ORIGINAL ARTICLE / ÖZGÜN MAKALE

ASSESSMENT OF PHARMACY STUDENTS' KNOWLEDGE, ATTITUDES AND PRACTICES ABOUT COVID-19 PANDEMIC AND VACCINES

ECZACILIK ÖĞRENCİLERİNİN COVID-19 PANDEMİSİ VE AŞILARI HAKKINDA BİLGİ, TUTUM VE UYGULAMALARININ DEĞERLENDİRİLMESİ

Aysu SELCUK[1]∗ **, Asuman BOZKIR[2]**

[1]Ankara University, Faculty of Pharmacy, Department of Clinical Pharmacy, 06560, Ankara, Turkey

[2]Ankara University, Faculty of Pharmacy, Department of Pharmaceutical Technology, 06560, Ankara, Turkey

ABSTRACT

Objective: *The objective of this study was to determine the knowledge, attitude, and practice towards the Novel Coronavirus Disease 2019 (COVID-19) and its vaccines among pharmacy students in Turkey.*

Material and Method: *A cross-sectional study was conducted among pharmacy students aged 18 years and older. Data collected from April 27 to June 27, 2022, via an online self-reporting questionnaire developed and validated by the investigators. Descriptive statistics were performed to determine potentially associated factors with knowledge, attitudes, and practices scores of the students.*

Result and Discussion: *Among the pharmacy students, the majority was female (72.6%) and mean ± standard deviation of age was 23.17 ± 3.27 years. The mean ± standard deviation of knowledge, attitude and practice scores were 8.25 ± 1.27, 7.47 ± 2.95, and 7.20 ± 2.14, respectively. A statistically significant association was found between students who received higher knowledge scores and being a senior student or a students from governmental universities. In general, students had good knowledge and practices about COVID-19 pandemic and vaccines. However, their attitudes towards COVID-19 pandemic and vaccines was poor. These findinds were found to be similar to those health care students from other countries.*

Keywords: *Attitudes, knowldege, pharmacy students, practice, survey*

∗ **Corresponding Author / Sorumlu Yazar:** Aysu Selcuk
e-mail / e-posta: aysuselcuk@ankara.edu.tr, **Phone / Tel.:** +903122033066

ÖZ

Amaç: *Bu çalışmanın amacı, Türkiye'deki eczacılık öğrencilerinin Yeni Koronavirüs Hastalığı 2019 (COVID-19) ve aşılarına yönelik bilgi, tutum ve uygulamalarını değerlendirmektir.*

Gereç ve Yöntem: *Eczacılık öğrencileri arasında 18 yaş ve üzeri olan bireylerle kesitsel bir çalışma yapılmıştır. 27 Nisan - 27 Haziran 2022 tarihleri arasında, araştırmacılar tarafından geliştirilen ve valide edilen bir çevrimiçi kişisel bildirim anketi aracılığıyla veriler toplanmıştır. Öğrencilerin bilgi, tutum ve uygulama puanları ile potansiyel olarak ilişkili faktörleri belirlemek için tanımlayıcı istatistiksel analizler yapılmıştır.*

Sonuç ve Tartışma: *Ankete katılan eczacılık öğrencilerinin çoğunluğu kadındı (%72.6) ve ortalama ± standart sapma yaşı 23.17 ± 3.27 idi. Bilgi, tutum ve uygulama puanlarının ortalama ± standart sapması sırasıyla 8.25 ± 1.27, 7.47 ± 2.95 ve 7.20 ± 2.14'tür. Daha yüksek bilgi puanları alan öğrenciler ile son sınıf öğrencisi veya devlet üniversitelerinden öğrenci olmak arasında istatistiksel olarak anlamlı bir ilişki bulunmuştur. Genel olarak, öğrencilerin COVID-19 hakkında iyi bilgi ve uygulamaları vardı. Ancak, COVID-19'a karşı tutumları zayıftı. Bu bulguların diğer ülkelerden gelen sağlık öğrencilerine benzer olduğu bulunmuştur.*

