

ORIGINAL ARTICLE

EVALUATION OF THE KNOWLEDGE, ATTITUDES, AND PRACTICES (KAP) OF OFFICER CADETS AT THE SRI LANKA MILITARY ACADEMY REGARDING COVID-19, AS A PROXY FOR KAP RELATED TO THE TRANSMISSION OF RESPIRATORY TRACT INFECTIONS

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Received 6th September 2026.

Accepted 8th October 2026.

On-line 27th October 2026.

Summary

Future pandemics and major epidemics are anticipated to be primarily respiratory infections. Similar to the COVID-19 pandemic, world militaries will have to play a key role in containing them. Future military leaders (present officer cadets) with good knowledge, attitudes, and practices (KAP) regarding respiratory infection prevention are important for that reason and for a healthy military and a healthy society. All-time studies focusing on military personnel's KAP regarding respiratory infections are very scarce. This 2023 cross-sectional study mainly assesses the KAP of officer cadets at the Sri Lanka Military Academy concerning COVID-19. We used it as a proxy for their KAP related to selected aspects common to the transmission of all respiratory tract infections.

This study utilized a self-administered structured questionnaire covering demographics, with 15 questions on knowledge, five on attitudes, and six on practices, administered to 246 officer cadets in October 2023. Spearman's rank-order correlation tests assessed relationships among the KAP scores.

All 246 participants returned the questionnaire, with limited item-level missing data. The mean KAP scores were favorable: 84.6% for knowledge, 89.8% for attitudes, and 87.4% for practices. Positive correlations were identified between knowledge and attitude scores, knowledge and practice scores and attitude and practice scores.

The KAP levels observed among officer cadets are good. To ensure Sri Lankan military preparedness for future respiratory pandemics, we recommended upholding these KAP levels through periodic, targeted health education. We found no English-language studies on KAP regarding respiratory infection transmission and control among officer cadets of any nation.

Key words: Respiratory tract infections; Pandemics; Military; COVID-19; Knowledge; Attitude; Practices; Sri Lanka

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KAP of Sri Lankan Officer Cadets on COVID-19, respiratory infections

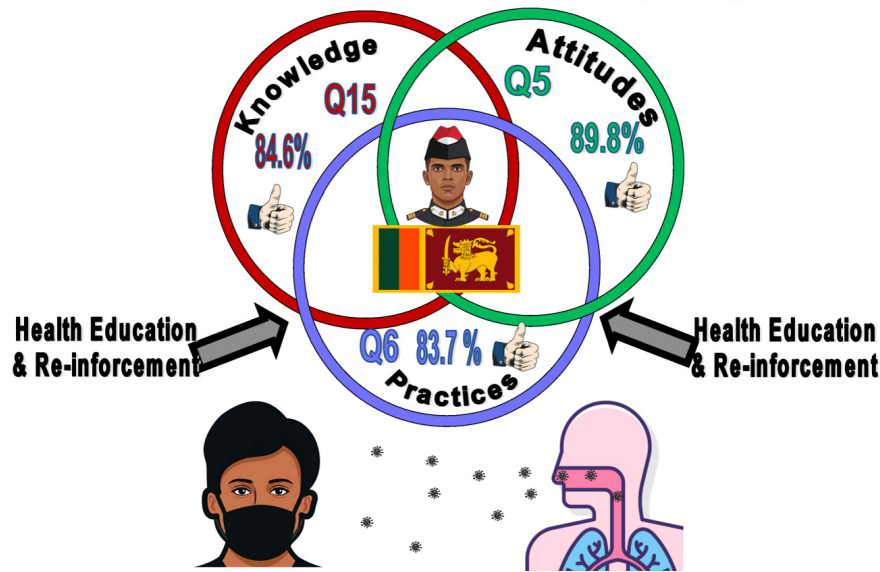


Figure 1. Graphic Abstract.

1. Background

1.1 Relevance of respiratory tract infections to the military and why this study is important

The majority of pandemics occurred during the last two millennia worldwide, were caused by pathogens transmitted mainly via the respiratory route (1). The next pandemic (disease X) is likely to be a respiratory infection (2). The COVID-19 pandemic has had a devastating effect on the world, including Sri Lanka (3). We would like to explain the relevance of good knowledge, attitudes, and practices (KAP) regarding respiratory tract infections to the military in detail since there is a scarcity of all relevant information consolidated in a single publication. The militaries of most nations played a key role in managing the COVID-19 pandemic (4-7). Sri Lankan military personnel played an important role in managing the pandemic by mainly performing the following duties: enforcement of lockdowns and curfews, tracing of contacts of cases, vaccination campaign work, construction and management of infrastructure, food supply, and other needs and security of many hurriedly created COVID-19 intermediate care centers and quarantine centers (8). They may have to play a similar role in controlling future pandemics/epidemics of respiratory tract infections. The migration of healthcare workers from Sri Lanka was accelerated, and recruitment was reduced immediately after the 2022 economic crisis, depleting the experienced health workforce (9). If another major respiratory infection outbreak occurs in the near future, the government may have to rely more on sources such as the military to hastily find the manpower necessary to contain it. All commissioned officers (second lieutenants to generals) of the Sri Lanka Army underwent a period of training at the Sri Lanka Military Academy (SLMA) in Diyatalawa. Officer Cadets of the SLMA will become army officers who will lead other ranks during future major disease outbreaks, doing the aforementioned and other tasks assigned to them by the national leadership (the President), supporting the healthcare system.

