Original Article :

Knowledge About Covid-19 During Its Initial Outbreak Among University Students And Staff In Saudi Arabia

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Abstract

Background & Aims:

The widespread COVID-19 and its detrimental impact have prompted governments to exert comprehensive protective measures to mitigate such effects. Recognizing the considerable positive impact of knowledge and awareness on individuals' behaviors, Saudi Arabia was one of the few countries that responded promptly to constrain the spread of the pandemic among its population and invested profoundly in awareness campaigns to educate the public about the virus.

We aim to evaluate the level of knowledge about COVID-19 among the public before the first case was confirmed in Saudi Arabia and investigate associations between the level of knowledge about COVID-19 and selected variables.

Methods:

We conducted a cross-sectional survey (n =737) to measure knowledge about COVID-19 in the early stages of the pandemic. Multiple regression analysis was performed to study the associations between knowledge and participant characteristics.

Results:

Overall, an above-average knowledge level about COVID-19 among participants was observed. Multiple linear regression modeling showed nonsignificant

الملخص

دفع انتشار جائحة كورونا ((COVID-١٩ واثاره السلبية الحكومات إلى اتخاذ تدابير وقائية شاملة للتخفيف من هذه الآثار. إدراكًا للتأثير الإيجابي الكبير للمعرفة والوعي على سلوكيات الأفراد، كانت المملكة العربية السعودية أحد الدول التي استجابت على الفور للحد من انتشار الوباء بين سكانها واستثمرت بشكل كبير في حملات التوعية لتثقيف الجمهور حول الفيروس.

تهدف هذه الدراسة إلى تقييم مستوى المعرفة حول مرض كورونا بين الجمهور قبل تأكيد الحالة الأولى في المملكة العربية السعودية والتحقيق في الارتباط بين مستوى المعرفة حول كورونا وبعض المتغيرات المختارة.

أجرينا مسحًا مقطعيًا على عينة مكنة من ٧٣٧ شخص لقياس المعرفة حول كورونا في المراحل الأولى من الوباء.

بشكل عام، ابرزت النتائج بأن مستوى معرفة كان أعلى من المتوسط بين المشاركين. أظهرت نمذجة الانحدار الخطي ارتباطات غير مهمة بين مقدمي الرعاية صحية ومستوى المعرفة حول مرض كورونا وبين عمر المشارك ومستوى المعرفة عن مرض كورونا. وكان جنس المشارك فقط هو المؤشر الهام على مستوى المعرفة حول مرض كورونا.

تعد التدخلات المبكرة والشاملة لزيادة الوعي بين السكان ضرورية لتوسيع معرفة الناس، الأمر الذي له تأثير مباشر على الالتزام بالإجراءات الموصى بها. ومع ذلك، وبناء على نتائج هذه الدراسة يتضح ان هناك فجوة بين الجنسين في مستوى المعرفة عن مرض كورونا والتي تستوجب التحقق عن سبب هذه الفجوة وفحصها لتوجيه التدخلات والسياسات الصحية المستقبلية.

associations between being a healthcare provider and knowledge about COVID-19 and the participant's age and knowledge of COVID-19. Only the sex of the participant (0.47, $p < 0.01$) was a significant predictor of knowledge about COVID-19.

Conclusion:

In pandemics such as COVID-19, early and comprehensive interventions to raise awareness among the population are necessary to expand people's knowledge, which directly influences adhering to recommended measures. However, there is a gender gap in knowledge about COVID-19 that must be examined to inform future health interventions and policies.

Keywords:

Cross-sectional study; COVID-19; knowledge; behavior; coronavirus

Introduction

The coronavirus disease (COVID-19) is a respiratory infection first detected in Wuhan, China, in December 2019. Since that time, the disease has spread rapidly across more than 150 countries; in mid-March, the World Health Organization (WHO) declared COVID-19 as a pandemic and urged all countries to exert effective preventive actions. By February 2021, the virus infected nearly 110 million individuals and caused more than 2,400,000 deaths worldwide [1].

