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Field Epidemiology Training Program, Division of Epidemiology
Department of Disease Control, Ministry of Public Health, Thailand
Tel: +6625903894, Fax: +6625903845, Email: osireditor@osirjournal.net, http://www.osirjournal.net

Risk of Coronavirus Disease 2019 (COVID-19) in Special Military Operations in Southern Thailand, 2021

Tawan Thongsawang[1]*, Kanokkarn Sawangsrisutikul[1], Phatcharida Hongchan[1], Patchanee Plernprom[1], Pattheenunt Thongsom[1], Paratthakorn Pingkan[1], Sareena Waeche[2], Zainab Waeduera-oh[2], Mahamad Mokmula[3], Natthaprang Nittayasoot[1], Rapeepong Suphanchaimat[1,4]

1 Division of Epidemiology, Department of Disease Control, Ministry of Public Health, Thailand

2 Si Sakhon District Public Health Office, Narathiwat Provincial Public Health Office, Ministry of Public Health, Thailand

3 Ruso Hospital, Ministry of Public Health, Thailand

4 International Health Policy Program, Ministry of Public Health, Thailand

*Corresponding author email: tawanthongsawang@gmail.com

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Abstract

On 12 Oct 2021, the Department of Disease Control received a notification of a coronavirus disease 2019 (COVID-19) cluster in a military camp in Southern Thailand. In collaboration with local health authorities, we investigated the outbreak to describe case characteristics, identify risk factors, and provide control measures. We conducted a descriptive study by reviewing laboratory results and medical records and interviewing the cases and military staff. A retrospective cohort study was undertaken to determine the potential risk of COVID-19 by Poisson regression with robust standard errors. Of 188 military personnel, 37 were confirmed cases (attack rate 19.7%). The attack rates among males and females were 28.97% and 10.71%, respectively. Most cases (97.3%; 36/37) had mild symptoms and one was asymptomatic. Attending a special operation in communities or forest (adjusted risk ratio (RR) 2.75 [95% CI 1.60–4.75]) and engaging in high-risk behaviors (adjusted RR 3.41 [95% CI 1.64–7.06]) were risk factors, while completing 2-dose vaccination schedule had a tendency to prevent COVID-19 infection. We recommend the implementation of strict symptom monitoring measures among special operation forces, efforts to promote personal hygiene, and we encourage all military staff to undergo full vaccination.

Keywords: COVID-19, military camp, vaccine, Thailand

Introduction

On 11 Mar 2020, the World Health Organization (WHO) declared coronavirus disease 2019 (COVID-19) as a global pandemic. COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] By September 2021, the WHO reported 231 million COVID-19 cases and 4.7 million deaths worldwide.[2] As of 30 Sep 2021, Thailand had faced over 1 million cases and about 11,000 deaths.[3] Since April 2021, the southern region of Thailand has accounted for 116,000 cases, specifically in the four southernmost provinces: Yala, Narathiwat, Songkhla, and Pattani.[4]

COVID-19 outbreaks in military camps has been documented in many countries such as Canada, South Korea, and the United States. The European Union and the European Economic Area also reported 29 clusters of COVID-19 among their military personnel.[5] Factors contributing to the infection within these clusters include close proximity in the working environment, shared canteens, and social gathering during training sessions and meetings.[5]

On 12 Oct 2021, the joint investigation team of the Division of Epidemiology, Department of Disease Control (DDC), Ministry of Public Health, received a notification of a cluster of COVID-19 cases in a military

camp in Narathiwat Province from the Office of Disease Prevention and Control Region 12 Songkhla (ODPC 12). The joint investigation team, comprising health personnel from various sources, including the Division of Epidemiology, ODPC 12, Narathiwat Provincial Public Health Office, Si Sakhon District Health Office and Si Sakhon Hospital, conducted an investigation during 12–15 Oct 2021. The aims of the investigation were to describe epidemiological characteristics of the cases, identify potential sources and risk factors, and provide recommendations and control measures.

Methods

The investigation comprised three parts as follows.

Descriptive Study

A descriptive study was conducted involving data collection, which consisted of reviewing laboratory records of confirmed cases, interviewing confirmed cases and military staff, and tracing contacts of confirmed cases using a semi-structured questionnaire. The study population included all people in the military camp between 15 Sep and 5 Nov 2021.