People's health-related knowledge helps them to establish appropriate attitudes toward healthy practices (10). Good knowledge, attitudes, and practices (KAP) regarding the basics of respiratory infection transmission and control will enable army officers in the field to perform the aforementioned tasks well by giving decisive and effective leadership (11). Respiratory tract infections are an occupational hazard for military personnel performing the above tasks. Military personnel, especially those recently enlisted, are more susceptible to respiratory tract infections because of living in crowded conditions, physical and psychological stresses of work, etc. (12, 13). A good KAP regarding respiratory infection prevention is useful for reducing the incidence of respiratory tract infections among military personnel, including officer cadets. Major outbreaks of respiratory tract infections can

hamper military recruitment and training, as happened during the COVID-19 pandemic (14). Disease outbreaks in military camps can spill into the general population. A healthy military is good for national security and for the public health of the general population. Sri Lankan army personnel are deployed in United Nations peace-keeping missions in several other countries. Such military movements may result in or extend epidemics by introducing novel respiratory pathogens to or from Sri Lanka (15, 16). A good KAP of military officers concerning respiratory tract infections is beneficial in reducing the risk of such epidemics. The majority of common bioterrorism/biological warfare agents are respiratory pathogens (17). Recent advancements in biosciences have made the creation of improvised bioweapons easier, thus increasing the risk of bioterrorism globally (18). Hence, the knowledge of respiratory pathogen transmission prevention has become more relevant to the militaries of even low- and lower-middle-income nations like Sri Lanka. Moreover, armed conflicts displace civilian populations and concentrate them in specific areas. Militaries sometimes have to take care of and rehabilitate surrendered combatants, as happened in Sri Lanka in 2009 (19). After natural disasters, authorities often call upon militaries to rescue and shelter victims. Rarely, militaries have to detain and temporarily shelter unauthorized immigrants who travel by boats, etc. Usually, all categories of those people are housed in crowded conditions. Such populations are more susceptible to contracting respiratory tract infections such as COVID-19 (20). Often, militaries have to cater to most of their health needs, which is another reason why awareness of respiratory illnesses is relevant to the military.

If any major gaps in the KAP, especially in crucial areas, are identified, remedial measures can be proposed. Our literature survey (explained below) has demonstrated that there is a severe paucity of KAP studies on respiratory tract infections conducted at all times among the military. Therefore, this study is important.

1.2 Why we used KAP concerning COVID-19 to represent the KAP of officer cadets regarding key aspects of respiratory illness transmission and prevention.

The fundamentals of transmission and prevention are common to all respiratory infections (21, 22). Most people gained knowledge and improved their attitudes and practices regarding respiratory infection prevention because of the intense and repetitive public education campaigns of 2020-2022 against COVID-19. For example, one Sri Lankan study demonstrated that 81.4% of participants reported a positive attitude toward the role of health education in COVID-19 (23). The initial infection prevention guidelines for COVID-19 from the World Health Organization (WHO) and other agencies were based on infection prevention guidelines developed for past epidemics such as MERS (24). Hence, nations are likely to utilize the recommended KAP guidelines regarding COVID-19 to manage the critical initial stage of future pandemics/major outbreaks of respiratory tract infections.

2. Methods

2.1 Ethics Statement

This study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Ethics Review Board of the Teaching Hospital-Peradeniya, Sri Lanka (THP/PLANNING/ERC/19/2023).

2.2 Study design and setting

This was a cross-sectional descriptive study. The study was conducted at SLMA-Diyatalawa (Longitude: 80.9431095, Latitude: 6.8059457, Elevation: 1266 m) in accordance with STROBE reporting guidelines. Additionally, we performed a methodical literature survey.

2.3 Objectives

Our main general objective was to assess the KAP of SLMA officer cadets (future military leaders of Sri Lanka) regarding some selected key aspects of respiratory tract infection transmission, prevention and related issues. Our main specific objective was to assess how the officer cadets of the SLMA answered the points tested in our 15 knowledge questions, five attitude questions, and six practice questions (Supplement file 1= (S1)). Our second specific objective was to identify correlations between individual knowledge and attitude scores, knowledge and

practice scores, and attitude and practice scores. Our third specific objective was to perform a literature survey to identify similar studies conducted among military personnel and compare their results with ours. Finally, we wanted to make practically useful recommendations based on our findings. We presumed that cadets residing in municipal council areas who tested positive for COVID-19 in the past and cadets who studied biological sciences for the GCE(A/L) exam have higher knowledge about respiratory tract infection transmission and prevention than the rest.

2.4 Participants

All officer cadets of the SLMA, numbered 266, in September-October 2023 were eligible for this study, and all of them participated. This group included eight cadets from other countries.

2.5 Survey instrument and data collection

The first author developed a self-administered structured questionnaire survey instrument (S1), based on questionnaires used in three published KAP studies, namely our references 25-27 and on his experience (25-27). This was improved by the second author. All 26 KAP questions were closed-ended. We included three knowledge questions (questions 6, 7, and 8) and one attitude question (question 22) that are more specific to military populations.

