



## RESEARCH PAPER

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## Knowledge, preventive behaviors, and risk perception related to COVID-19 among the University students in Sindh Province, Pakistan

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**Key words:** COVID-19, Knowledge, Sindh, University students

<http://dx.doi.org/10.12692/ijb/19.2.230-239>

Article published on August 30, 2021

### Abstract

**Background:** - A pandemic due to the novel virus coronavirus disease 19 (COVID-19) began from Wuhan, China in December 2019. **Objective:** - The purpose of present study was to investigate the knowledge, preventive behaviors, and risk perception among university students in Sindh, Pakistan. **Method:-** This was an online cross-sectional study conducted from 5<sup>th</sup> to 28<sup>th</sup> of November 2020. The total number of university students was 483 from different universities of Sindh. An online questionnaire was designed using google form. Online Questionnaire link shares with university students through teachers, Whatsapp groups, and Facebook groups. The questionnaire comprised twenty-five items out of them COVID-19 related knowledge thirteen items, Eight items related to practice behaviors, and four items about risk perceptions. **Results:** - The results show that 92% average correct answers of university students about knowledge and 90.5% had a high level of COVID-19 knowledge. A large population of 94.8% follows a high level of practice behaviors. 94.7% of University students average performance in practice behavior. In the risk perception section, the majority of students believed that their family and friends have a higher-risk of COVID-19 than themselves. There was a significant correlation found between COVID-19 related knowledge, self-reported preventive behaviors, and risk perceptions. **Conclusion:-** The study concluded that university students were found with a high level of related knowledge related to COVID-19 and high performance in practice behaviors and a moderate level of risk perception.

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## Introduction

COVID-19 has been first reported as a cluster of pneumonia cases of unknown etiology from Wuhan, Hubei, Mainland China on 8<sup>th</sup> December 2019 (S. Khan *et al.*, 2020). Severe Acute Respiratory Syndrome coronavirus-2 (SARS-CoV-2) are positive-stranded RNA viruses. It is revealed from the gene sequencing that SARS-CoV-2 viruses belong to the family *Coronaviridae* and the *Nidovirales* order (Habibzadeh and Stoneman 2020). The first name of this virus was 2019-nCoV and then changed it as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) given by the Coronavirus Study Group (CSG) of the International Committee on Taxonomy of Viruses (Baker *et al.*, n.d.). The virus spread through one of the most important routes of transmission on which health care professionals and scientists agreed, the mode of transmission is direct contact of human-to-human and via respiratory droplets (Lai *et al.* 2020).

The SARS-Cov-2 also shows symptoms like other family members such as clinical symptoms of COVID-19 are dry cough, fever which was seen in 99% of infected people, dyspnea, and on imaging bilateral patchy (Huang *et al.* 2020; Lai *et al.*, 2020). On 26 February 2020, the first case of COVID-19 was reported in Karachi, Pakistan (Government of Pakistan. 2020). Due to the unavailability of vaccine and antiviral drugs the second wave started in Europe (Looi 2020) and Pakistan. On 28 October 2020 Government of Pakistan announced the second wave of COVID-19 in-country (Junaidi I. 2020).

In a study conducted in Punjab province on health professionals, the knowledge level in participants was 75%. While attitude in health professionals was 86.5% and 73.4% of health professionals engaged in practices of preventive behaviors (Salman, Mustafa, Asif, Zaidi, Shehzadi, *et al.*. 2020). Another study in Punjab province reported that 50% of university students knowing COVID-19, 65.4% of university students found with a positive attitude, and 36.5% of university students were following the preventive practices (Salman, Mustafa, Asif, Zaidi, Hussain, *et al.*. 2020).

The aim of the current study to found out the COVID-19 related knowledge, preventive behaviors, and risk perception among university students in Sindh province, Pakistan. In case of not proper knowledge about COVID-19 in university students can cause of increase their anxiety and stress and maybe they not work properly in their daily life. It is also possible or chances that they also a carrier of disease without a practice of preventive behaviors and risk perception. So it is necessary that to investigate the pandemic disease-related knowledge, practice behaviors, and risk perception in university students because currently pandemic is continuing worldwide and this is a time to try reduce the level of cases as much as possible because in Pakistan day-by-day cases increasing in university students and this situation is very alarming for the government as well as for people.