Anahtar Kelimeler: *Anket, bilgi, eczacılık öğrencileri, tutum, uygulama*

INTRODUCTION

The population worldwide is currently facing a serious health problesm called as The Novel Coronavirus Disease 2019 (COVID-19) pandemic, which is caused by a novel coronavirus [1]. The coronavirus is formely known as 2019-nCoV, the new strain named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [2]. The coronavirues causes the illness named COVID-19 [2,3]. One of severe outcomes of the COVID-19 is that it can cause a fatal effect on humans after its short time of detection [2]. It mainly spread through respiratory droplets [4]. So, the people got infected when they come in contact with infected patients' saliva and nose discharges [4]. Studies demonstrated that approximately 31% of patients infected with SARS-CoV-2 was asymptomatic while 40% of symptomatic patients had mild or moderate symptoms including fever, dry cough, myalgia, tiredness [3,5]. Nearly 15% of symptomatic patients had severe symptoms including chest pain, shortness of breath or difficulty of breathing, which requires oxygen support [3,5]. The critical conditions such as respiratory failure, acute respiratory distress syndrome, sepsis and septic shock, thromboembolism and multiorgan failure were experienced by nearly 5% of the patients [5]. The COVID-19 pandemic continues to impose burdens of disease and death as it severely disrupts societies and economies worldwide [6].

While waiting the development of direct treatments of the COVID-19, vaccination approach to overcome the disease became one of the solutions. Developing a vaccine for SARS-CoV-2 generally requires months to years [7]. Different vaccines are available including live attenuated virus, viral vectors, inactivated virus, subunit vaccines, recombinant DNA, and protein vaccines [7]. Nucleic acid, live attenuated virus, protein subunit and viral vector vaccines attempts were made as a solution to the SARS-CoV-2, of which there is no active cure. More than 60 vaccine candidates have been investigated against COVID-19, but they can probably have low efficacy due to existing immunity [8]. Vaccine studies are still ongoing today and some mRNA and inactivated vector vaccines are approved. Vaccines are predicted to reduce the COVID-19 damage on the global public health [9].

Besides fighting against the pandemic with the social distance, hygiene practices; dissemination of misinformation is also an issue with COVID-19. The misinformation can cause a wide range of negative effects in society, including in the scientific community and called an infodemic [6]. The infodemic is defined as the inability of people to access reliable and accurate information due to the prevalence of false information in times of crisis such as pandemics, earthquakes, and terrorist attacks, and the rapid spread of this false information [10]. Infodemic is a public health problem when it prevents people from accessing the appropriate guidance in times of crisis such as COVID-19 pandemic [6]. Increasing digitalization, i.e., the widespread use of social media and the internet may cause infodemia to spread more rapidly [10]. Infodemia can have a significant impact on the acceptance of a COVID-19 vaccine, which was the only hope prior to treatment [6]. This can also result in increased misinformation

and vaccine opposition. Therefore, knowledge, attitude, and practice (KAP) is an important function to eliminate risk from infodemia and to improve health prevention and promotion in public [4]. KAP can be targeted for a range of health behaviours and beliefs about COVID-19 pandemic, symptoms, treatment, and outcomes.

It is very important for the students, who constitute an important part of the society, to have accurate and up-to-date information and to have the desired behaviors and practices in the fight against the pandemic. Only a few published articles evaluate the KAP of students towards COVID-19. To the best of our knowledge, this is the first study to assess KAP of pharmacy students towards COVID-19 and vaccines. Thus, this study aims to determine the knowledge, attitude, and practice towards COVID-19 and its vaccines among pharmacy students in Turkey.

MATERIAL AND METHOD

A cross-sectional, online survey in the Google Docs platform was conducted among faculties of pharmacy in Turkey during the COVID-19 period on 27 April and 27 June 2022. Students were eligible if they were 18 years or older and studying in faculty of pharmacy. Students were invited to participate in the study and after the approval from the rectorship.