Thereafter, the questionnaire was subjected to face and content validation. It was reviewed by three consultants: a university professor in community medicine, a senior lecturer in community medicine, and a consultant community physician working for the Ministry of Health of Sri Lanka. They have approved all questions. Cadets were approached by two instructors of the SLMA who volunteered to help authors. Cadets were informed by announcing a pre-prepared message. The instructors informed the cadets about the study's main objective and that it is a private study conducted by these authors. The cadets were cordially invited to join in their free will to answer our paper-based questionnaire. The cadets were informed that they were free to leave at any time and that they were free to avoid answering any questions, but it would be very helpful for this study if they answered all questions to the best of their ability. They were told that answers should be anonymous (no names or identity numbers on papers) and to feel free to ask the two instructors for clarifications or call the first author. Consent forms containing this information were distributed and collected with their signatures before distributing the questionnaires (informed written consent was obtained). When cadets were approached and the questionnaire was filled out, two authors, the commandant, and other senior SLMA officers were not present in the venue. Two instructors collected completed questionnaires. To maintain confidentiality, only they and the authors had access to completed consent forms and questionnaires. First the questionnaire was piloted among 20 randomly selected cadets in September 2023, and they were excluded from the main study. After collecting their answers, the first author obtained feedback from each over the phone. Based on the feedback obtained, the final version of the questionnaire (supplement file 1 = (S1)) was created, and the main survey was conducted in October 2023 among the remaining 246 cadets. As the language of instruction of the SLMA is English, the questionnaire was in English. However, based on feedback obtained from the pilot study, to make things clearer for participants, we added relevant Sinhala translations of words within brackets for six words (Sinhala is the first language of about three-fourths of Sri Lankans).

The questionnaire (S1) had four main sections. The first section (questions 1-5) comprises demographic data and whether participants tested positive for COVID-19. The second section (questions 6-20) contains 15 knowledge questions, rated Yes=1 and No or I do not know=0, for a total score ranging from 0 to 15. The third section (questions 21-25) made up five attitude questions rated on a scale comprising Agree=2, Somewhat agree=1, and Disagree=0 for a total score ranging from 0 to 10. The fourth section (questions 26-31) was made up of six practice questions rated on a scale comprised of Yes=2, Sometimes=1, and No=0 for a total score ranging from 0 to 12. Total scores were categorized according to Bloom's cut-off points (an 80.0–100.0% score meant good knowledge, a score of 60.0–79.0% was taken as satisfactory knowledge, and a score of ≤ 59.0% was considered poor knowledge) (27).

2.6 Literature survey to find similar studies conducted among military personnel

We searched the Google Scholar, PubMed, and Europe PMC databases in February 2025 to identify similar studies conducted among military personnel. First, we searched for the keywords military, KAP studies, and respiratory tract infections combined using the Boolean operator AND. We then replaced "military" with "cadets,"

"army," "navy," and then "air force" while keeping the other two keywords and searching. Thereafter, we repeated the search using the keywords military, KAP studies, and COVID-19, combined using the Boolean operator AND. Finally, we repeated the search by replacing "military" with "cadets," "army," "navy," and then "air force" while keeping the keywords KAP studies and COVID-19. However, this search does not qualify for a systematic literature survey.

2.7 Statistical Analyses

We entered the responses into Microsoft Excel spreadsheets. Descriptive analyses were performed using Microsoft Excel 2010. Spearman's rank-order correlation tests were performed to identify correlations between individual scores of three components. The independent samples Mann-Whitney U test was used to determine any significant differences in knowledge scores between participants who tested positive for COVID-19 in the past and those who did not. Cronbach's alpha was calculated for knowledge, attitudes and practices components. SPSS 23.0 software (IBM Inc., Chicago, USA) was used for the latter three estimates.

We present the calculation for Question 21 as an example of how we calculated scores for attitude questions. We excluded unanswered participants. All 246 have answered this question. 196 answered "agree", and each obtained two marks; 49 answered "somewhat agree", and each obtained one mark; and one answered "disagree", and no marks were given. Therefore, the average scores (marks %) obtained for Question 21 were as follows: $(196 \times 2 + 49 \times 1) / (246 \times 2) = 89.6\%$. We present the calculation for Question 26 as an example of how we calculated scores for practice questions. We excluded two unanswered participants. 244 have answered this question. 219 participants answered "yes", and each obtained two marks; 21 answered "sometimes", and each obtained one mark; and four answered "no", and no marks were given to them. Therefore, the average scores (marks %) obtained for Question 26 were as follows: $(219 \times 2 + 21 \times 1) / (244 \times 2) = 94.1\%$.

We estimated the mean knowledge score by totaling each participant's knowledge score and dividing it by the number of participants. For the analysis and to find the median knowledge score, we used Microsoft Excel 2010 software. We estimated the mean attitude and mean practice scores similarly.

We describe the calculation of the knowledge score for males as an example of the calculation of scores for demographic groups. We have totaled all male participants' knowledge scores and divided them by the number of male participants.

3. Results

Two hundred forty-six cadets (except 20 cadets of the pilot study) completed the survey. However, not everyone answered all questions (table 2).

3.1 Descriptive data of participants

Table 1 shows the demographic characteristics of the participants and whether they tested positive for COVID-19 in the past.