The broad and accelerated spread of COVID-19 and its detrimental health and economic impact has prompted governments worldwide to adopt comprehensive protective measures such as social distancing, quarantine, isolation, travel restrictions, and enforced personal protective measures[2]. Such policies and interventions have targeted different interventions, including organizational, social, and individual levels [3]. Unlike other health challenges, COVID-19 preventive measures relied heavily on individual behavior. Intrapersonal level factors such as knowledge stand to be one of the most significant levels of influence in predicting people's preventive behaviors. Several studies found a significant association between knowledge and intention to act [4]. More knowledge about the illness etiology, transmission, degree of severity, and treatment prospect is signifi-

cantly associated with higher adherence to protective and control measures. However, promoting healthy behaviors requires prior knowledge about the current level of knowledge people have, types of misinformation roaming between the public, and trust of the main sources of health information [5]. Initiating an extensive public health camping or an educational program without identifying those critical factors can significantly diminish its efficacy and success. Thus, determining people's knowledge of the disease is key.

Saudi Arabia is one of the few countries that reacted promptly to control the spread of the pandemic among its residents. The country began even before any cases were reported and before the WHO declared COVID-19 as a pandemic [6]. Precautionary steps taken by the Saudi government can be categorized into three components: a collaborative effort between 19 governmental and non-governmental agencies to plan, evaluate, and implement preventive measures; restrict travel even for Umrah, and enforced restriction on social gathering and unnecessary movement [7]. Before the first case was detected in Saudi Arabia, the Saudi Ministry of Health (MOH) initiated a massive educational campaign to spread awareness about COVID-19 and promote protective and preventive measures 8.

Given the significant efforts delivered by the Saudi government, it is essential to evaluate the impact of such provisional campaigns. Thus, we aim to understand the level of knowledge people have about COVID-19 at the outset of the outbreak before the first case was detected in Saudi Arabia. The purpose of the study is two folds: First, to assess the level of knowledge about COVID-19 among the public before even the first case was confirmed in Saudi Arabia. Second, to investigate associations between the level of knowledge about COVID-19 and several individual characteristics such as healthcare workers. The findings of this study will serve as a building block for future interventions to be framed and tailored to the targeted population.

Materials and methods

Data Collection

We collected data using a cross-sectional online survey to measure the public's knowledge about COVID-19 in the early stages of the pandemic before the first case was detected in Saudi Arabia. The survey items were guided by the literature and reviewed by experts in the public health field. The online survey was administered to a large sample of participants in February 2020. We targeted faculty, employees, and students of a major multi-branch uni-

versity in Saudi Arabia, the Saudi Electronic University. The university offers graduate and undergraduate degrees to male and female students from different demographics and backgrounds. The inclusion criteria involved participants aged 18 years who are either students, employees, or faculty at SEU. Participants were excluded if they met the following criteria: below 18 years of age, or students were not registered as SEU students at the time of the study. University's employees' and students' emails were retrieved from the university's registrar, and each email was given an identifier number to ensure anonymity and data privacy. To enhance the response rate, multiple invitation emails were sent. First, an invitation email was sent to the pool of participants (all of the University employees and students). The sent email provided detailed information about the study's background, objectives, procedures, the time required to complete the survey, researcher's contact information, privacy and confidently confirmations, consent, and the right to the opt-out statement. Secondly, two reminder emails were sent to ensure participant's involvement and enhance the response rate. At the end of the data collection process, 737 participants have completed the online survey. The Ethical Committee of the Saudi Electronic University approved the study protocol (SEUREC-CHS20106).

Measures

The survey consisted of two sections: demographics and the knowledge construct. Five items examined participant's demographics: age, gender, being a healthcare provider, and participant's college affiliation. Twenty items measured the knowledge construct: six items focused on transmission routes; four items assessed participant knowledge about the severity of the disease; four items asked about general characteristics of the disease; four items inquired about the risk of contracting the disease; two items evaluated participants trust in public health authorities. For each item, three options were provided (Yes, No, and I do not know). Since few participants selected the third option, the two last options were collapsed into one category (NO). One point is granted for each correctly answered question. The knowledge construct was determined by adding all the correctly answered questions. Survey instructions, details, and questions were in Arabic, the mother language for all participants.