The survey was used a standardized approach which included the review of the literature, group discussion among the investigators, expert panel evaluation, pilot study, and the validation of the final questionnaire. The investigators developed the initial questionnaire based on literature search and their expertise and experienes. After the initial draft of the survey, 2 clinical pharmacists, 1 sociologist, 3 pharmacists specialized in medicine and vaccine technology participated in the expert panel to review the survey questions for content validity. In the expert panel, they were asked to evaluate each question in the questionnaire in terms of content and scope, and to state their opinions and suggestions, if any. As a result of the first panel, there was no need for a second and third panel, as panel recommendations were for minor editing in the questions. A pilot study was conducted among the pharmacy students to evaluate the questions in terms of content, scope and intelligibility. During the pilot study, 55 students were included and 93% of them evaluated the questions as clear and understandable. For reliability, Cronbach's Alpha values were calculated and were found to be 0.6. It is acceptable when the Cronbach's Alpha is equal or above 0.6.

The final questionnaire included a brief introduction about this study, the declaration of anonymity and confidentiality from researchers, and the confirmation of voluntary participation from students. The first session included 7 questions about the socio-demographic characteristics of the students and their vaccination status. The session for knowledge, attitudes and practice included 10, 12, and 10 questions respectively. The attitudes and practice questions were assessed based on the 5-point Likert scale.

Beside the knowledge, attitudes and practice questions, sociodemographic characteristics such as gender, age, history of vaccination and COVID-19 disease were collected.

The continuous variables were reported as mean (standard deviation) and categorical variables were reported as number (percentage). Statistical analyses were performed using IBM SPSS Statistics 21. A Chi Square or Fisher's Exact tests were performed among the variables. Statistically significant differences were considered when the p-value < 0.05.

RESULT AND DISCUSSION

A total of 383 pharmacy students participated in this study. The majority was female (72.6%) and mean ± SD age was 23.17 ± 3.27 years. More than half of them were fourth year students (46.5%). Almost all the students had at least one dose of COVID-19 vaccine (98.4%) and one-third were infected with COVID-19 disease at least one time (33.4%). Demographic characteristics of the students are presented in Table 1.

The majority of the students responded correctly that COVID-19 is spread through the respiratory tract (92.7%), there is no effective drug treatment for COVID-19 yet (at time of the study period, 82.5%), the elderly and those with chronic diseases are more likely to experience COVID-19 (97.4%), COVID-19 mRNA vaccines contain mRNA of the antibody-forming antigenic construct of the targeted virus

(89.8%), those who have the COVID-19 vaccine can get the disease (99.0%), and the COVID-19 vaccine is never administered to people who have had the disease (97.1%) (Table 2). The mean ± SD knowledge score was 8.25 ± 1.27 (range from 4-10).

Table 1. Demographics of the pharmacy students (n=383)

Variable	n (%)
Age, mean ± SD	23.17 ± 3.27
University	
Government	366 (4.4)
Private	17 (95.6)
Education year	
First year	26 (6.8)
Second year	41 (10.7)
Third year	83 (21.7)
Fourth year	178 (46.5)
Fifth year	55 (14.4)
Gender, Female	278 (72.6)
COVID-19 vaccine	
Yes	377 (98.4)
mRNA	295 (77.0)
Inactive	37 (9.7)
Both	45 (11.7)
Influenza vaccine	29 (7.6)
History of COVID-19 diagnosis	128 (33.4)

COVID-19: The Novel Coronavirus Disease 2019, SD: standard derivation.

Table 2. Knowledge of pharmacy students about COVID-19 and vaccines

Questions	True, n (%)	False, n (%)	Do not know, n (%)
1. The COVID-19 is spread through the respiratory tract.	355 (92.7)	20 (5.2)	8 (2.1)
2. There is no effective drug treatment for COVID-19 yet.	316 (82.5)	39 (10.2)	28 (7.3)
3. The elderly and those with chronic diseases are more likely to experience COVID-19.	373 (97.4)	7 (1.8)	3 (0.8)
4. Cold chain rules should be applied to both mRNA and inactivated COVID-19 vaccines.	276 (72.1)	49 (12.8)	58 (15.1)
5. The components used alongside the virus components to increase the safety and efficacy of COVID-19 vaccines are called adjuvants.	284 (74.2)	3 (0.8)	96 (25.1)
6. COVID-19 mRNA vaccines contain mRNA of the antibody-forming antigenic construct of the targeted virus.	344 (89.8)	10 (2.6)	29 (7.6)
7. COVID-19 vaccines should be administered intramuscularly to the deltoid muscle.	267 (69.7)	27 (7.0)	89 (23.3)
8. Those who have the COVID-19 vaccine can get the disease.	379 (99.0)	3 (0.8)	1 (0.3)
9. The COVID-19 vaccine is never administered to people who have had the disease.	6 (1.6)	372 (97.1)	5 (1.3)
10. COVID-19 vaccines can be administered together with other vaccines (such as the flu vaccine).	194 (50.7)	61 (15.9)	128 (33.4)

COVID-19: The Novel Coronavirus Disease 2019.