Table 1. Demographic characteristics of participants (n = 246).

Characteristic	n and (%)
1. Sex	
Male	236 (96%)
Female	10 (4%)
2. Age	
Median (Mean) age in years	24 (24.7)
Not answered	01(0.4%)

Characteristic	n and (%)
3. Area of permanent address	
Municipal councils (within a city = most urbanized)	26 (10.6%)
Urban councils (within a town)	31 (12.6%)
Pradeshiya Sabha (usually peri-urban or rural areas)	182 (74%)
Not answered	07 (2.8%)
4. General Certificate of Education (Advanced /Level) stream (subjects studied at year 12 and 13 at school)	
Arts	50 (20.3%)
Commerce	83 (33.7%)
Biological Sciences	17 (6.9%)
Mathematics(Physical Sciences)	55 (22.3%)
Technology	28 (11.4%)
Other	04 (1.6%)
Not answered	09 (3.7%)
5. Ever been tested positive for COVID-19	
Yes	50 (20.3%)
No	191 (77.6%)
Not answered	05 (2%)

The vast majority (96%) were males. The age range was 20-30 years with a median age of 24, and 83% were aged 23-25 years. The majority (74%) permanently resided in Pradeshiya Sabha areas (usually peri-urban or rural areas). The General Certificate of Education (Advanced Level), or GCE (A/L) stream, refers to the combination of subjects they studied in years 12 and 13 at school (high school) before enlisting as cadets. Most (33.7%) had studied commerce subjects. 20.3% of cadets have been tested positive for COVID-19 at least once.

3.2 Outcome Data

The answer rates for five demographic characteristic questions were 96.3% -100%. The answer rates for 26 KAP questions were 98.4% -100%.

We present the summary of answers to the knowledge section in Table 2.

Table 2. Results of participants knowledge (n = 246).

Knowledge Question	Answer n (Answer %)			
	Yes	No	I do not know	Not answered
6. Military exercises/training programs of many countries has to be postponed/ abandoned as a result of COVID-19 pandemic	202 (82.1%)	30 (12.2%)	12 (4.9%)	2 (0.8%)
7. Military personnel of many countries including Sri Lanka have made important contributions to control COVID-19 pandemic	233 (94.7%)	8 (3.3%)	4 (1.6%)	1 (0.4%)
8. Most pathogens (germs) used as biological weapons and bioterrorism agents enter human body through the respiratory tract	183 (74.4%)	13 (5.3%)	49 (19.9%)	1 (0.4%)
9. Respiratory tract infections are transmitted through tiny droplets that go out from mouth and nose of patients when they cough and sneeze	225 (91.5%)	9 (3.7%)	12 (4.9%)	0 (0%)
10. COVID-19 patients can give out droplets containing pathogens to air even during normal exhalation	183 (74.4%)	24 (9.8%)	37 (15%)	2 (0.8%)
11. Respiratory droplets given out by patients with COVID-19 fall on surfaces. I can get those infections if I touch my face after touching those surfaces	224 (91.1%)	15 (6.1%)	6 (2.4%)	1 (0.4%)

Knowledge Question	Answer n (Answer %)			
	Yes	No	I do not know	Not answered
12. COVID-19 can be transmitted by shaking hands	220 (89.4%)	19 (7.7%)	7 (2.8%)	0 (0%)
13. Hand washing with soap and water removes germs in hands	213 (86.6%)	26 (10.6%)	6 (2.4%)	1 (0.4%)
14. COVID-19 vaccines protect us from getting seriously ill and dying forms of COVID-19	197 (80.1%)	24 (9.8%)	25 (10.2%)	0 (0%)
15. Even if I get 3 or 4 doses of COVID-19 vaccines still I can get COVID-19 again in the future	155 (63.0%)	29 (11.8%)	59 (24.0%)	3 (1.2%)
16. COVID-19 infected but without fever people can transmit the disease to others	195 (79.3%)	16 (6.5%)	33 (13.4%)	2 (0.8%)
17. If people maintain a social distance of 1-2 meters from others, it helps to control the spread of COVID-19	237 (96.3%)	6 (2.4%)	3 (1.2%)	0 (0%)
18. If people avoid going to crowded places, it helps to control the spread of COVID-19	229 (93.1%)	13 (5.3%)	3 (1.2%)	1 (0.4%)
19. Maintaining good ventilation in rooms when several people are there, helps to control spread COVID-19	190 (77.2%)	26 (10.6%)	29 (11.8%)	1 (0.4%)
20. Separation of COVID-19 patients from others (isolation) soon after their diagnosis helps to control the spread of COVID-19.	235 (95.5%)	2 (0.8%)	6 (2.4%)	3 (1.2%)

After excluding unanswered participants, the average scores (marks %) obtained for each knowledge question were as follows. Questions 6 (82.8%), 7 (95.1%), 8 (74.7%), 9 (91.5%), 10 (77.5%), 11 (91.4%), 12 (89.4%), 13 (86.9%), 14 (80.1%), 15 (63.7%), 16 (79.9%), 17 (96.3%), 18 (93.4%), 19 (77.6%), and 20 (96.7%). For questions 6, 7, 9, 11, 12, 13, 14, 16, 17, 18, and 20, 80% -100% of cadets who answered gave correct answers when percentages were rounded to the nearest whole number. For all other questions (8, 10, 15, and 19), 60% -79% of cadets gave correct answers. Based on the independent-samples Mann-Whitney U test, there was no statistically significant difference (p-value is 0.870) in knowledge scores between participants who tested positive for COVID-19 in the past and those who did not.

