



Research article

Self-learning on COVID-19 among medical students in Bhutan:
A cross-sectional studyThinley Dorji^{a,b,*}, Saran Tenzin Tamang^c, T.V.S.V.G.K. Tilak^a^a Department of Internal Medicine, Armed Forces Medical College, Maharashtra University of Health Sciences, Pune, India^b Kidu Mobile Medical Unit, His Majesty's People's Project, Thimphu, Bhutan^c Faculty of Postgraduate Medicine, Khesar Gyalpo University of Medical Sciences of Bhutan, Thimphu, Bhutan

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ABSTRACT

Background: Bhutan lacks a medical school and all medical students are trained in Sri Lanka, Bangladesh and India. When the COVID-19 pandemic led to the closure of medical schools in these countries in March–April 2020, the medical students were repatriated to Bhutan. Upon return, they were kept in government-sponsored facility quarantine for 21 days. This study assessed their knowledge on COVID-19 as a part of self-learning and their attitude towards participation in government's health response to COVID-19.

Methods: This was a cross-sectional study among medical students who had returned to the country. The survey was conducted through an online questionnaire while the students were in facility quarantine. The sample size calculated was 129 and convenient sampling was used. Knowledge was assessed using 20 questions, each scored 1/20. Knowledge was considered “good” if the cumulative score was $\geq 80\%$, “satisfactory” if ≥ 60 –79% and “poor” if $< 60\%$. Correlation between knowledge score and duration of clinical clerkship was tested using Pearson's correlation coefficient. Attitude of students towards their willingness to participate in the national COVID-19 response was tested using rating scales. Data were analysed using Stata 13.1.

Results: 120 medical students responded to the survey (response rate = 93%). Eighty-eight (74%) had good knowledge, 28 (23%) had satisfactory knowledge and only four (3%) had poor knowledge on COVID-19. The students scored high on the symptomatology, mode of transmission, prevention and treatment options and on local epidemiology; and scored low on the forms of mechanical ventilation and on home-management of non-critical cases. The knowledge score correlated with the duration of clinical clerkship they had undertaken ($r = 0.326$, $p = 0.001$). The primary source of information were social media sites (102, 85%), television (94, 78%) and newspapers (76, 63%). The majority (78, 65%) were willing to participate in the government's COVID-19 response but could not identify what roles they could play. The fear of contracting COVID-19 was reported by eight students (7%).

Conclusions: Medical students had good knowledge on COVID-19 and had self-learned through social media, television and newspapers. The students held positive attitude towards participation in the government's COVID-19 response.

1. Introduction

Bhutan is a small country situated in the eastern Himalayas with a population of 0.7 million. Healthcare is provided free of cost at all levels, guided by the National Health Policy 2011 within the broader framework of overall national development and pursuit of happiness. Healthcare is provided through a three-tiered system: primary health centres and 10-bedded hospitals at the primary level, district and general hospitals at secondary level, and referral hospitals with specialist services at the

tertiary level. The three referral hospitals are located in geographically strategic locations in the west, east and the central regions. Specific COVID-19 management hospitals are designated across the country while the majority of the confirmed cases were treated at the Jigme Dorji Wangchuck National Referral Hospital, Thimphu [1].

Modern health system in Bhutan began in 1956 and there has been a chronic shortage of health human resources, particularly doctors. All of Bhutan's doctors are trained in other countries and all are employed by the Royal Civil Service Commission as the healthcare system is fully run

* Corresponding author.

E-mail address: dorji.thinleydr@gmail.com (T. Dorji).<https://doi.org/10.1016/j.heliyon.2021.e07533>

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by the government; no private practice is allowed. In 2020, there were 376 doctors in Bhutan with particular shortage of specialist doctors [2]. As of 2019, there were approximately 180 Bhutanese medical students in Sri Lanka, Bangladesh and India [3]. These students are fully or partially funded by the Royal Government while some are privately funded. The duration of undergraduate medical training is five years in Sri Lanka and four years in Bangladesh and India, followed by one-year internship programme. The students can take up internship programme offered by the Faculty of Postgraduate Medicine, Khesar Gyalpo University of Medical Sciences of Bhutan at three tertiary hospitals in Bhutan.