## Materials and methods

The goal of current study to investigate the knowledge, practice behaviors, and risk perception related to the COVID-19 pandemic among the university students of Sindh province, Pakistan. This was an online cross-sectional study. University students currently enrolled in university were participants of the study. This study population was calculated by the Raosoft sample size calculator. The estimation based on population and answer distribution of 50 percent, the 483 was required sample size with 95 percent confidence level and an error margin of 5 percent.

An online questionnaire (English language) was used in this study to assess the knowledge, preventive behaviors, and risk perception among university students. This study was conducted from 5<sup>th</sup> to 28<sup>th</sup> of November 2020. In this study, an online questionnaire was used to abide by government rules. Because during the outbreak government implemented strict rules in the country included 2-meter distance, wearing a mask, and close contact precautions.

## Measures

The questionnaire is divided into four parts demographic information, knowledge, preventive behaviors, and risk perceptions related to COVID-19.

### *Demographic information*

Age, gender (male, female and other), the resident (City/village) source of education (WHO, Media (Tv channel, radio, etc)), Social media and others.

### *COVID-19 Related-Knowledge*

The knowledge questions related to COVID-19 were adopted from previous studies about MERS (Kim and Choi 2016; M. U. Khan *et al.*, 2014), and COVID-19 (McIntosh, Hirsch, and Bloom 2020; Soltan, El-Zoghby, and Salama 2020; Taghrir, Borazjani, and Shiraly 2020). Thirteen questions were assessed in this section. These knowledge questions about pandemic disease were previously reliable and validated in various studies (Aker and Midik 2020; Taghrir, Borazjani, and Shiraly 2020; Soltan, El-Zoghby, and Salama 2020). This section contains 3 items about basic science and etiology of COVID-19, 2 items included about incubation period and symptoms, 2 items related to the route of transmission, 1 item related to diagnoses of COVID-19, 1 item about suspicious cases referring and 4 items of specific and public prevention. If a student responds 'yes' its weightage was 1 and if 'no' its weightage was 0. The knowledge-related score is calculated by summing the correct responses to the items and then convert the calculated score into a percentile. A level of knowledge designed as high, moderate, and low level with  $\geq 75\%$ , 50-75%, and  $\leq 50\%$ , respectively (Soltan, El-Zoghby, and Salama 2020; Taghrir, Borazjani, and Shiraly 2020).

### *Self-reported Preventive Behaviors*

Practice behavior section based on 8 items that were already used in previous studies (Kim and Choi 2016; Taghrir, Borazjani, and Shiraly 2020). These items were reliable and validated (Kim and Choi 2016; Soltan, El-Zoghby, and Salama 2020; Taghrir, Borazjani, and Shiraly 2020). Items of this section, 1 item about practice behavior during coughing, 4 items were included about avoiding a visit to public places in the routine, 2 items related with frequent hand washing and disinfectant the surface area, and the last item included about the closely talking with people. The score is assigned to items and each item has 1 point for the 'yes' response and 0 points for 'no'.

Practice behavior total score was ranged from zero to eight. This total score converted into a percentile. If a university student obtains a score above  $> 75\%$  then he/she is considered as a high level of practice behaviors and if a university student obtains  $< 75\%$  then he/she is considered as low level of practice behaviors (Soltan, El-Zoghby, and Salama 2020; Taghrir, Borazjani, and Shiraly 2020).

### *Risk Perception*

Items added in this section were reliable and validated and were used in previous studies, (Kim and Choi 2016; Taghrir, Borazjani, and Shiraly 2020; Ding *et al.*, 2020). 4 items were included in this section for the measurement of risk perception among university students about COVID-19. Items were assigned a score using a Likert-type scale from 1 to Never and 4 to strongly agree. For reducing the bias, a Likert-type scale (4-point) was used for university students. The risk perception item's score and the total score is calculated in mean and standard deviation. The range of sum score is from 4-16. The level of the score for risk perception is set as the mean score of 4-7 as low, 8-10 as moderate, and 11-16 considered as high-risk perception.

### *Data Collection*

An online designed questionnaire using Google form was used for the data collection. The online questionnaire link was shared with students through teachers, Facebook groups, and Whatsapp groups. The university students were motivated to share the survey form link to other colleagues if they want. When university students click on the link, they were directed to the survey form. Where several questions appear, to which the university students respond. This study was not required any ethical approval.

### *Data Analysis*

In Microsoft Excel 365, data was entered. Statistical Package for Social Science (SPSS 26.0) (IBM, Armonk, NY, USA) was used for the data analysis. Mann-Whitney test and Pearson correlations test computed. For categorical variables, frequencies, and percentages were computed. The mean and standard deviation (SD) were computed for the descriptive data.