The definition of a patient under investigation was any person in the study population who came into contact with a COVID-19 case and developed at least one of the following symptoms: fever, cough, sore throat, nasal discharge, sputum, headache, myalgia, diarrhea, anosmia, ageusia, dyspnea, conjunctivitis and rash. A probable case was any person in the study population with positive SARS-CoV-2 by a commercial COVID-19 antigen test kit (ATK), approved by the Thai Food and Drug Administration. A confirmed case was a person in the study population who was diagnosed with positive SARS-CoV-2 by reverse transcription polymerase chain reaction (RT-PCR). The ATK sample collection was performed by a military nurse while nasopharyngeal swab for RT-PCR was performed by health personnel at Si Sakhon Hospital.

For contact tracing, a close contact was anyone who contacted with a COVID-19 case within a 2-meter distance for more than five minutes or who stayed in the same unventilated area with the case for more than 30 minutes within two days prior to symptoms onset or after developing symptoms. A high-risk close contact was a close contact who did not wear proper personal protective equipment. A low-risk close contact was a close contact who did not meet the criteria for being a high-risk contact.

Contact tracing was performed using an online semi-structured questionnaire adapted from the DDC standard questionnaire. We searched for additional military staff who were under investigation and high-risk contacts using the same questionnaire and combined these data with military nurse records.

Descriptive findings were presented as proportion and percentage for categorical data, while median and interquartile range (IQR) were presented for continuous data.

Environmental Study

We conducted a walk-through environmental survey of the military camp. The modalities in the camp such as dining areas and fitness center were observed. We also conducted in-depth interviews with the military nurses to gather information about the routine activities of camp staff. Accommodation features and quarantine protocols for new soldiers and for those returning from vacation or from a special operation were inspected. The special operation commander was interviewed for characteristics of the operations conducted outside the camp premises.

Analytic Study

We conducted a retrospective cohort study to identify possible risk factors of COVID-19 infection in the military camp. We defined a case as anyone presented in the military camp between 15 Sep and 5 Nov 2021 and tested positive for SARS-CoV-2 by ATK. All other personnel were defined as non-cases.

The outcome variable was the SARS-CoV-2 ATK result. Independent variables included gender, age, underlying disease, vaccine history, special operation attendance, and personal hygiene. We used Poisson regression with robust standard errors for both univariable and multivariable analyses. Variables with a p-value less than 0.1 in the univariable analysis and were also modifiable in practice were included in the initial multivariable analysis. Results were presented in the form of risk ratio (RR) and adjusted RR with 95% confidence interval (CI).

Ethic Consideration

This study was performed as part of the outbreak investigation following the Thai-DDC mission. We strictly protected the confidentiality of the participants and adhered to the ethical principles of the Declaration of Helsinki.

Results

Descriptive Study

The camp housed a total of 188 soldiers and was composed of three main sectors: commander sector, female sector, and operation sector. Based on the contact tracing, there were 103 high-risk and 84 low-risk close contacts. All high-risk contacts were tested

by ATK, of which 36 were positive and all were later confirmed by RT-PCR. The high-risk contacts who presented negative ATK results were quarantined for 14 days and were re-tested on day 14 or when symptoms developed. Totally, there were 37 confirmed cases (including the index case) and no deaths. Thirty-six cases developed mild symptoms and one was asymptomatic. The distribution of symptoms is shown in Figure 1. The overall attack rate was 19.7%. The specific attack rate was highest in the operation sector 58.0% (29/50), followed by the female sector 10.7% (6/56), and the commander sector 2.4% (2/82).