Statistical analysis

Descriptive statistics such as participant's demographic frequencies and proportions of correctly answered items were obtained using SPSS (IBM SPSS, version 27, New York, USA). To examine the relationship

between participants' knowledge about COVID-19 and other variables, a multiple linear regression model was developed to determine the association between the level of knowledge among the public and potential factors: being a health care provider, participant's college affiliation, age, and gender. Unstandardized and standardized regression coefficients (β) and their 95% confidence intervals (CIs) quantified the associations between variables and knowledge with a statistical significance level set at $p < .05$ (two-sided). All linear regression assumptions were checked to ensure accurate estimates.

Results

Of the sample (n = 737), most participants were middle-aged (M = 29, SD = 6.9), about two-thirds (62%) were female, almost half (45%) were from the college of health sciences, and about one-fourth (22%) were health care workers (see Table 1).

Participant's level of knowledge about COVID-19, which consisted of 20 items, had a wide range (range 6 – 19) with a high overall average of knowledge (M = 14.1, SD = 1.90). Additionally, the level of knowledge was slightly negatively skewed (skewness = -0.37), indicating more par-

Table 1. Demographic profile of all participants

Characteristics	Number (n=737)	Percentages (%)
Sex		
Male	263	37.8
Female	432	62.2
College affiliation		
Health sciences	315	45.3
Computing and informatics	103	14.8
Administrative and Financial Sciences	170	24.5
Science and Theoretical Studies	69	9.9
Other	38	5.5
Being a health care worker		
Healthcare workers	152	21.9
Non-healthcare workers	543	78.1
Branch		
Riyadh	315	45.9
Dammam	223	29.5
Jeddah	102	13.2
Abha	97	11.4
Age (years)	Mean	SD
	28.7	1.9

ticipants having knowledge scores below 14. A closer inspection of each knowledge item showed that most participants answered some questions incorrectly (see Table 2). For instance, 77% of the participants believed the virus could be transmitted from animals to humans, 44% believed the virus could be transmitted by sex, 83% thought children are at greater risk of the disease that it can be deadly for the younger population, and 65% considered COVID-19 similar to the typical seasonal influenza.

Table 2. Number of participants correctly replying to individual items about knowledge of COVID-19 (N=737)

Item	Correct responses
COVID-19 is contagious and is transmitted from animals to humans	159 (22.9%)
COVID-19 may be transmitted by shipping goods from China	555 (79.9%)
COVID-19 is transmitted by drops or sneezing spray from an infected person	672 (96.7%)
COVID-19 is transmitted by shaking hands or touching the infected person	502 (72.2%)
COVID-19 is transmitted by touching the tools used by the infected person	493 (70.9%)
COVID-19 is transmitted through sex	402 (57.8%)
COVID-19 is dangerous and may lead to death, especially in children	124 (17.8%)
COVID-19 is dangerous and may lead to death, especially in the elderly and those with weak immunity	662 (95.3%)
There is a vaccination against COVID-19	661 (95.1%)
There is a treatment against COVID-19	639 (91.9%)
The cause of COVID-19 is a virus, not bacteria	592 (85.2%)
COVID-19 is similar to SARS that started previously in China	417 (60%)
COVID-19 is similar to MERS that started previously in Saudi Arabia	360 (51.8%)
COVID-19 is similar to the flu	244 (35.1%)
It may take 14 days for the symptoms of COVID-19 to appear in an infected person	433 (62.3%)
A person infected with COVID-19 should be one of the most vulnerable to high temperature	579 (83.3%)
Have you heard of the COVID-19 disease spreading in China now	694 (99%)
The possibility that someone in my area will contract COVID-19 is almost impossible	580 (83.5%)
I trust the numbers and statistics provided by the Ministry of Health	499 (71.8%)
I am confident in the capabilities of the Ministry of Health to limit the spread of COVID-19	509 (73.2%)

Multiple linear regression was modeled with knowledge of COVID-19 as the response variable and age, sex, being a healthcare worker, and affiliated college as the explanatory variables. The designed model showed an appropriate fit ($F(7, 687) = 2.62$, $p < .05$) with ($R2 = 0.026$), indicating that the proposed model explains 2.6% of the knowledge variance. The Durbin-Watson statistic was satisfactory ($d = 1.96$), which indicated the absence of first-order linear auto-correlation in our model.

The regression model showed a positive relationship between being a healthcare provider and knowledge about COVID-19 and a negative association between the participant's age and knowledge of COVID-19 (see Table 3).