Table 3 depicts the summary of answers to the Attitudes section.

Table 3. Results of participants attitudes section (n = 246).

Attitudes Question	Answer n (Answer %)			
	Agree	Somewhat agree	Disagree	Not answered
21. My health is interconnected with the health of the people around me	196 (79.7%)	49 (19.9%)	1 (0.4%)	0 (0%)
22. Knowledge of respiratory tract infections is useful to a military officer	211 (85.8%)	31 (12.6%)	3 (1.2%)	1 (0.4%)
23. If I get diagnosed of COVID-19, I am happy to receive a Public Health Inspector (PHI) at my home to investigate in to it	196 (79.7%)	33 (13.4%)	15 (6.1%)	2 (0.8%)
24. If another wave of COVID-19 occurs I am happy to always wear a mask at public places	204 (82.9%)	28 (11.4%)	10 (4.1%)	4 (1.6%)
25. If COVID-19 like pandemic occurs in the future I am happy to participate in a team to manage it	218 (88.6%)	19 (7.7%)	5 (2.0%)	4 (1.6%)

The scores for each attitude question were as follows: Question 21 (89.6%), 22 (92.7%), 23 (87.1%), 24 (90.1%), and 25 (94.0%).

The summary of answers to the practices section is given in Table 4.

Table 4. Results of participants practice section (n = 246).

Practices Question	Answer n (Answer %)			
	Yes	Sometimes	No	Not answered
26. When I saw new health messages from the government about COVID-19 I gave my attention to it	219 (89.0%)	21 (8.5%)	4 (1.6%)	2 (0.8%)
27. When I have a cough I wear a mask when I go out of my room/home.	165 (67.1%)	64 (26.0%)	15 (6.1%)	2 (0.8%)
28. When I have a cough I maintain a distance of 1-2 meters from other people	169 (68.7%)	59 (24.0%)	16 (6.4%)	2 (0.8%)
29. When the government announced COVID-19 is rising in the country I avoided going to crowded places	211 (85.8%)	24 (9.8%)	10 (4.1%)	1 (0.4%)
30. When the government announced COVID-19 is rising in the country I used to wear a mask at public places	228 (92.7%)	13 (5.3%)	3 (1.2%)	2 (0.8%)
31. I try to avoid touching my nose, eyes and mouth after onset of COVID-19 pandemic	191 (77.6%)	33 (13.4%)	18 (7.3%)	4 (1.6%)

The scores for each practice question were as follows: Questions 26 (94.1%), 27 (80.7%), 28 (81.4%), 29 (91.0%), 30 (96.1%), and 31 (85.7%). Table 5 depicts a breakdown of the scores obtained for the knowledge, attitudes, and practices sections of the questionnaire by our demographic groups for comparison.

Table 5. A breakdown of scores obtained for knowledge, attitudes and practices sections of the questionnaire by our demographic groups (n = 246).

	Knowledge	Attitudes	Practices
The count (and %) of participants who obtained 100% marks	51 (20.7 %)	118 (48%)	109 (44.3%)
The count (and %) of participants scored ≥60%	235 (95.5%)	184 (74.8%)	223 (90.7%)
The count (and %) of participants scored ≥80%	187 (76%)	166 (67.5%)	193 (78.5%)
Mean knowledge/Attitudes/Practices score	84.6%	89.8%	87.4%
Median knowledge/Attitudes/Practices score	86.7%	90%	91.6%
Demographic group	Knowledge Score (%)	Attitudes Score (%)	Practices Score (%)
Sex			
Male (96%)	84.5	89.8	87.5
Female (4%)	87.3	91	83.2
Area of permanent address			
Municipal councils (within a city = most urbanized) (10.6%)	81.5	86.8	88.8
Urban councils (within a town) (12.6%)	84.7	92.3	86.6
Pradeshiya Sabha (usually peri-urban or rural areas) (74%)	84.7	89.9	87.6
GCE (A/L) stream (subjects studied at year 12 and 13 at school)			
Arts (20.3%)	82.4	87.6	83.3
Commerce (33.7%)	83.1	88.3	88.9
Biological Sciences (6.9%)	85.4	89.4	80.9
Mathematics(Physical Sciences) (22.3%)	85.6	92	90.2
Technology (11.4%)	85.9	92.5	86.9
Other (1.6%)	98.3	97.5	97.9
Ever been tested positive for COVID-19			
Yes	85.2	90.2	87.5
No	84.1	89.7	87.3

A series of Spearman's rank-order correlation tests demonstrated positive correlations between individual knowledge and attitude scores, $\rho(246) = 0.326$, $p < 0.001$; individual knowledge and practice scores, $\rho(245) = 0.210$, $p = 0.001$; and individual attitude and practice scores, $\rho(245) = 0.238$, $p < 0.001$. Cronbach's alpha values for the responses to the knowledge, attitudes, and practices components of our main study, respectively, were 0.557, 0.386 and 0.645.

