Case series of coronavirus (SARS-CoV-2) in a military recruit school: clinical, sanitary and logistical implications

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ABSTRACT

Introduction A new coronavirus, called Severe Acute Respiratory Syndrome-CoronaVirus-2 (SARS-CoV-2), has emerged from China in late 2019 and has now caused a worldwide pandemic. The impact of COVID-19 has not been described so far in a military setting. We therefore report a case series of infected patients in a recruit school in Switzerland and the herein associated challenges.

Methods Retrospective review of COVID-19 cases among Swiss Armed Forces recruits in the early weeks of SARS-CoV-2 pandemic in the canton of Ticino, the southernmost canton of Switzerland. Positive cases were defined with two positive PCR testing for SARS-CoV-2 from nasopharyngeal swabs. Serological testing was performed with a commercially available kit according to manufacturers' instructions.

Results The first case was likely contaminated while skiing during weekend permission. He became symptomatic 4 days later, tested positive for SARS-CoV-2 and was put into isolation. He showed complete symptom resolution after 48 hours. Quarantine was ordered for all recruits with close contact in the past 2 days, a total of 55 persons out of 140 in the company. Seven out of nine recruits in one particular quarantine room became mildly symptomatic. SARS-CoV-2 PCR was positive in one of them. Seven days after initial diagnosis, the index patient and the other one from the quarantine retested positive for SARS-CoV-2, although they had been completely asymptomatic for over 96 hours. Serological testing revealed positive for both patients. All others showed negative IgM and IgG.

Conclusions Young healthy recruits often showed a mild course of COVID-19 with rapid symptom decline but were persistent SARS-CoV-2 carriers. This illustrates how asymptomatic patients may be responsible for covert viral transmission. An early and prolonged establishment of isolation and quarantine for patients and close contacts is essential to slow down the spread of SARS-CoV-2, especially in the confined space of a military environment.

Key messages

- Basic hygiene measures and social distancing are essential but may be hardly feasible in a military setting.
- Young patients usually show mild course with early symptoms resolution and may be before and after symptoms presentation covert carriers and spreaders of SARS-CoV-2.
- For these reasons, it is important to proceed to early prolonged isolation and quarantine of patients with COVID-19 patients and close contacts, respectively.
- Covert viral transmission is very likely and may explain actual difficulties to contain COVID-19 pandemic

INTRODUCTION

A new coronavirus causing severe acute respiratory syndrome, called SARS-CoV-2,[1] emerged in the region of Wuhan, Mainland China, in December 2019.[2] This rapidly spreading virus most likely originated from bat to human transmission in a wet market in China and now caused a worldwide pandemic of coronavirus disease (COVID-19).[3] Cheng *et al*[4] already recognised and warned in 2007 about the potential time bomb that large reservoirs of SARS-CoV-like viruses in horseshoe bats represent.

Exceptional measures have been undertaken by the WHO and national governments all over the world in an effort to slow the spreading of the disease.[5] Severe disease occurring in elderly and morbid population caused massive overwhelming of intensive care units and respiratory support teams.[6 7]

Here, we describe early experience in a military setting in Switzerland and the herein associated challenges. The cases occurred in the canton of Ticino, which is the southernmost canton of Switzerland and borders Italy's regions of Piedmont and Lombardy, which are among the most heavily struck COVID-19 regions in the world.[7] Although severe disease is unlikely in the highly selected population of a recruit school,[8] management of logistical issues in this closed environment is highly challenging. Our aim is to emphasise how aggressive early management of disease can avoid general spread among the troops, which can jeopardise any subsidiary engagement in supporting civil institutions and hospitals.

METHODS

This is a retrospective cases series among members of the Swiss Armed Forces (MAF) during the COVID-19 pandemic. All members of the Swiss Armed Forces provided informed consent for the study.