Table 3. Multiple regression analysis results: level of knowledge of COVID-19 and participants characteristics

Effect	Estimate	SE	CI 95%		p
			LL	UL	
Constant	13.95	0.39	13.18	14.725	0.00
Age	-0.01	0.01	-0.03	0.02	0.74
Sex	0.47	0.16	0.15	0.79	0.05
Health Care provider	0.22	0.22	-0.23	0.66	0.33
College Computing and informatics	-0.26	0.23	-0.71	0.19	0.26
College Administrative and Financial Sciences	-0.38	0.19	-0.76	0.01	0.05
College Science and Theoretical Studies	0.06	0.27	-0.47	0.61	0.81
College: Other	0.31	0.34	-0.36	0.10	0.37

However, such relationship estimates were not statistically significant ($p > .05$). Only the sex of the participant ($\beta = 0.47$, $p < .05$) was a significant predictor of knowledge of COVID-19, which indicates that females have an approximately half-point increase in their average level of knowledge of COVID-19 compared to males.

Discussion

This study sought to evaluate the level of knowledge about COVID-19 among a large sample before the first case in Saudi Arabia was detected. Additionally, the study assessed the relationship between the level of knowledge about COVID-19 and relevant individual characteristics. The findings showed that the level of knowledge of participants was relatively high. From the 20 questions asking about the level of knowledge, most participants answered about 14 questions correctly. However, the majority of the participants incorrectly answered several specific items. The linear regression model showed a significant relationship between the level of knowledge of COVID-19 and the gender of the participant, with females significantly having higher knowledge compared to males. No significant difference in knowledge was detected between health care providers and the non-healthcare providers among the participants.

Despite the novelty of the diseases, our finding indicated a high level of knowledge about COVID-19 among the study's sample. This above than the average level of knowledge can be attributed to the substantial global and, more importantly, the local effort to educate and raise collective awareness about the disease [9]. In Saudi Arabia, the MOH has acted effectively and promptly in initiating a massive campaign to spread tailored, accurate, and credible information about the nature of the disease, transmission methods, and related preventive measures [10]. This campaign has started early as soon as the WHO announced the

first case of COVID-19 in China. Moreover, the campaign has increasingly gained momentum and was disseminated through different media channels and platforms to ensure the whole population receives the message [11]. Additionally, the MOH has contributed significantly to the comparatively low infection and death rate by increasing health care facilities and capacities to offer explicit treatment protocols [12]. Even though the results showed an above-average level of knowledge about COVID-19, there was a variation in the proportion of correct answers among the knowledge questions. A high proportion of participants answered several questions incorrectly. In particular, most participants showed a lack of understanding of important facts such as how the disease is transmitted and the severity of vulnerable populations. These findings parallel finding for other research. One study indicated the most common misinformation about COVID-19 was the belief that the disease impacts only the elderly, mosquitoes can transmit the virus, and the homemade remedy can potentially cure the disease [13]. Another study showed that participants from the US and the UK perceived children to have a higher mortality rate from COVID-19 than the elderly [14]. Additionally, the study showed a gap in knowledge about COVID-19 between males and females. Acknowledging such disparity in knowledge is essential and identifying the reason behind such a gap is key to developing tailored programs.

The findings of this study reflect the importance of early interventions to raise knowledge among the public and the provision of accurate information to debunk disseminated myths and misconceptions. However, some limitations should be mentioned. First, the study's findings are based on a convenient, albeit large, sample and cannot be generalized to the whole population due to the cross-sectional design. Second, the self-reported levels of knowledge might not accurately evaluate the actual level of knowledge among individuals. Thus, future research can implement additional methods to triangulate assessment tools to obtain reliable and valid knowledge levels. Finally, since the study was conducted before the spread of the COVID-19 in Saudi Arabia, it was not feasible to compare our results to other local studies.

Conclusion:

Despite the mentioned limitations, the study offers valuable information about the level of awareness about COVID-19 among the Saudi population before the outbreak begins in the country. The results can be used as a reference for future research. Additionally, the identified mis-

conception and misinformation can inform future intervention plans and help tailor the proper message for the public to ensure accurate information is disseminated.

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