3.3 Results of our literature survey

A total of 8950 articles, predominantly (8678) from Google Scholar, were identified. Titles were read, and irrelevant articles and duplicates were excluded. Among the excluded were a study done among 3-11-year-old children of a cadet school (they are not military cadet officers), studies conducted among healthcare workers (HCW) of military hospitals, and a study conducted among HCW of a section of the Indian armed forces. HCWs have advanced training in this subject; thus, we considered that comparing an exclusive HCW population with general military populations is inappropriate. In the English literature, there have been no KAP studies on COVID-19 or other respiratory tract infections conducted among officer cadets in any nation. No such studies have been conducted among any military after the end of the pandemic. Finally, we identified only six studies conducted among military personnel. These are our references: 5, 42, 44, 45, 46, and 49.

4. Discussion

Control of respiratory infection transmission is a broad subject, and there are dozens of important points to be tested. Nonetheless, shorter surveys have been demonstrated to be reliable and produce higher response rates (29). Thus, we struck a balance and limited our questionnaire to questions we believe to be most relevant to Sri Lankan officer cadets. Cronbach's alpha values could have been higher if we had included additional interrelated questions. Exclusion of question 21 would have improved Cronbach's alpha in the attitudes component. There were other limitations in the questionnaire that we mention in the limitations section. Considering all, we like to describe our questionnaire as an author-developed, preliminarily validated questionnaire rather than a fully validated KAP instrument. Future researchers can build on this foundation. The answer rates for the 26 KAP questions were very good (98.4% - 100%). Our officer cadets obtained good mean scores for the knowledge (84.6%), attitudes (89.8%), and practices (87.4%) components. We have arranged the rest of our discussion in the seven subheadings.

4.1 Comparison with similar studies conducted among the general population

In comparison, a study conducted in the Northern Sri Lankan general population during the early days of the COVID-19 pandemic (2020) demonstrated mean scores for knowledge (42.4%), attitudes (81.4%), and practices (24.8%) (23). A systematic review and meta-analysis of 84 KAP studies from 45 countries on COVID-19 estimated overall correct answers for knowledge, good attitudes, and good practices as 75%, 74%, and 70%, respectively (32). The corresponding score percentages in our study were higher. However, when comparing, we must be mindful of the differences in the KAP points tested and differences in scoring in different studies. These studies were conducted during the pandemic when people's attention, concern, and health education campaigns about COVID-19 (respiratory tract infections) were intense. Our study was conducted after the pandemic. The World Health Organization (WHO) has considered COVID-19 a public health emergency of international concern (PHEIC) from January 2020 to May 2023 (33). In Sri Lanka, the importance given to COVID-19 by most people we know was reduced after mid-2022 as the disease incidence clearly reduced, and the 2022 economic and political crises diverted people's concerns to other issues.

A survey of 24,653 HCW across 57 countries, including Sri Lanka, showed that those with prior training had significantly higher preparedness and awareness to face the COVID-19 pandemic (34). A good KAP with active social participation had positive effects on the control of major respiratory infection epidemics in the recent past, namely SARS, Ebola, and H1N1 human influenza (35). Our results and the aforementioned systematic review and meta-analysis of 84 KAP studies show significant positive correlations between knowledge and practice and attitude and practice (32). Considering all of the above, we believe that maintaining and improving present (2023) good KAP scores among officer cadets and service personnel through health education materials and periodic refresher

training would empower future military leaders and the nation to face future such major epidemics more effectively. The same is applicable to other branches of the military.

4.2 Discussion of scores obtained by cadets of selected demographic groups

We expected residents of municipal council areas and cadets who studied biological sciences for the GCE(A/L) exam to have higher knowledge scores than the rest, but our results indicate that this is not the case. A plausible explanation is that those who absorbed the most out of the COVID-19-related health education campaigns, irrespective of the subjects they studied in school, scored well on knowledge questions. Four participants who studied subjects other than mainstream subjects for the GCE (A/L) exam (the other category), perhaps non-Sri Lankan cadets, had very good KAP scores. In comparison, COVID-19-related KAP scores were markedly higher among urban inhabitants than among rural inhabitants in the general population of Cameroon and Egypt in studies published in 2021 and 2020 (25, 36). In our study, residents of other areas scored higher in the knowledge and attitude sections compared to residents of municipal council (city) areas, and all scores were good. This indirectly indicates that COVID-19-related health education campaigns in Sri Lanka have reached urban and rural areas equally well.

Repetition and reinforcement of health education have been shown to be useful for the sustainability of health-related knowledge (37). Repetition of health messages regarding COVID-19 was shown to be correlated with response efficacy in another study (38). More than 95% of cadets who answered Knowledge Questions 7 (95.1%), 17 (96.3%), and 20 (96.7%) responded correctly. To our best knowledge, knowledge regarding the answers to these questions was widely and repeatedly disseminated and reinforced by government agencies, news media, and social media in Sri Lanka during the pandemic. We assume that such exposure would have contributed to the very good scores. Cadets who were tested positive for COVID-19 did not score better than those who did not. It indicates that experiencing COVID-19 did not contribute to the improvement of KAP among these cadets.