## Results

The total number of university students in this study were 483. The university students' mean age was 20.56 years. Out of 483 university students, 246 (50.9%) were male university students and 237 (49.1%) were female university students. Covid-19 related knowledge and practice behaviors were significantly different between male and female university students ( $P < 0.05$ ). Knowledge related to COVID-19 and practice behavior were higher found in female university students. Among participants, 266 (55.1%) students were living in urban areas and 217

(44.9%) students were living in rural areas. Education of Covid-19 was received by a large population of university students 423 (87.6%). For university students who had or had not to get an education related to COVID-19, significant differences were found between them ( $P < 0.05$ ). University students' sources of education were WHO, Media (TV channels, radio, etc), social media, and Others Table 1. There was a significant difference amongst them ( $P < 0.05$ ). Further demographic information is shown in Table 2.

**Table 1.** Differences in Major Variables According to Demographics, Using Mann-Whitney Test (N = 483).

Variables	Characteristic	Number (%)	Related Knowledge Range 0–100		Preventive Behaviors Range 0–100		Risk Perception Range 1–16	
			Mean ± SD	U	Mean ± SD	U	Mean ± SD	U
Gender	Male	246 (50.9%)	89±13.2	25110	93.1±15.6	25171	9.2±2.5	26393
	Female	237 (49.1%)	92.8±9		96.4±9.7		9.5±2.1	
Resident	Urban	266 (55.1%)	91.6±10.2	27566	95.4±11.9	28146	9.2±2.1	25937
	Rural	217 (44.9%)	89.9±12.8		94±14.4		9.6±2.6	
Received education about COVID-19?	Yes	423 (87.6%)	92.1±10.6	6450	95.3±12.8	9775	9.4±2.3	11245
	No	60 (12.4%)	82.1±13.6		90.6±14.3		8.9±2.6	

M, mean; SD, standard deviation; U, Mann-Whitney U value; COVID-19, Coronavirus disease 2019.

<sup>a</sup>Investigated only for those who received education of COVID-19, <sup>\*\*</sup>significant at level of  $P < 0.001$ ; <sup>\*</sup>significant at level of  $P < 0.05$ .

**Table 2.** The source of information about education of COVID-19.

Variable	Yes	P value
WHO	49 (10.1%)	<.05
Media (Tv Channels, Radio etc)	98 (20.3%)	
Social Media	162 (33.5%)	
Others	174 (36%)	
Total	483 (100%)	

WHO, World Health Organization

Significant at level of  $P < 0.05$

Risk perception was found significantly different in those students who were living in urban areas and

those who live in rural areas at the level of  $P < 0.05$ . Female students were found with higher risk perception as compared to male students Table 1. In the COVID-19 related knowledge section, University students' average response was 92%. University students show a high, moderate, and low level of related knowledge with 90.5%, 39%, and 1.4%, respectively. Two items secured the lowest score; the first item is about the origin of COVID-19 and the second related to the diagnostic test secured the score of 78.1% and 86.5%, respectively. Items related to knowledge of COVID-19 were shown in Table 3.

**Table 3.** Level of COVID-19 Related Knowledge.

Items (True or False)	Correct Answer Rate (Range 0 – 100%)
COVID-19 is a respiratory infection caused by a new species of coronavirus family. (T)	88%
The first case of COVID-19 was diagnosed in Wuhan, China. (T)	99.2%
The origin of COVID-19 is not clear but it seems that it has been transmitted to human by sea foods, snakes or bats. (T)	78.1%
Its common symptoms are fever, cough and shortness of breath but nausea and diarrhea were reported rarely. (T)	92.1%
Its incubation period is up to 14 days with a mean of 5 days. (T)	91.3%

Items (True or False)	Correct Answer Rate (Range 0 – 100%)
It can be diagnosed by PCR test on samples collected from nasopharyngeal and oropharyngeal discharge or from sputum and bronchial washing. (T)	86.5%
It is transmitted through respiratory droplets such as cough and sneeze. (T)	96.1%
It is transmitted through close contacts with an infected case (especially in family, crowded places and health centers). (T)	95.4%
The disease can be prevented through handwashing and personal hygiene. (T)	97.7%
A medical mask is useful to prevent the spread of respiratory droplets during coughing. (T)	95.5%
The disease can be prevented through no close contacts such as handshakes or kissing, not attending meetings and frequent hand disinfection. (T)	90.3%
All people in society should wear masks. (T)	93.6%
If symptoms appear within 14 days from direct contact with a suspected case, the person should inquire at a nearby public health center. (T)	96.6%
Total	92%

T, True; COVID-19, Coronavirus Disease 2019.