Nasopharyngeal swabs from both nostrils was performed by an experienced otolaryngologist. Diagnosis of COVID-19 was made after positive

PCR for SARS-CoV-2 by the cantonal laboratory in Bellinzona, Ticino, Switzerland.

Quarantine was established for persons with close contact (less than 2 m) for more than 15 min in the last 48 hours before onset symptom of the COVID-19 positive index patient.

For serological testing, we used a commercially available immunochromatography rapid test with SARS-CoV-2 protein-specific IgM and IgG. This test was performed according to the manufacturers' instructions with a reported sensitivity and specificity of 93% and 95%, respectively.

RESULTS

On 12 March 2020, a recruit presented at the military medical centre of Monte Ceneri (Ticino, Switzerland) with headache, dry cough and fever since the previous day. His exposition and travel history were unremarkable, expect for a skiing trip in the Swiss Alps during a permission 4 days before. The patient (patient 1) was isolated. PCR testing from nasopharyngeal swab was positive for SARS-CoV-2, at the time it was the second positive case in the Swiss Armed Forces. The patient was treated symptomatically with acetaminophen and antitussive drugs. Quarantine was ordered for any person with a close contact with patient 1. A total of 55 MAFs had to be quarantined, for a total headcount of 140 of the concerned company. A separate military barrack was requisitioned for the planned quarantine period of 5 days. The 55 MAFs were put in seven separate rooms. A thermometer was provided to each room, and a room deputy was responsible of reporting the health state of the roommates twice a day.

In the first day of the quarantine (13 March 2020), 7 of 9 MAFs in a particular single room developed flu-like symptoms such as coughing, odynophagia, weakness and slightly elevated temperatures. PCR nasopharyngeal swabs were negative for all cases. Most of the symptomatic quarantined MAFs showed rapid resolution of the symptoms without treatment, except for two of them. They showed persistent mild cough and slightly elevated temperatures.

Nasopharyngeal swab was repeated on 17 March 2020 in these two patients. One was positive for COVID-19 (patient 2). Isolation of the entire room was ordered for 10 more days. The MAF in the other rooms did not show any symptoms, and quarantine could be withheld after 120 hours.

Both SARS-CoV-2 positive cases (patients 1 and 2) showed a very mild disease. Patient 1 had fever for 2 days (38.8°C and 38.1°C). Patient 2 never developed fever. After 2 days in patient 1 and 3 days in patient 2, symptoms of COVID-19 disappeared completely. After 2 and 3 days, symptoms of COVID-19 disappeared completely in patient 1 and 2, respectively.

Seven days after initial diagnosis (20 March), we repeated PCR testing of nasopharyngeal swabs. Both patient 1 and patient 2 were still positive, although they had been completely asymptomatic and well for the past 5 and 4 days, respectively.

Interestingly, patient 2 had very limited direct contact to patient 1, but they both had contact to a third person, which remained asymptomatic the whole course of the quarantine and tested negative for SARS-CoV-2. Although remaining unproven, the third person was likely an asymptomatic SARS-CoV-2 carrier. This patient may have been the link with patients 1 and 2.

Finally, we performed serological test on isolated MAF 14 days after patient 1 was diagnosed with COVID-19. In patients 1 and 2, serological testing was positive for both IgM and IgG. Interestingly, all other close contacts to our positive patients, including the third suspected asymptomatic carrier, tested negative.

Figure 1 Tents inside a military gym to provide extra quarantine/isolation facilities. The separate tables are for catering.

DISCUSSION

The COVID-19 epidemic is a rapidly spreading disease that is met with exceptional sanitary measures worldwide to limit its spread. As illustrated in our case series, limiting the spread of the disease has proven to be highly challenging for several reasons.

First, hygiene measures such as hand washing, social distancing and sneezing and/or coughing in the elbow are basic measures that only show limited efficacy. In the particular conditions of a recruit school and military barracks, some of these measures are hardly feasible and impractical.

