revealed that two third of participants followed precautions to avoid infection. Home self-isolation, avoiding crowded places, washing hands appropriately, avoiding touching mouth and nose with uncleaned hands, physical distancing, use of hand sanitizers, and wearing masks when going outside were followed by more than 70% of participants. These strict preventative procedures may be ascribed largely to high perceived susceptibility and probability of infection among study participants. Of note, respondents adopting healthy behaviors is as a consequence of authorities' efforts to allocate generous resources for protection supplies during the pandemic.

Nevertheless, only 63% of participants followed cough etiquette and only about half of the sample used surface disinfectants for places, cellular phones, and they opened letters with caution. This indicates that self-protection consciousness must be enhanced, and some protective actions need to be adjusted.

We also investigated certain demographic variables that were linked to good knowledge which can help public health policymakers and health professionals identify target populations for COVID-19 prevention and education. In our study, the education level had the most significant influences on the knowledge score. The higher the education level, the greater the knowledge level of COVID-19. This hypothesis is supported by the substantial positive relationship between education levels and COVID-19 knowledge scores evidenced in other studies [1, 7].

These findings also imply that health education interventions would be more successful if they targeted certain demographic groups. For example, COVID-19 knowledge may be substantially improved if health education programs are especially tailored for people with a low level of education.

It was noted that individuals diagnosed to have COVID-19 or suspected to have the infection were more likely to have higher knowledge score. This is expected as because of the seriousness of the pandemic and the overwhelming news stories on this public health crisis, people sought to actively learn about how to protect themselves and their family.

According to our findings, males had higher level of COVID-19 knowledge. This was an opportunity to address disparities in health literacy among men and women in Saudi Arabia. These results are contradictory to results obtained in previous studies which demonstrated that level of knowledge was higher among females[10, 11]. This might be due to the fact that the majority of the men surveyed in our study held a bachelor's degree or above. Previous research indicated that women were more knowledgeable about infectious disease prevention and control than males, and that men were more prone to participate in hazardous behavior[11].

Knowledge score correlated negatively with age in our study. This finding is contradictory to previous studies [2, 6] in which participants over the age of 50 exhibited higher knowledge scores, which might be attributed to a higher risk perception of developing COVID-19 and illness consequences. In our study, results are explained by the fact that middle age population might be more to seek for knowledge especially 80% of the sample aged below 40 years.

The level of knowledge whether in urban or rural areas didn't have any impact on COVID-19 knowledge. These results are similar to some previous studies which demonstrated that both people living in urban and rural areas have similar knowledge level [1, 10]. This might be attributed to the health education interventions that helped to enhance awareness of infectious illnesses and compliance with healthy living practices among urban and rural people. As expected, Urban residents usually have better preventive practices, which may be associated with the fact that urban residents have a high level of health literacy and are exposed to a high degree of health publicity. Due to restricted access to the internet and online health information resources, vulnerable sections of the Saudi society, such as rural people, are more likely to have poor understanding about the COVID-19 outbreak. Rural residents usually have a low level of education, health services are lagging, and health publicity is rarely carried out, that is why the governmental prevention and control efforts were mostly directed towards this section of the community. The insignificant difference in our study might also be due to small proportion of participants from rural areas.

In our study, MOH was ranked the first source of information followed by official governmental press release, then social media, while families and friends and the daily newspapers were the least sources of information. Likewise, was the most trusted source of information. This was nearly comparable to the study performed in China early during the pandemic in which TV, the official website of China's National Health Commission, and the Health Commission's WeChat account were the main source of information [7]. According to another research[10], social media platforms were the most significant source of information (92.0%), followed by television (66.2%). Another study performed in India among medical doctors reported that higher trustworthiness was reported for official government bulletins released by the Indian Council of Medical Research (84.2%) or the Ministry of Health and Family Welfare (84.5%), and least trustworthiness expressed for information circulated on social media networks (6.94%). This discrepancy may be attributed to the difference in the selected sample were in the Indian study participants were medical doctors and it is expected that they will depend on official medical research as the trustworthy source of information[12]. Our study showed that social media platforms and television play key roles in the dissemination of information. As a result, emphasis should be placed on increasing public awareness and health education through a variety of outlets. It is crucial to highlight that the government has made significant efforts at all levels, including public awareness initiatives. The MOH has developed an extensive public awareness campaign, which has been disseminated through its website, television, and different social media platforms. The MOH has created a COVID-19 guide in more than ten languages to provide citizens with facts and preventive warnings. The MOH also interacts with the public and the media, particularly through social media channels. These early initiatives on involving the public in preventative and control measures, as well as attempts to counteract rumors and disinformation, have tremendously aided the government in responding quickly and adopting precautionary measures against COVID-19 to control its spread.

The strengths of this study include the large sample size of 2787 individuals and that it was performed during a critical period. Another strength is that the general public's knowledge, attitude, perception and practice were all evaluated together. This is not, however, the first research done in the Kingdom, and it is thought to indicate continuing monitoring of the pandemic situation. It demonstrates the evolution of knowledge, attitude, and practices in comparison to prior published studies, and so gives profile data for future meta-analysis inquiries.

This study has a few limitations, first, during this time period, community-based national sample surveys were not possible. As a result, data were gathered online. There was a selection bias since participants who were unable to complete the online survey did not participate. Second, people who responded to this questionnaire are those who have smartphones, well-educated and have email IDs. The outcomes of our study may differ from the knowledge, attitude, and practice of uneducated individuals. Third, data utilized in this study's analysis were self-reported, which may have resulted in reporting bias and might be influenced by self-desirability. Finally, this is a cross sectional study, so it did not address causation.

Conclusion:-
Saudi people with high educational level, younger age, males and individuals suspected or diagnosed to have COVID-19 were more likely to have higher knowledge score. Good COVID-19 knowledge is related with positive attitudes and appropriate COVID-19 practices, implying that health education programs focused at increasing COVID-19 knowledge can help encourage a positive attitude and promote safe practices. Majority of the Saudi people perceived that they have very poor or poor level of knowledge while only minority perceived that they have good or very good knowledge. In contrast, Majority of participants perceived that they have good knowledge on how to protect themselves from COVID-19. Governmental efforts through educational campaigns should continue

as the worldwide threat of COVID-19 continues to emerge. These efforts should be targeted to people with low level of knowledge and poor attitudes and practices.

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