4.3 Discussion of scores obtained for knowledge questions

Less than 80% of cadets who answered knowledge questions; 15 (63.7%), 8 (74.7%), 10 (77.5%), 19 (77.6%), and 16 (79.9%) - responded correctly. Knowledge regarding answers to questions 15, 10, 19, and 16 was disseminated in Sri Lanka during the pandemic, to our best memory, but not so widely or repeatedly. Officer cadets have access to information that most pathogens used as biological weapons and bioterrorism agents enter the human body through the respiratory tract, and that knowledge is relevant to modern militaries. Nevertheless, the score for this question was comparatively low, although good, according to Bloom's cut-off points. This knowledge point is more specific to militaries and did not receive publicity in the above-mentioned health education sources and, importantly, was not reinforced by repetition. We believe these are plausible explanations for the comparatively low scores. The point that COVID-19 vaccines protect us from becoming seriously ill and dying from COVID-19 was given wide and repeated publicity from mid-2021 to early 2022 in Sri Lanka. However, the score of 80.1% for that question (Question 14) was below the mean knowledge score. There was much misinformation and disinformation about COVID-19 vaccines, especially on social media, during that period. This misinformation may have confused some cadets (39). For the other knowledge points about vaccination (even with three or four doses of COVID-19 vaccines, a person can contract COVID-19 again), the score was below the mean. We think the likely reason for this lower score is that information was not widely or repeatedly disseminated in Sri Lanka. Awareness of the vaccine limitations is also important. For example, neglecting the risk of contracting COVID-19 from vaccinated co-workers was a key reason for the vaccine breakthrough COVID-19 cluster that we studied, which had one of the highest reported attack rates (40).

4.4 Discussion of scores obtained for attitudes questions

Out of five attitudes questions, the score for question 23 was the lowest, although it was a good score (87.1%). Public health education programs during the pandemic covered the importance of cooperating with public health inspectors (PHI) if a person contracts COVID-19. One plausible reason for this lowest score is that certain individuals disliked PHI's visits to avoid getting quarantined and to prevent outsiders from inspecting their homes. We think that >92% of participants agreeing that knowledge of respiratory tract infections is useful to a military

officer and expressing willingness to participate in managing future COVID-19-like pandemics is a very positive thing (questions 22 and 25).

4.5 Correlations between scores obtained for knowledge, attitudes and practice

Our results demonstrated statistically significant but weak to moderate positive correlations between knowledge and attitudes, knowledge and practice, and attitudes and practices. This finding is particularly intriguing because our attitude and practice questions do not directly relate to our knowledge questions. Nonetheless, in comparison, a systematic review of 13 studies with a pooled population of 26099 showed health knowledge notably favors adoption of health behaviors and practices during pandemic emergencies (41). The aforementioned meta-analysis also identified a significant positive correlation between knowledge and practices and attitudes and practices (32).

Knowledge about avoiding crowded places to control the spread of COVID-19 was good (score of 93.4%). The score for the related practices question of avoiding crowded places when the government announced COVID-19 was rising was also good (91.0%). In contrast, on a global scale, although 95% of the general population had the knowledge of avoiding crowded places to prevent COVID-19 infection, only 75% of them were practicing it (32). Knowledge of a social distance of 1-2 meters is helpful in controlling the spread of COVID-19 is good (score of 96.3%) among our cadets (question 17). However, for the practice question of maintaining a distance of 1-2 meters from others when having a cough, the score was 81.4%. For comparison, a study conducted among 162 army personnel in Mozambique published in 2022 demonstrated a good level of knowledge of COVID-19 among most participants, but only about half of the participants practiced preventive measures (42). A study conducted among dental patients in Tanzania regarding COVID-19 showed good knowledge and positive attitudes but poor practice (43). The aforementioned meta-analysis shows that although 88% of participants had a positive attitude toward maintaining social distancing, only 70% of them were practicing it (32). When the government announced COVID-19 was rising in the country, 91.0% of our participants used to avoid going to crowded places, and 96.1% were used to wearing a mask in public places (questions 29 and 30). The lowest attitude scores were for questions 21 and 23, which dealt mainly with the prevention of infection transmission to others. All considered, the plausible explanation is that participants' concerns and actions about both their safety and prevention of the spread of disease to others are good. Concerns and actions about their safety are higher, which is expected.

4.6 Comparison of our results with the results of similar studies conducted among military populations

Korean soldiers who were educated about tuberculosis (which causes high morbidity and mortality worldwide, including in Sri Lanka) received better scores in all areas of knowledge, attitudes, and preventive practices than others (44). That further supports our recommendations to maintain the present good KAP of SLMA officer cadets with periodic educational activities.

Only 12.61% of participants in the Benin army scored >50% on knowledge questions, but about 95% reported having a satisfactory attitude toward COVID-19 in 2020 (45). In contrast, the prevalence of correct knowledge was >80% in a cantonment of the Indian army in 2020 (46). These studies were conducted during the early days of the pandemic, when people's attention, concern, and health education campaigns about COVID-19 were intense, but those participants were exposed to health education campaigns only for a short period. We believe that the reinforcement of knowledge through repeated exposure to health education messages on COVID-19 throughout the pandemic helped our cadets achieve a knowledge score of 84.6%, even months after the pandemic in comparison.