In March–April 2020, in South Asia, even before the first lockdown in India was announced, schools and colleges including medical schools were closed. With clinical rotations cancelled, online teaching-learning modules were rapidly adopted in many colleges and has been particularly useful to international students who returned to their home countries [4, 5]. The pandemic situation has brought significant changes to medical education including their transition from students to doctors [6, 7]. While some regulatory bodies have called for early graduation and registration of medical students for meaningful participation in the present pandemic, others have cautioned against taking up roles beyond their competence [8, 9, 10]. In Italy, at the height of health crisis when the health system was overwhelmed, medical students were fast tracked and recruited as doctors [11]. The urgency to recruit young health workers in the ongoing pandemic is also due to higher complication rates and mortality reported among older healthcare workers [10, 11]. This has led to a tension between safeguarding education and responding to the demands on health service [7]. In countries where there are shortages of health human resources, medical students have been employed in various capacities in response to the pandemic.

After Bhutan reported its first case of COVID-19 in March 2020, the Royal Government took a decisive action and re-called forty-six post-graduate doctors studying outside the country [12] and more than 100 medical students studying in Sri Lanka, Bangladesh, Thailand and India in March–April 2020 [13]. Upon their return, like thousands of other Bhutanese who were evacuated to Bhutan, these doctors and medical students were kept in mandatory 21-day facility quarantine in hotels [1]. This study assessed the knowledge of medical students on COVID-19, the sources of information and their attitude towards participation in health response to COVID-19 in the country. This study was conceived with an aim to report on the student learning behaviour during pandemics that disrupts conventional medical education.

2. Research method

2.1. Study design

This was a cross-sectional study.

2.2. Study site and study population

This study was conducted among medical students in facility-quarantine in Paro and Thimphu districts.

2.3. Sample size and sampling

For sample size calculation, we assumed that 50% of the respondents would have good knowledge on COVID-19. The sample size was calculated for proportions considering a 95% confidence level, 0.05 margin of error and finite correction for student population of 180 [3]. Allowing for a 5% dropout rate, the final sample size was 129. In the absence of the proper list of medical students coming into the country from various colleges and countries, convenience sampling was used. All medical students in facility quarantine were contacted via email address retrieved from the tertiary education database.

2.4. Study tool

The study questionnaire was designed to collect the respondent's basic information, and assess their knowledge, sources of information and their attitude towards participation in COVID-19 responses. The study tool was reviewed by seven experts on COVID-19 for its content and construct validity. As a result of this exercise, two items were revised and seven items were dropped. The S-CVI for the revised questionnaire was 0.96.

Knowledge was tested using twenty multiple choice questions. The knowledge was assessed under the following domains: disease definition, causative agent, symptomatology, mode of transmission and incubation period, clinical course of disease, diagnostic tests and centres in the country where these tests were available, case management and mortality rate, preventive measures, global and local epidemiology and the national hotline number for COVID-19-related information. We also assessed the common sources of COVID-19-related information. Attitude was tested using rating scales against given statements on their willingness and fear of participating in COVID-19 responses, what role they would play and if medical students can make meaningful contributions during the pandemic in Bhutan. We also assessed whether the students had received training at their colleges on the use of personal protective equipment in providing care to COVID-19 patients.

2.5. Data collection

Data were collected in April 2020 using Google Forms that were emailed to the students. Online data collection allowed social distancing at a time when quarantine facilities were out of bounds for visitors. The online data collection method was designed using the checklist for reporting results of internet e-surveys [14].

2.6. Data processing and analysis

The data were extracted from Google Forms and analysed in STATA Version 13.1 (StataCorp, Stata Statistical Software). Each knowledge question was scored 1/20. A cumulative score of $\geq 80\%$ was categorized as "good knowledge", score of $\geq 60\text{--}79\%$ was considered "satisfactory knowledge", and score $< 60\%$ was considered "poor knowledge." Correlation between knowledge score and duration of clinical clerkship was tested using Pearson's correlation coefficient. Results with p -value less than 0.05 were considered significant. Themes around attitude of students towards their willingness to participate in the national COVID-19 response are presented as frequencies and percentages.