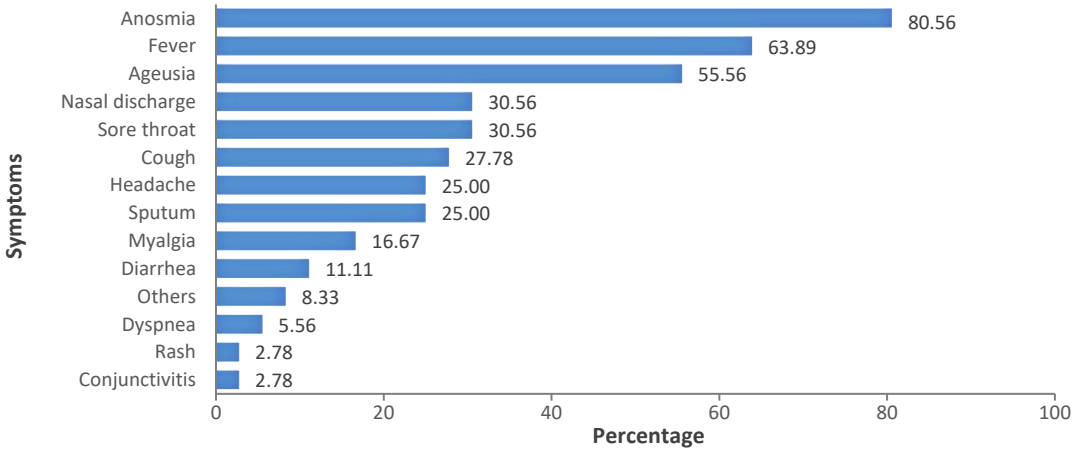

Figure 1. Frequency of symptoms among COVID-19 cases in a military camp in Southern Thailand, 15 Sep–5 Nov 2021 (n=36)

The median (IQR) age of the cases was 31 (29–36) years and the male-to-female ratio was 5:1. The median (IQR) cycle threshold value was 21.3 (19.6–25.2). Almost half (46.0%, 17/37) of the cases had underlying disease, the most common being allergic rhinitis (47.1%). About half (19/37) had received a two-dose vaccination. Seventeen had received one-dose, and there was only one unvaccinated case. The vaccine history and corresponding attack rates are shown in Table 1. The attack rates among males and females were 29.0% and 10.7%, respectively. The attack rates among attendees of a special operation was 51.5% and for those attending the camp fitness center was 50.0%.

Table 1. Vaccination history of confirmed cases in a military camp in Southern Thailand, 15 Sep–5 Nov 2021 (n=149)

Vaccination history	Attack rate by history of vaccination
At least two doses (at least 14 days)	
CoronaVac + CoronaVac / BBIBP-CorV + BBIBP-CorV	13.0% (6/46)
CoronaVac + ChAdOx1	21.4% (9/42)
ChAdOx1 + ChAdOx1	12.5% (4/32)
One dose	
ChAdOx1	60.7% (17/28)
No vaccination	100.0% (1/1)

CoronaVac is from Sinovac®, ChAdOx1 is from AstraZeneca®, BBIBP-CorV (Vero Cells) is from Sinopharm®.

The epidemic curve is presented in Figure 2. The index case developed symptoms on 29 Sep 2021 while the first case's symptoms started on 22 Sep 2021. The first case was a soldier returning from a special operation, which involved military duty in Bacho District.