In the section on practice behaviors, the average response of university students was 94.7%. Most (94.8%) of university students responded that they were involved in the practice of preventive behaviors and only 5.2% respond low level of practice behavior. In this section, (91.1%) was the minimum score of the item 'canceled or postponed meeting' Table 4. Items are present in Table 4.

**Table 4.** Practicing Preventive Behaviors.

Items (Yes or No)	% of yes
I cancelled or postponed meetings with friends, eating-out and sport events.	91.1%
I reduced the use of public transportation.	94%
I went shopping less frequently.	93.6%
I avoided coughing around people as much as possible.	97.5%
I avoided places where a large number of people are gathered.	94.6%
I increased the frequency of cleaning and disinfecting items that can be easily touched with hands (i.e. door handles and surfaces).	95%
I washed the hands more often than usual.	97.5%
I discussed COVID-19 prevention with my family and friends.	94.4%
Total	94.72%

COVID-19, Coronavirus disease 2019.

In the risk-perception section, the average response rate of university students was mean 9.4 out of 16. This mean score was moderate. University students in this section had high, moderate, and low levels of risk perception

with (31.1%), (56.7%), and (12.2%), respectively. 'fear of COVID-19' item secured the least score mean of 1.9 Table 5. Other items are shown in table 5.

**Table 5.** Risk Perception of COVID-19.

Item	Mean ± SD (Possible Range 1 – 4 )
I may become infected with COVID-19 more easily than others.	1.9 ± 1.1
I am afraid to be infected with COVID-19	2.4 ± 1
Fear of losing your relative	2.6 ± 1
How scared are you that a relative will catch the coronavirus disease (COVID-19)?	2.5 ± 1
Total	9.4 ± 2.3 (possible range = 4 – 16)

M, mean; SD, standard deviation; COVID-19, Coronavirus disease 2019.

**Table 6.** Correlation between COVID-Related Knowledge, Preventive Behavior and Risk Perception among university students.

Variables	Related-Knowledge		Preventive Behaviors		Risk Perception	
	R	P value	R	P value	R	P value
Related-knowledge	1	-	0.413**	0.001	0.208**	0.001
Preventive behaviors	0.413**	0.001	1	-	0.123**	0.007
Risk perception	0.204**	0.001	0.171**	0.001	1	-

Pearson correlation, r

\*Statistically significant ( P < 0.05)



A significantly moderate association present between Knowledge and practice behaviors ( $r = 0.413^{**}$  and  $P < 0.001$ ) and the significantly low correlation between preventive behaviors and risk perception ( $r = 0.204^{**}$   $P < 0.001$ ) Table 6.

### Discussion

The study was designed to examine the level of COVID-19 related knowledge, self-reported preventive behaviors, and risk perception among university students. According to our best knowledge, first-time such study conducted among the university students to discuss such aspects in Sindh province, Pakistan.

This study result shows that the average correct response of university students was 92% and 90.5% of the university students found with high COVID-19 related knowledge. Previously studies reported a lower average of the correct response of the medical students was 78.3%, 74%, 80.9%, and 87% (YAKAR *et al.*, 2020; Modi *et al.*, 2020; Soltan, El-Zoghby, and Salama 2020; Taghrir, Borazjani, and Shiraly 2020). The present study results much higher than previous studies reported a lower score for those medical participants who had a high level of COVID-19 related knowledge with 50.2%, 79.6%, 73.5%, and 78.3% (Salman, Mustafa, Asif, Zaidi, Hussain, *et al.* 2020; Soltan, El-Zoghby, and Salama 2020; Taghrir, Borazjani, and Shiraly 2020; YAKAR *et al.*, 2020).