2.7. Ethics considerations

Ethics approval was obtained from the Research Ethics Board of Health, Ministry of Health, Bhutan. Informed consent was taken from the study participants as per the consent process approved by the ethics committee. For confidentiality, the data were anonymized and only the pooled/aggregate results are presented.

3. Results

There were 120 medical students who responded to survey questionnaire (response rate = 93%). The mean age was 22 (± 2) years; the proportion of students were distributed almost equally across first to fifth year of study; the median duration of clinical clerkship attended was 8 months (IQR 1, 18 months). The basic profile of the students and the country of study is shown in Table 1.

3.1. Knowledge on COVID-19

Eighty-eight students (74%) had good knowledge, 28 (23%) had satisfactory knowledge and only four (3%) had poor knowledge on

Table 1. Basic profile of Bhutanese medical students studying Bachelor of Medicine and Bachelor of Surgery (MBBS) in Sri Lanka, Bangladesh and India surveyed for the COVID-19 Knowledge-Attitude study, April 2020.

Basic characteristics	n	(%)
Sex		
Female	89	(74)
Male	31	(26)
Country of study		
Sri Lanka	85	(71)
Bangladesh	30	(25)
India	5	(4)
Year of study		
First year	23	(19)
Second year	20	(17)
Third year	30	(25)
Fourth year	22	(18)
Fifth year	25	(21)
Study sponsor		
Full government sponsored	56	(47)
Partial government sponsored	46	(38)
Private sponsored	18	(15)
Trained on the use of personal protective equipment		
Yes	5	(4)
No	115	(96%)

COVID-19. The students scored high on the symptomatology, mode of transmission, prevention and treatment options and on factors of local epidemiology such as all cases being imported (at the time of data collection), select centres with reverse transcription-polymerase chain reaction (RT-PCR) facilities and local COVID-19 hotline numbers. The students scored the lowest on the forms of mechanical ventilation in the treatment of severe cases and on the World Health Organization policy of domiciliary management of non-critical COVID-19 cases. The knowledge score had significant correlation with the duration of clinical clerkship

Table 2. Assessment of knowledge on COVID-19 among Bhutanese medical students studying Bachelor of Medicine and Bachelor of Surgery (MBBS) in Sri Lanka, Bangladesh and India surveyed for the COVID-19 Knowledge-Attitude study, April 2020*.

Knowledge questions	Correct response		Incorrect response	
	n	(%)	n	(%)
What is COVID-19?	108	(90)	12	(10)
What causes COVID-19?	110	(92)	10	(8)
What are the most common symptoms of COVID-19?	118	(98)	2	(2)
A person who is asymptomatic may transmit the COVID-19 virus.	117	(97)	3	(3)
How long is the incubation of COVID-19?	104	(87)	16	(13)
Which of the following is the MOST COMMON mode of COVID-19 transmission?	104	(87)	16	(13)
All the COVID-19 cases that were reported in Bhutan were imported cases (as of April 2020).	119	(99)	1	(1)
How is the diagnosis of COVID-19 confirmed?	98	(82)	22	(18)
Which of the following centres DOES NOT have a RT-PCR testing facility for COVID-19 (as of April 2020)?	102	(85)	18	(15)
Which of the following has correctly matched the proportion of patients with the severity of COVID-19 infection?	99	(83)	21	(17)
Which one of the following is an approved treatment for COVID-19?	89	(74)	31	(26)
Which one of the following is NOT a part of mechanical ventilation?	22	(18)	98	(82)
What is the range of death rates reported due to COVID-19?	108	(90)	12	(10)
Patients with COVID-19 can be managed at home if the infection is non-severe.	65	(54)	55	(46)
What is the quarantine period recommended by World Health Organization for a primary contact?	111	(93)	9	(7)
Which one of the following is the most important measure to prevent COVID-19 infection?	100	(83)	20	(17)
All of the following are means to limit physical interactions, EXCEPT	106	(88)	14	(12)
In providing care for patients with COVID-19, which one of the following is the most important protective measure for health workers?	105	(88)	15	(12)
All of the following are identified at-risk groups for severe illness with COVID-19, EXCEPT	100	(83)	20	(17)
What is the toll-free number for COVID-19 related information in Bhutan?	95	(79)	25	(21)

* The study questionnaire can be viewed in the Supplementary Material.

these students had undertaken ($r = 0.326, p = 0.001$) and had no relation to sex, age or country of study. The details on knowledge score are shown in Table 2.