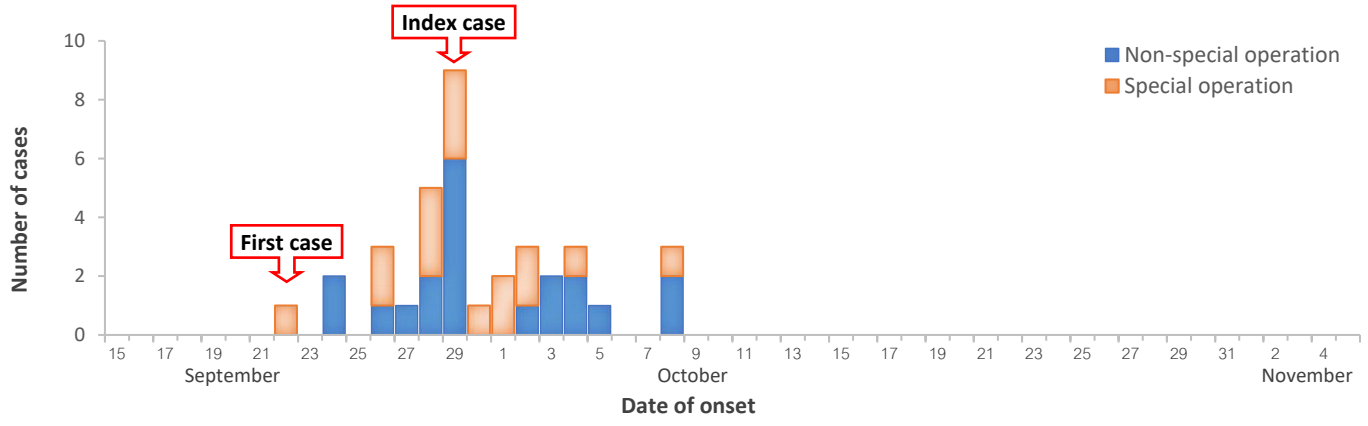

Figure 2. Epidemic curve of a COVID-19 cluster in a military camp in Southern Thailand, 15 Sep–5 Nov 2021 (only symptomatic cases, n=36)

Environmental Study

From the walk-through survey, we found that in the operation sector, 26 personnel shared one bedroom of dimension 60 m^2. All military staff shared one bathroom which was cleaned once a day. The camp had a fitness center and a canteen, which everybody in the camp could use; however, there was no specific regulations such as time limit or the number allowed to use at one time.

Analytic Study

We interviewed 163 soldiers out of 188 (response rate 87%). Being male (RR 2.70, 95% CI 1.20–6.10), having an underlying disease (RR 2.00, 95% CI 1.04–3.85), attending a special operation (RR 3.35, 95% CI 1.98–5.65), and using the camp fitness center (RR 2.63, 95% CI 1.51–4.59) were significantly associated with an increased risk of infection. Completing a two-dose vaccination schedule (RR 0.37, 95% CI 0.21–0.63) and good personal hygiene (RR 0.24, 95% CI 0.14–0.41) were significant protective factors (Table 2).

Table 2. Attack rates and risk ratios of COVID-19 infection in a military camp in Southern Thailand, 15 Sep–5 Nov 2021 (n=163)

Variables	Case	Non-case	Attack rate (%)	Risk ratio	95% CI	*P*-value
Gender						
Male	31	76	28.97	2.70	1.20–6.10	0.017
Female	6	50	10.71			
Age (years)						
≥35	11	46	19.30	0.79	0.42–1.48	0.455
<35	26	80	24.53			
Underlying disease[$]						
Yes	7	10	41.18	2.00	1.04–3.85	0.037
No	30	116	20.55			
Attending special operation[#]						
Yes	17	16	51.52	3.35	1.98–5.65	<0.001
No	20	110	15.38			
History of attending camp fitness[*]						
Yes	10	10	50.00	2.63	1.51–4.59	0.001
No	27	115	19.01			
Completing two-dose vaccination[±]						
Yes	19	102	15.70	0.37	0.21–0.63	<0.001
No	18	24	42.86			
Personal hygiene[§]						
Good	10	78	11.36	0.24	0.14–0.41	<0.001
Poor	27	48	36.00			
Sharing a bedroom						
Yes	29	76	27.62	2.00	0.98–4.10	0.057
No	8	50	13.79			
Sharing a bathroom						
Yes	35	108	24.48	2.45	0.63-9.44	0.194
No	2	18	10.00			

[$]*Includes chronic lung diseases, cardiovascular diseases, diabetes mellitus, obesity, gastrointestinal diseases, orthopedic disorders, inflammatory arthritis diseases, and allergic rhinitis.*

[#]*Soldiers were tasked to go on outreach in the communities or in the forest to fight against insurgents.*

[*]*One of the participants did not respond to the question regarding their attendance at the fitness camp.*

[±]*Full vaccination means completing two doses for at least 14 days since the last dose (reference = no vaccination plus single-dose vaccination).*

[§]*Good hygiene was defined as always wearing a face mask when in public and always or sometimes washing hands before and after touching public items while poor hygiene was defined as never or sometimes wearing a face mask or never washing hands.*

On multivariable analysis, due to the small number of cases, we limited the number of variables to no more than four. We omitted sex and underlying disease as our intention was to focus on modifiable factors. We combined personal hygiene with accommodation sharing into a new variable, 'high-risk behavior'. In the final model, the adjusted RRs of attending a special operation and high-risk behaviors were 2.75 (95% CI 1.60–4.75), and 3.41 (95% CI 1.64–7.06), respectively. Receiving a two-dose vaccination showed a tendency towards protecting against COVID-19 infection (Table 3).