The majority of the students were likely to accept getting vaccinated by mRNA (72.3%) or inactive vaccines (76.5%). They were likely to trust mRNA (71.3%) or inactive vaccines (56.4%). More than half of them believed that COVID-19 disease would be defeated with vaccines (62.2%) or with medications (68.7%). The majority recommended getting vaccinated (82.8%). The institutions which more than half of students trusted were the Turkish Pharmacists Association (59.3%) or World Health Organization (58.2%) (Table 3). The mean ± SD attitudes score was 7.47 ± 2.95 (range from 0-12).

In general, students had good practices about COVID-19. Based on the responses to practice

questions, the majority indicated that they used a mask even after vaccination (83.4%), followed social distancing rules (82.7%) and hygiene rules such as washing hands and using hand sanitizers (92.1%), rules set by the faculty (85.1%) and self-isolations rules such as curfew (90.3%) (Table 4). The mean ± SD practice score was 7.20 ± 2.14 (range from 0-10).

Table 3. Pharmacy students' attitudes towards COVID-19 and vaccines

Questions	Strongly agree, n (%)	Agree, n (%)	Neutral, n (%)	Disagree, n (%)	Strongly disagree, n (%)
1. I avoid getting vaccinated because of the possible side effects of mRNA COVID-19 vaccines.	14 (3.7)	35 (9.1)	57 (14.9)	105 (27.4)	172 (44.9)
2. I avoid getting vaccinated because of the possible side effects of inactivated COVID-19 vaccines.	9 (2.3)	22 (5.7)	59 (15.4)	105 (27.4)	188 (49.1)
3. I do not trust inactivated vaccines used to prevent COVID-19.	32 (8.4)	54 (14.1)	82 (21.1)	87 (22.7)	129 (33.7)
4. I do not trust mRNA vaccines used to prevent COVID-19.	21 (5.5)	26 (6.8)	63 (16.4)	108 (28.2)	165 (43.1)
5. I believe that we will defeat the COVID-19 disease with vaccines.	119 (31.1)	119 (31.1)	80 (20.9)	35 (9.1)	30 (7.8)
6. I believe that we will defeat the COVID-19 disease with drug treatments that exist or will be discovered.	129 (33.7)	134 (35.0)	85 (22.2)	24 (6.3)	11 (2.9)
7. I recommend getting vaccinated to those around me.	239 (62.4)	78 (20.4)	44 (11.5)	10 (2.6)	12 (3.1)
8. I use aspirin when I get the COVID-19 vaccine.	43 (11.2)	39 (10.2)	89 (23.2)	79 (20.6)	133 (34.7)
9. The Ministry of Health Turkey is the institution I trust most about COVID-19 and vaccines.	83 (21.7)	94 (24.5)	113 (29.5)	54 (14.1)	39 (10.2)
10. The Turkish Pharmacists Association is the institution I trust most about COVID-19 and vaccines.	104 (27.2)	123 (32.1)	102 (26.6)	44 (11.5)	10 (2.6)
11. The World Health Organization is my most trusted institution for COVID-19 and vaccines.	107 (27.9)	116 (30.3)	104 (27.2)	31 (8.1)	25 (6.5)
12. The US Food and Drug Administration is my most trusted agency for COVID-19 and vaccines.	75 (19.6)	94 (24.5)	106 (27.7)	70 (18.3)	38 (9.9)

COVID-19: The Novel Coronavirus Disease 2019.