The sources of information were social media sites – Facebook pages of the Ministry of Health (102, 85%) and the Prime Minister's Office (80, 67%), television (94, 78%) and newspapers (76, 63%). Less than half of the students reported reading scientific journals for information (52, 43%). Only a quarter of the students (31, 26%) had attended lectures/symposia on COVID-19 at their colleges. The details of the sources of COVID-19 information are shown in Table 3.

3.2. Attitude towards participation in COVID-19 responses

The majority (78, 65%) responded that they should participate in the government's COVID-19 response and were willing to serve (92, 77%) in any part of the country. However, the students could not identify what roles they could play: clinical work (19, 16%) or advocacy and communications (33, 37%) but half of them felt that they may not make meaningful contributions in the COVID-19 response (57, 48%). The fear of contracting COVID-19 was reported in only a small proportion of

Table 3. Sources of information on COVID-19 reported by Bhutanese medical students studying Bachelor of Medicine and Bachelor of Surgery (MBBS) in Sri Lanka, Bangladesh and India surveyed for the COVID-19 Knowledge-Attitude study, April 2020.

Sources of information	n	(%)
Facebook page – Ministry of Health	102	(85)
Television	94	(78)
Facebook page – Prime Minister's Office	80	(67)
Newspapers	76	(63)
Health professionals	70	(58)
Scientific journals	52	(43)
Lectures/symposium	31	(26)
Family members	30	(25)
Others	8	(7)

Table 4. Attitude towards participation in COVID-19 response among Bhutanese medical students studying Bachelor of Medicine and Bachelor of Surgery (MBBS) in Sri Lanka, Bangladesh and India surveyed for the COVID-19 Knowledge-Attitude study, April 2020.

Attitude statements	Agree		Neutral		Disagree	
	n	(%)	n	(%)	n	(%)
Medical students should participate in the COVID-19 response.	78	(65)	41	(34)	1	(1)
Medical students should be assigned only clinical work (taking care of patients) during the COVID-19 response effort.	19	(16)	17	(14)	84	(70)
Medical students should only work in communication and advocacy in the community on COVID-19 instead of the hospital.	33	(37)	62	(52)	25	(21)
I am willing to serve in any part (rural/urban) of the country wherever required during the COVID-19 response effort.	92	(77)	24	(20)	3	(3)
In the current settings, medical students cannot make meaningful contributions in the COVID-19 response.	16	(13)	47	(39)	57	(48)
I am afraid that I might get COVID-19 if I work in the hospital.	8	(7)	47	(39)	65	(54)

students (8, 7%). The details of the ratings on attitude statements are shown in Table 4.

4. Discussion

4.1. Knowledge on COVID-19

The overall knowledge score on COVID-19 was high amongst Bhutanese medical students. The students knew about the symptoms, mode of transmission, causative agent, confirmation of diagnosis and preventive measures. The students had good knowledge on the local epidemiology in Bhutan – cases being imported ones (until August 2020), the regional centres where RT-PCR facilities were available and the national COVID-19 hotline number. The knowledge was poor on options identifying the types of mechanical ventilation for severe cases and the World Health Organization recommendation on domiciliary management of non-severe cases.

Our study reflects the trend of medical learning among students from three countries when the pandemic disrupted their education in 2020. The findings from this study reflects a unique trend where social media information have contributed to more learning than conventional means such as lectures/symposia or the scientific literature. This is similar to surveys among medical students in Jordan and Turkey where the majority relied on online sources and social media for COVID-19 related information [15, 16]. In Bhutan, the official Facebook pages of the Ministry of Health and the Prime Minister's Office carried information that were designed by their medical teams. This trend demonstrates the increasing usefulness of real-time sharing of information and knowledge transfer through social media [16, 17]. The use of scientific journals (43%) was relatively higher than 27% reported among students in Jordan [15]. At the time of this study, most of the medical colleges had not initiated online lectures and only a quarter of the students had received information through their teachers.