A 2020 study among tri-service personnel in Nigeria showed that the demographic characteristics of respondents were not correlated with their knowledge, perceptions, and attitudes regarding COVID-19 (5). In conclusion, those authors state that KAP studies are helpful in the proper utilization of the military in situations such as the COVID-19 pandemic and are useful to society as well. They recommend educating the military to face future pandemics (5). We agree with those conclusions.

In 2020 (the early days of the pandemic), a KAP study on COVID-19 was conducted among 998 HCWs of the Indian armed forces, comprising 159 medical doctors. They found a high prevalence (>90%) of knowledge related to the symptoms and transmission of COVID-19, with no statistically significant difference in knowledge

based on the category of HCW, except for two technical questions (26). However, their questions were more advanced. As mentioned before, we think that repeated exposure to health education messages during the pandemic would have helped our officer cadets without medical/HCW training achieve a knowledge score of 84.6%, even many months after the pandemic ended.

The correct handwashing practice is useful in preventing the transmission of respiratory tract infections via fomites (47). A study published in 2017 illustrated a statistically significant correlation between knowledge, attitudes, and handwashing practices among South Korean soldiers (48). Those authors concluded that exposure to publicity materials is more effective than health education in promoting the practice of hand washing (48). Based on this evidence, we suggest using publicity materials to periodically reinforce good KAP regarding respiratory infection prevention among the Sri Lankan military.

A study conducted among regular personnel of the British Royal Navy in 2021 is the only published similar study that covers an entire service arm of any nation (49). However, the response rate in that study was only 6%. The overall knowledge of COVID-19 symptoms and transmission was high among the respondents, as in our study. When considering respondents' attitudes, 82.1% felt isolation of positive and suspected cases reduced the risk of COVID-19, with face coverings being considered the least effective measure (68.7%). In a study of a sample of Nigerian military personnel, out of the given options, most (99.1%) participants have recognized isolation as the best way to prevent COVID-19 (5). These two studies examined this point in the Attitudes section. We tested this point in the knowledge section of our study. 96.7% of the participants in our study knew that isolation of COVID-19 patients soon after their diagnosis helped to control the spread of COVID-19. For the practice question, "When the government announced COVID-19 was rising in the country, I used to wear a mask in public places," our participants' score was 96.1%.

A 2021 study involving 47 marines of the United States Marine Corps showed that the most frequent reason among 235 reasons for declining the COVID-19 vaccine was difficulty in understanding health information (50). Considering this, we recommend periodic, simple, clear, and easy-to-understand health messages to reinforce the knowledge of officer cadets.

4.7 Limitations

This study was conducted at a single military academy, and the sample was predominantly male (96%). These limitations affect the generalizability of the results to other military populations, especially female personnel and members of other branches of the armed forces. Our questionnaire did not have questions to identify the source of the cadet's health information. Furthermore, our use of close-ended questions for assessing the KAP may have generated limited information. We assessed the practices using five questions. This method is not as accurate as the assessment of practice based on observations. For our knowledge questions, all correct answers were "yes." That would have led to acquiescence and guessing bias in answering, a significant methodical limitation. Responses to practice questions might have been subject to recall bias. This was a cross-sectional study conducted in late 2023. Only a year and a few months have passed from the end of the intense, long, and repetitive health education campaign regarding respiratory infection prevention in Sri Lanka at the time of our study. In 2026, KAP levels of the present officer cadets of SLMA might be different (lower). Instead of conducting direct standardized comparisons, we compared our results to published studies by examining the reported scores. We performed Cronbach's alpha for our main study. But failed to do so for our pilot study.

5. Conclusions

While admitting this study has limitations, we conclude that officer cadets of the SLMA in 2023 had good knowledge, attitudes, and practices regarding tested aspects of respiratory infection transmission and prevention. We think that officer cadets scored particularly well on questions for which the relevant information was widely and repeatedly disseminated by health education campaigns to control COVID-19. There were positive correlations between knowledge and attitudes, knowledge and practices, and attitudes and practices. An important practical implication of this study is that periodic refresher health education may reinforce these points in the minds of office cadets, which may help to maintain and improve their KAP regarding respiratory infections. This may provide dividends

to the nation. We believe that the conduction of similar studies among officer cadets of other nations and other branches of the military and taking steps to improve their KAP on respiratory infection transmission and prevention would be beneficial in establishing military preparedness for future pandemics.

List of abbreviations

KAP	Knowledge, Attitudes, and Practices
SLMA	Sri Lanka Military Academy
WHO	World Health Organization
MERS	Middle East respiratory syndrome
GCE(A/L)	General Certificate of Education (Advanced / Level)
HCW	Healthcare workers
PHI	Public health inspectors

Conflict of interest statement

The authors state that there are no conflicts of interest regarding the publication of this article.

Funding

Authors declare no financial support.

Acknowledgements

The authors sincerely thank all who helped us to conduct this study, including the SLMA-Diyatalawa, especially the instructors who helped us; the Ministry of Defence-Sri Lanka, the three experts who reviewed our questionnaire, and the Health Ministry statistician who helped us in data analysis.

Authorship contribution statement

NDB Ehelepola: Conceptualized and designed the study, project administration, data analysis, resources, literature survey, wrote the manuscript, approved the final version submitted for publication. EWRSB Ehelepola: Data acquiring and processing, project administration, reviewed the original draft and approved the final version submitted for publication.

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