Most university students were familiar with COVID-19 related knowledge. Approximately 99.2% of university students correct response to the identified nCOVID-19 origin and about the incubation period 91.3% of university students provided the correct response. Taghrir *et al* and Soltan *et al* reported lower results in their studies, 95.4% and 94.7% of medical students answered this item while about incubation period 85.4% and 91.5% of medical students provide the right answer (Taghrir, Borazjani, and Shiraly 2020; Soltan, El-Zoghby, and Salama 2020). A study reported that 36.4% of health care workers provide a correct response about 2-14 days incubation period (Bhagavathula *et al.*, 2020). Previous studies conducted in Iran, Pakistan, and China reported 85.4%, 96.3%, and 66.4% correct answers related to

the incubation period of COVID-19, respectively (Saqlain *et al.*, 2020; Zhong *et al.*, 2020; Taghrir, Borazjani, and Shiraly 2020). The identification of suspected cases at an early stage would be possible with the incubation period information. Most university students (96.1%) were well familiar with the route of transmission of SARS-CoV-2). Previous studies' results were high to present study results, Taghrir *et al*, Zhong BL *et al*, Soltan *et al*, Bhagavathula and Abdelhafiz *et al*, reported that 92.9%, 98.9%, 94.3%, 95.9%, and 39% of participants responds correctly to the mode of transmission of nCOVID-19 (Taghrir, Borazjani, and Shiraly 2020; Zhong *et al.*, 2020; Soltan, El-Zoghby, and Salama 2020; Abdelhafiz *et al.*, 2020; Bhagavathula *et al.*, 2020). 97.5% of university students knew about prevention methods like washing hands and personal hygiene. This study results higher than previous studies conducted in Pakistan, Iran, and Egypt. In their studies, Pakistani, Iranian, and Egyptian medical students reported 89.4%, 93.8%, and 92.2%, respectively. (Taghrir, Borazjani, and Shiraly 2020; Soltan, El-Zoghby, and Salama 2020; Salman, Mustafa, Asif, Zaidi, Hussain, *et al.*, 2020). Another item in this study responds to most of the university students 96.6%, item related with 'report nearby hospital if in a person symptoms appear within 14 days after contact with a suspected case'. These results were very higher than Iranian medical students 73.8% and Egyptian medical students 80.2% gave the correct response of this item (Taghrir, Borazjani, and Shiraly 2020; Soltan, El-Zoghby, and Salama 2020).

In this study, 78.1% lower number of university students knew about the origin of COVID-19. This item obtained a minimum score in the knowledge section. Similar results reported in Egypt, the study conducted on the medical students (Taghrir, Borazjani, and Shiraly 2020) while these results lower than the study conducted in Iran on medical students 82.5% provide the correct answer to this item (Soltan, El-Zoghby, and Salama 2020). These results are similar to Egypt medical students (Soltan, El-Zoghby, and Salama 2020) and lower than Iranian medical students, the study reported 82.5% of students

responded to this question (Taghrir, Borazjani, and Shiraly 2020). And 80% response right answer to “COVID-19 is a respiratory infection caused by a new species of coronavirus family.”. Soltan *et al.* and Taghrir *et al.* stated higher results, in their studies, 94.7% of Egyptian medical students and 95.4% of Iranian medical students responded with the correct answer to this item (Taghrir, Borazjani, and Shiraly 2020; Soltan, El-Zoghby, and Salama 2020). Hence, university students need to increase their knowledge of COVID-19.

While 96.1% of the university students were well familiar with the route of transmission of COVID-19 via respiratory droplets and disease also transfer from others. This result is in similarity to that found among the Ugandan medical students (99%) (Olum *et al.* 2020) and Egyptian medical students 94.5% (Soltan, El-Zoghby, and Salama 2020) but is more than that reported by the Taghrir *et al.* in their study 92.9% Iranian medical students agreed with the disease spread through airborne or respiratory droplets are the major resources of transmission while 89.6% of medical students agreed that disease transmitted via close contact with a suspected person (especially in friends, family, gatherings, health centers and hospitals or health centers (Taghrir, Borazjani, and Shiraly 2020).

This study revealed in the section of self-reported behaviors that 94.7% was the average score of university students in practice behavior. Mostly 94.8% of university students were a high level of performance in practice behaviors and a minority 5.2% of university student's performance was low in practice behavior. These similar results reported by Taghrir *et al.*, 94.2% had a high level of performance in preventive behaviors among medical students and a study conducted in Egypt, 92% of the medical students were practicing preventive behaviors (Taghrir, Borazjani, and Shiraly 2020; Soltan, El-Zoghby, and Salama 2020).

In the section on practice behaviors, 97.5% of university students showed that they were avoided coughing around people as much as possible and

washed hands than usual. 95% of university students also showed that they frequently clean and disinfecting items. 94% of university students reduce shopping, cancel or postponed events, and avoided such places where a large number of people present. WHO demonstrates in their guidelines 2-meter distance, wear a mask, frequently wash hands, avoid coughing in a crowded area, and reduce public transport and cancel or postponed the events or gatherings?