Medical students are future healthcare providers and need comprehensive knowledge on both the clinical and public health management of emerging and re-emerging diseases. This study demonstrates that students had self-sufficiency and were able to self-learn adequate knowledge on a topic that was new and in a scenario that was hitherto not faced. Integration of learning with online tools goes beyond traditional roles of students [17, 18] and is an important attribute to becoming successful doctors for the 21st century. However, as the World Health Organization has cautioned, there is an important need to assess the reliability of the source of information when many unregulated contents are available online [19]. We recommend medical colleges to include in their curriculum how students can assess the veracity of scientific information available through online sources.

4.2. Attitude towards engagement in COVID-19 activities

The students held positive attitudes towards participation in the national COVID-19 response. This is similar to findings from a survey of medical students in Singapore where two-thirds reported that it was their professional responsibility to be a part of the medical team and

participate in clinical activities in hospitals [20]. It has been suggested that in places where there are acute shortages, medical students may be tasked with care of routine patients to free the other health workers for COVID-19 management [10, 11]. In our study, the students could not identify whether they should shoulder clinical job responsibilities or take on communications and advocacy work and only 13% believed that they can make meaningful contributions. In a study in Turkey, a quarter of the students (24.3%) reported that they are not competent to handle clinical responsibilities whereas others reported that they would be happy to work in the emergency department [16]. The engagement of medical students in healthcare settings is advisable only after a thorough assessment of student's readiness and the severity of needs and shortages in the health system. It is suggested that medical students can assist with routine outpatient clinical care, care of chronic patients and routine antenatal checks of pregnant women. Many of these tasks can be performed via telemedicine and involves no risk of infectious transmissions. Medical students in advanced stages of training may be engaged in inpatient care.

One of the reasons that may deter medical students from returning to clinical settings is their fear of contracting COVID-19. Among medical students, fear was reported in 1.3% medical students in Turkey and anxiety in 24.9% in China [16, 21]. In our study, 7% of students reported fear of contracting COVID-19.

4.3. Preparedness of medical students in clinical engagement

The involvement of medical students in clinical roles in the COVID-19 pandemic varies across countries and their regulatory bodies. Many have argued that medical students are not certified practitioners with increased risk of exposure and consumption of PPEs and that inadequately trained students might act as additional vectors for viral transmission [16, 18]. The proportion of medical students who had received training on the use of personal protective equipment was very low: 4% in our study, and 7% among final year students in Turkey [16]. If the government were to engage medical students in clinical settings, proper inductions, training on the infection control measures and the use of PPEs and clear guidance on working within their competencies are required [7, 22]. It is suggested that medical students be given targeted volunteering opportunities that supplement their educational needs and specific learning objectives [7]. Experience from Denmark shows that after adequate training on infection control and emphasis on the role of medical students in the pandemic emergency healthcare workforce, two thirds of students had volunteered to work in pandemic emergency departments [22]. Even in Bhutan, at the height of the pandemic with mass testing of thousands of samples with RT-PCR, laboratory technician students were engaged in sample collection and running the tests [1].

4.4. Study limitations

As the scenario of COVID-19 evolved in South Asia and in Bhutan, the perception of these medical students might have changed over time. This paper was an attempt to understand their knowledge and attitude towards participation in COVID-19 response in the context of Bhutan which

trains all of its doctors outside the country. However, it is important to report such knowledge-attitude studies to add to the increasing scientific literature on student learning during pandemic situations. In the assessment of the knowledge, the study questionnaire was delivered through online means and not in the conventional exam-type setting. However, with the social distancing norms that are in place for COVID-19, it is equally important to report on data collected through pragmatic means. In the assessment of attitude, there might have been some component of social-desirability bias in the willingness reported in the study.

5. Conclusion

Medical students had good knowledge on COVID-19 and the sources of information were mostly social media contents. The students had positive attitude towards participating in the COVID-19 national response but did not identify any specific roles in which they can make meaningful contributions. The findings from this study may help better understand the involvement of medical students in the management of pandemics.

Declarations

Author contribution statement

Thinley Dorji: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Saran Tenzin Tamang: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

TVSVGK Tilak: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data included in article/supplementary material/referenced in article.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

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