Strict contact isolation is required. It has been shown that viable SARS-CoV-2 on plastic surfaces can be present up to 72 hours after inoculation in experimental setting,[9] making contagion through door knobs and scale ramps very likely.[9] It is therefore paramount to ensure separate catering, sanitation and lodging. With increasing case and suspected numbers (patients with SARS-CoV-2 and quarantined MAFs), it can become increasingly difficult to obtain appropriate facilities in a military environment. As emergency solution, we used tents to extend lodging capacity for quarantined MAFs (Figures 1–3).

Our series shall emphasise the psychological burden during the time of quarantine and isolation.[10] Although in the military setting, we had the relative advantage of having to group MAFs

Figure 2 Sleeping beds inside a military tent shown in Figure 1.

Figure 3 Military barracks after days of quarantine and before sanitisation.

for logistical reasons, which resulted in although isolated yet not lonely quarantine conditions.

Second, many young people are largely asymptomatic but may be SARS-CoV-2 carriers transmitting the disease.[11] Estimates reach from 18% to at least 59% in some studies.[12 13] Although fever and cough are described as the most common symptoms and sometimes deemed to be typical of COVID-19,[14] it is very important to remember that in young adults, symptomatology can be much milder and quite atypical. Our two patients showed a mild course disease with symptom resolution after few days but continued to be positive for SARS-CoV-2 in nasopharyngeal swabs. This finding underlies the importance of prolonged isolation to reduce further virus transmission, as SARS-CoV-2 can still be proven in apparently healthy adults many days after symptom resolution.[15] This is also paramount for health workers to not underestimate as, if they became infected, the risk of further spreading the disease, while willing to treat it, is high.[15]

Covert virus spreading also seems to occur during the preclinical inoculation period. Mean incubation time was reported to be 6.2 days (range 2–14) with asymptomatic carriers before and after the clinical overt phase, if any present.[16] In the preclinical phase, it is important to separate any person with contact to a suspected or confirmed case. On 20 March 2020, the Swiss Government increased quarantine time recommendations from 5 days up to 10 days. Our findings support this decision as it covers more accurately the incubation time for contacts.

However, some slightly symptomatic carriers may test negative in PCR of nasopharyngeal swabs. Therefore, it is important to time adequately swabs and to repeat them, if clinical suspicion of COVID-19 is present. Wang *et al*[17] described the highest sensitivity for PCR for bronchoalveolar lavage fluid (93%) followed by sputum (72%), nasal swabs (63%) and pharyngeal swabs (32%). A combination of different or symptom-oriented swap localisation may be useful.

Of note, SARS-CoV-2 can also be transmitted by oral–faecal route with viral shedding proven in stool specimen of patients with COVID-19.[17]

The relative lack of sensitivity of PCR, especially in young and healthy population, poses great challenges to epidemic control.[17 18] For that reason, serological testing has gained great interest in the past weeks but still requires further validation.[19] In our case series, none of the asymptomatic close contacts to patients 1 and 2 tested positive for PCR and/or serology. One possible explanation is that hygiene measures during quarantine and isolation were sufficient to avoid further spread. However, considering the high reproduction number of COVID-19, a false-negative PCR from nasopharyngeal swab and false negative serology have to be considered. For the latter, a weak to mild symptomatology could explain the lack of detectable immune reaction.[20] Finally, negative serological testing might be linked to not yet fully validated technology.[19] How covert shedding of SARS-CoV-2 may be reduced in the future, for example by prophylactic hydroxychloroquine,[21] remains unknown but is of great strategic interest for civil and military authorities.

CONCLUSIONS

Young and healthy patients often show a mild course when infected with SARS-CoV-2. They may be before and after symptom presentation carriers and spreaders of SARS-CoV-2. This factor may lead to significant covert viral transmission.

An early and prolonged establishment of isolation and quarantine for patients and close contact persons, respectively, is therefore essential to slow down SARS-CoV-2 epidemic growth, especially in confined space conditions seen in a military setting.

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