Table 4. Pharmacy students' practices about COVID-19 pandemic measures

Questions	Always, n (%)	Mostly, n (%)	Sometimes, n (%)	Rarely, n (%)	Never, n (%)
1. I report the side effects I have experienced after vaccination through the Hayat Eve Sığar (HES) application.	103 (26.9)	59 (15.4)	70 (18.3)	63 (16.4)	88 (23.0)
2. I continue to use a face mask after vaccination.	287 (74.9)	71 (18.5)	15 (3.9)	6 (1.6)	4 (1.0)
3. I follow social distancing rules to avoid COVID-19.	215 (56.1)	102 (26.6)	46 (12.0)	12 (3.1)	8 (2.1)
4. I avoid using public transport to prevent the spread of COVID-19.	47 (12.3)	36 (9.4)	97 (25.3)	102 (26.6)	101 (26.4)
5. I use a face mask to avoid COVID-19.	218 (56.9)	75 (19.6)	43 (11.2)	26 (6.8)	21 (5.5)
6. To avoid COVID-19, I periodically wash my hands with soap and water or use hand sanitizer.	259 (67.6)	94 (24.5)	24 (6.3)	4 (1.0)	2 (0.5)
7. I follow the other rules set by our faculty to avoid COVID-19 (for example, not making crowds in and out of the classrooms, airing the classroom before and after the lesson).	214 (55.9)	112 (29.2)	36 (9.4)	14 (3.7)	7 (1.8)
8. I follow up-to-date information about COVID-19.	140 (36.6)	126 (32.9)	87 (22.7)	26 (6.8)	4 (1.0)

Table 4 (*continue*). Pharmacy students' practices about COVID-19 pandemic measures

9. I follow up-to-date information about COVID-19 vaccines.	137 (35.8)	117 (30.5)	95 (24.8)	28 (7.3)	6 (1.6)
10. I implement measures such as curfew related to COVID-19.	287 (74.9)	59 (15.4)	26 (6.8)	7 (1.8)	4 (1.0)

COVID-19: The Novel Coronavirus Disease.

According to the statistical analysis, students who received higher knowledge scores from the questionnaire were more likely senior students [odds ratio (OR) (95% confidence interval (CI)= 2.15 (1.35-3.44), p<0.001], and from governmental universities [OR (95% CI) = 3.60 (1.35-9.64), p<0.007] (Table 5).

Table 5. Associations between pharmacy students' characteristics and the KAP scores

Variables	Knowledge			
	Poor Score ≤ 7	Good Score > 7	OR (95% CI)	p value
Female Male	68 (24.5%) 28 (26.7%)	210 (75.5%) 77 (73.3%)	1.12 (0.67-1.87) 1	0.657
Senior students (4th and 5th year) Junior students (3rd year or less)	45 (19.3%) 51 (34.0%)	188 (80.7%) 99 (66.0%)	2.15 (1.35-3.44) 1	0.001
Government university students Private university students	87 (23.8%) 9 (52.9%)	279 (76.2%) 8 (47.1%)	3.60 (1.35-9.64) 1	0.007
Variables	**Attitudes**			
	Poor Score ≤ 8	Good Score > 9	OR (95% CI)	p value
Female Male	150 (54.0%) 67 (63.8%)	128 (46.0%) 38 (36.2%)	1.51 (0.95-2.39) 1	0.083
Senior students (4th and 5th year) Junior students (3rd year or less)	127 (54.5%) 90 (60.0%)	106 (45.5%) 60 (40.0%)	1.25 (0.83-1.90) 1	0.290
Government university students Private university students	207 (56.6%) 10 (58.8%)	159 (43.4%) 7 (41.7%)	1.10 (0.41-2.95) 1	0.854
Variables	**Practice**			
	Poor Score ≤ 7	Good Score > 7	OR (95% CI)	p value
Female Male	124 (44.6%) 53 (50.5%)	154 (55.4%) 52 (49.5%)	1.27 (0.81-1.99) 1	0.304
Senior students (4th and 5th year) Junior students (3rd year or less)	104 (44.6%) 73 (48.7%)	129 (55.4%) 77 (51.3%)	1.18 (0.78-1.78) 1	0.440
Government university students Private university students	170 (46.4) 7 (41.2%)	196 (53.6%) 10 (58.8%)	0.81 (0.30-2.17) 1	0.670

CI: Confidence Interval, KAP: knowledge, attitudes and practice, OR: Odds Ratio.