Table 3. Adjusted risk ratios of COVID-19 infection in a military camp in Southern Thailand, 15 Sep–5 Nov 2021 (n=163)

Variables	Adjusted risk ratio	95% CI
Attending a special operation	2.75	1.60–4.75
Completing 2-dose vaccination	0.56	0.31–1.00
High-risk behavior[$]	3.41	1.64–7.06

CI: confidence interval

[$]Combining poor personal hygiene, fitness center use, and bedroom sharing (1 if all variables were true, 0 otherwise)

Discussion

We confirm a COVID-19 outbreak in a military camp. Most cases were male and almost half had joined a special operation unit off-site. The overall attack rate in this study was relatively high (19.7%) compared to outbreaks in similar settings. For instance, a COVID-19 outbreak in a military unit in South Korea presented an attack rate of 1.3%. The low attack rate in South Korea might be explained by a difference in testing protocol and quarantine measures between South Korea and Thailand.[6]

The highest specific attack rate was found in the operation sector. This sector is responsible for observing and assessing various risk situations, and executing clandestine military operations in the community. Thus, they might face a greater risk of contracting COVID-19 from the community than staff in other sectors.

From the environmental survey, the population density in the special operation sector was about 2.30 m^2 per person. This level is lower than that recommended by the Department of Health, Ministry of Public Health of at least 4 m^2 per person, a level which is believed to mitigate the risk of COVID-19 infection.[7]

Attending the camp fitness center and sharing a bedroom indirectly indicates that soldiers did not adhere to the recommended physical distancing policies. This fact is consistent with the finding from the environmental survey demonstrating that the camp did not limit the number of people using the fitness center and the canteen. It is well known that in fitness centers, wearing a mask while exercising is impractical. Studies have highlighted the increased risk of infection in attending fitness centers.[8]

Being fully vaccinated was found tends to be a protective factor in this study. The WHO reported that the full vaccination of CoronaVac in Chile could protect against symptomatic COVID-19 infection by 67%.[9] Moreover, as suggested by various studies, good personal hygiene, especially mask-wearing and hand-washing, have been reported to have a protective effect.[10–12] A previous study in Thailand showed that wearing a mask during contact with a COVID-19 case and frequent hand washing can reduce the risk of COVID-19 infection by approximately 77% and 67%, respectively.[13]

Limitations

This study contained both strengths and weaknesses. One of the strengths was the use of primary data from interviewing confirmed cases, non-cases, and involved military staff. However, there are some limitations. First, nonparticipation and nonresponse can bias the results of a cohort study.[14] In this study the nonresponse rate was approximately 13%, most of whom were non-cases and were not part of the special operation unit, implying that our estimated risk ratio was likely to be underestimated. Second, ATKs were mainly used rather than RT-PCR due to the camp protocol. The false-negative property of ATK may have resulted in our attack rate to be underestimated. Lastly, the questionnaire asked for historical data of the participants. Thus, memory bias was inevitable.

Public Health Recommendations

We recommend that strict monitoring of symptoms among soldiers returning from special operations, with quarantining for symptomatic cases, be promptly implemented. This measure will help identify possible cases and entail timelier isolation of those cases to prevent further transmission. Personal protective behaviors against COVID-19, such as mask-wearing, hand-washing and physical distancing where possible, should be emphasized to all camp staff. Limiting the number of people using the camp fitness center is also recommended. The vaccination program in the camp should be expedited. Soldiers joining the special operations unit should be considered for vaccination priority as they tend to face a greater risk of infection than others.

Conclusion

This investigation documented the presence of a COVID-19 outbreak in a military camp with an overall attack rate of 19.7%. Almost all cases developed mild symptoms. Joining the special operation unit was a significant risk factor. Other risk factors included high-risk behaviors such as sharing an accommodation and/or infrequent use of face mask. Completing a two-dose vaccination schedule had a tendency to prevent COVID-19 infection. To prevent further outbreaks, strict monitoring of COVID-19 symptoms among the camp staff, especially soldiers returning from special operations outside the camp, should be promptly enforced.

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Suggested Citation

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