Positive attitude levels of university students against the epidemic were found sufficient. COVID-19 reported the first cases in Pakistan since February 26, 2020, to protect them from disease Ministry of Health has drawn attention to the importance of personal hygiene and social isolation. Reducing the spread of the outbreak and the Pakistan Ministry of Health has proposed SOPs to follow to all individuals and all citizens to be protected from diseases and the public spotlight has talked about the importance of complying with these rules. The high attitude scores of the university students suggested that the rules proposed by the Pakistan Ministry of Health and WHO were followed.

Regarding the student's risk perception, 56.7% had a moderate level of risk perception. These results were higher than Iranian medical students 32.9% had a moderate level of risk perception. In this section, our study revealed that mean scores were higher found in items ‘Fear of losing your relative’, ‘How scared are you that a relative will catch the coronavirus disease (COVID-19)?’ than ‘I am afraid to be infected with COVID-19’ it means that university students worried that their family member and relatives were at higher risk of COVID-19 infection than themselves.

A study conducted in China in which 85.1% of college students believed that their family members were infested with COVID-19. On the other hand, only a minority of college students thought that there were more likely chances of infected from COVID-19 (Ding *et al.* 2020). Most of the college students present at home, and their family members may have come in close contact with the people at the work and they return to home for taking care of the family, that's

why college students think that their family members more at risk of COVID-19 and their own risk of COVID-19 is lower. While another possibility is that COVID-19 infected older people more rapidly and severely after infection occurs. So students of college may be more nervous about their elderly family members and parents than themselves. The third possible reason is that college students lack the subjective feeling of control over their parents' behavior. The measures reducing the feeling of control may increase their risk perception (Van and Van 2000).

It is confirmed from the research and literature that COVID-19 is known as one of the most disastrous diseases of the decade. Due to COVID-19 many morbidities and fatalities globally are still happening constantly per day (Wadood *et al.*, 2020).

Our study revealed that university students received information about COVID-19 WHO 10.1%, news media 20.3%, social media 33.5%, and other resources 36%. A previous study reported that (87.68%) Pakistani healthcare professional's source of COVID-19 information was social media. (Saqlain *et al.*, 2020) Yakar *et al.* and Kushalkumar *et al.* also reported that 66.8% and 65.2% of students' resource of information was social media, respectively (YAKAR *et al.*, 2020; Gohel *et al.*, 2020). Currently, social media is the biggest source of information about COVID-19. Because the majority of people use Facebook, Twitter, and Whatsapp. While on social media like Facebook, Twitter, and Whatsapp large of the wrong information circulating about COVID-19 and misguided the people. Now focus on providing authentic information to healthcare professionals and also local people as they prevent disease.

In this study, it is also found that the level of knowledge and practice behaviors significantly higher found in female university students as compared to male university students ( $P < 0.05$ ). Hend *et al.* reported similar results where female knowledge score was significantly higher than male students. Yakar *et al.* result were contrary to the present study, the study reported that male knowledge related to COVID-19 significantly higher than female university

students (YAKAR *et al.*, 2020) Other cross-sectional studies like Taghrir *et al* and Modi *et al.* stated that there was no significant relationship between knowledge and sex (Modi *et al.*, 2020; Taghrir, Borazjani, and Shiraly 2020).

This study results indicated that female university students were more aware of COVID-19 and they follow the prevention precautions as recommended by health professionals.

The study also shows that those participants who get education about COVID-19 had significantly higher knowledge, preventive behavior, and risk perception with a level of  $P < 0.05$ . Previous study results match with our results (Olum *et al.*, 2020). Taghir *et al.* reported that there was no significant differences were present between those students who get the education and those who do not get education about COVID-19 (Taghrir, Borazjani, and Shiraly 2020). The association between Knowledge and practice behaviors moderate significant ( $r = 0.413^{**}$  and  $P < 0.001$ ) and the significant low correlation between preventive behaviors and risk perception ( $r = 0.204^{**}$   $P < 0.001$ ). Soltan *et al.* reported that correlation between knowledge and practice behaviors moderate significant while Taghrir *et al.* reported a negative significant association between risk perception and practice behaviors.

### Conclusion

University students in Sindh, Pakistan have a high level of knowledge, practice behaviors related to the pandemic virus, and a moderate level of risk perception.

### Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

### Conflict of interest

The authors declare that they have no conflict of interest.

### Ethical statement

This study not required any ethical approval.



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