Generally, almost all students had a high level of knowledge. The scores of senior pharmacy students were higher compared to those of junior pharmacy students. Similar to our study (74.9%), the knowledge towards COVID-19 among healthcare students in Saudi Arabia and Vietnam were 65.7% [11] and 86.6% [5], respectively. The knowledge scores of university students in Vietnam were 75.61% [12], while it was 85.3% (means score out of 22 questions was 18.76) among student nurses in Philippines [2]. Similarly, the majority of nursing students in Italy had good score for knowledge about COVID-19 (94.6%) [13]. However, the knowledge score was low among undergraduate medical students in Indonesia (29.8%) and health care students in China (28.3%) [14,15]. Compared to pharmacy

students in Turkey (8.25 ± 1.27), the medical students in Turkey had the lower means of the 10 questions on the COVID-19 knowledge questionnaire, which was 7.83 ± 1.27 [16].

In our study there were no differences in knowledge scores of male and female students. However, female students were more likely to have higher scores of KAP in a study conducted among the university students in Vietnam [5,12]. Several factors including age, sex, country of residence, school type, school year, family income and perceptual awareness on COVID-19 can affect their knowledge, attitude, and/or practice toward COVID-19 [14].

Regarding attitudes towards COVID-19 and vaccines, the percentage of students who received higher scores from the attitudes questions was poor (43.3%). It was lower than those students from Vietnam (68.8% and 98.4%), China (67.8) and Italy (90.6%) [5,12,13,15]. The percentage of students who received higher scores from practice questions was moderate with 53.8% in our study. It was similar to the health care students from China (58.6%) [15]. However, health care students from Vietnam had higher percentage for positive practices about COVID-19 (94.9%) [12]. Nursing students from Italy (88.9%) had better practices about COVID-19 [13] compared to the pharmacy students in Turkey (43.3%).

Although the attitude towards COVID-19 pandemic was poor, there were some good elements of attitudes and practice. For example, students stated that they recommended getting vaccinated to those around them (83%), followed social distancing rules (83%), wore a face mask (77%), periodically washed their hands with soap and water or use hand sanitizer (92%) and followed the other rules set by their faculties to avoid COVID-19 (85%).

The most trusted agencies about COVID-19 and vaccines among the pharmacy students were the Turkish Pharmacists Association (60%), the World Health Organization (58%), and the Ministry of Health Turkey (46%), respectively. Thus, pharmacy students were likely to search for information from these agencies during the pandemic. It was also in line with the students' responses that they follow up-to-date information about COVID-19 (70%) and vaccines (66%).

There were several limitations of this study. The students participated voluntarily and not all pharmacy faculties in Turkey were invited. Therefore, the generaliazibility of the findings may not be applicable. Due to having enough sample size and participation from each selected faculties, the results of this study are still valuable. Since, the study was designed as cross sectional, we were not able to assess the impact of variables such as panic and anxiety about COVID-19 on the students' responses. There was also a risk for reporting bias as it was a self-reported questionnaire.

The results of this study showed that there is a great need for educational interventions about COVID-19 pandemic and vaccines. Although majority had a good knowledge score, the knowledge did not seem to be enough to change their attitudes and practices. The interventions must focus not only knowledge but also to improve attitudes and practice of the students. This also reflects the new curriculum need for pharmacy students where they can learn communicable diseases more and have further information about COVID-19 vaccines to have positive attitudes and practice.

ACKNOWLEDGEMENTS

AUTHOR CONTRIBUTIONS

Concept: A.S., A.B.; Design: A.S., A.B.; Control: A.S., A.B.; Sources: A.S., A.B.; Materials: A.S., A.B.; Data Collection and/or Processing: A.S., A.B.; Analysis and/or Interpretation: A.S., A.B.; Literature Review: A.S., A.B.; Manuscript Writing: A.S., A.B.; Critical Review: A.S., A.B.; Other: -

CONFLICT OF INTEREST

The authors declare that there is no real, potential, or perceived conflict of interest for this article.

ETHICS COMMITTEE APPROVAL

The Ethics Committee for Human Research of Ankara University is approved the study (Date: January 1, 2022, Decision No: 01/08).

REFERENCES

1. Sakr, S., Ghaddar, A., Sheet, I., Eid, A.H., Hamam, B. (2021). Knowledge, attitude and practices related to COVID-19 among young Lebanese population. BMC Public Health, 21(1), 653. [CrossRef]

2. Quisao, E.Z.S., Tayaba, R.R.R., Soriano, G.P. (2021). Knowledge, attitude, and practice towards COVID-19 among student nurses in Manila, Philippines: A cross-sectional study. Belitung Nursing Journal, 7(3), 203-209. [CrossRef]

3. World Health Organization. (2020a). Rolling updates on coronavirus disease. Available at: https://www.who.int/emergencies/dise   ases/novel-coronavirus-2019/events-as-they-happen.   Accessed date: 05.11.2022.

4. Getawa, S., Aynalem, M., Bayleyegn, B., Adane, T. (2022). Knowledge, attitude and practice towards COVID-19 among secondary school students in Gondar town, Northwest Ethiopia. PloS One, 17(5), e0268084. [CrossRef]

5. Le An, P., Huynh, G., Nguyen, H.T.N., Pham, B.D.U., Nguyen, T.V., Tran, T.T.T., Tran, T.D. (2021). Knowledge, attitude, and practice towards COVID-19 among healthcare students in Vietnam. Infection and Drug Resistance, 14, 3405-3413. [CrossRef]

6. Gölbaşı, S.D., Metintaş, S. (2020). COVID-19 Pandemisi ve infodemi. ESTÜDAM Halk Sağlığı Dergisi, 5(COVID-19 Özel Sayısı), 126-137.

7. Belete, T.M. (2020). A review on promising vaccine development progress for COVID-19 disease. Vacunas, 21(2), 121-128. [CrossRef]

8. Soleimanpour, S., Yaghoubi, A. (2021). COVID-19 vaccine: Where are we now and where should we go? Expert Review of Vaccines, 20(1), 23-44. [CrossRef]

9. Ita, K. (2021). Coronavirus Disease (COVID-19): Current status and prospects for drug and vaccine development. Archives of Medical Research, 52(1), 15-24. [CrossRef]

10. World Health Organization. Infodemic. Available at: https://www.who.int/health-topics/infodemic#tab=tab_1. Accessed date: 05.11.2022.

11. Mohsin, S.F., Agwan M.A., Alsuwaydani, Z.A. Knowledge towards COVID-19 among healthcare students in the central region of Saudi Arabia. Postgraduate Medical Journal, 97(1149), 448-451. [CrossRef]

12. Doan, D.A., Ho, H.H., Tran, L.D., Nguyen, P.L., Le, A.T.L., Dinh, D.X. (2022). Knowledge, attitudes, and practices of university students regarding COVID-19: A cross-sectional study in Vietnam. BMC Public Health, 22(1), 2016. [CrossRef]

13. Santangelo, O.E., Provenzano, S., Armetta, F., Pesco, G., Allegro, A., Lampasona, M., Terranova, A., D'Anna, G., Firenze, A. (2021). Knowledge, attitudes and practices towards COVID-19 among nursing students of the University of Palermo: Results from an online survey. Journal of Preventive Medicine and Hygiene, 62(2), 270-276. [CrossRef]

14. Adli, I., Widyahening, I.S., Lazarus, G., Phowira, J., Baihaqi, L.A., Ariffandi, B., Putera, A.M., Nugraha, D., Gamalliel, N., Findyartini, A. (2022). Knowledge, attitude, and practice related to the COVID-19 pandemic among undergraduate medical students in Indonesia: A nationwide cross-sectional study. PloS One, 17(1), e0262827. [CrossRef]

15. Zhang, J., Yin, Y., Dean, J., Zhang, X., Zhang, Y., Wang, J., Zhang, Y. (2021). Knowledge, attitude, and practice survey of COVID-19 among healthcare students during the COVID-19 outbreak in China: An online cross-sectional survey. Frontiers in Public Health, 9, 742314. [CrossRef]

16. Yakar, B., Öztürk Kaygusuz, T., Pirinçci, E., Önalan, E. Ertekin, Y.H. (2020). Knowledge, attitude and anxiety of medical students about the current COVID-19 outbreak in Turkey. Family Practice and Palliative Care, 5(2), 36-44. [CrossRef]