



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Available online at www.sciencedirect.com

Public Health

journal homepage: www.elsevier.com/puhe

Short Communication

An acute febrile outbreak in a refugee community of an Italian asylum seeker center: lessons learned



M. Ciccozzi ^{a,i}, E. Riva ^{b,i}, S. Vita ^{c,i}, E. Cella ^a, M. Fogolari ^d, S. Spoto ^e,
M. Lopalco ^{f,g}, G. Ceccarelli ^{c,f,g,h}, S. Angeletti ^{d,*}

^a Unit of Medical Statistics and Molecular Epidemiology, University Campus Bio-Medico of Rome, Italy

^b Unit of Virology, University Campus Bio-Medico of Rome, Italy

^c Migrant and Global Health Research Organisation, Centro di Ricerca Sulla Salute Globale e Delle Popolazioni Mobili (Mi-Hero), Italy

^d Unit of Clinical Laboratory Science, University Campus Bio-Medico of Rome, Italy

^e Internal Medicine Department, University Campus Bio-Medico of Rome, Italy

^f Sanitary Bureau of Asylum Seekers Center of Castelnuovo di Porto, Rome, Italy

^g Auxilium Società Cooperativa Sociale, Senise (PZ), Italy

^h Department of Public Health and Infectious Diseases, University of Rome Sapienza, Italy

ARTICLE INFO

Article history:

Received 31 March 2018

Received in revised form

18 May 2018

Accepted 18 May 2018

Available online 20 July 2018

Keywords:

Outbreak

Refugees

Best practice

Infection control

ABSTRACT

Objectives: The management of infectious outbreaks in closed settings represents an important public health issue. An outbreak of acute febrile syndrome affecting 22 refugees resident at the Asylum Seekers Centre of Castelnuovo di Porto in Rome has been reported, and the preventive and control measures adopted have been described as an example of public health safety.

Methods: Pharyngeal swab and whole-blood samples were collected from 22 cases observed and analyzed for standard bacterial cultures and respiratory and herpesviruses by qualitative CLART PneumoVir2 and Entherpex microarray.

Results: A possible respiratory-transmitted etiology and a concomitant reactivation of multiple herpesviruses have been evidenced. The epidemiological investigation showed that the spread of the epidemic was promoted because patients were hosted in neighboring rooms or in the same room, facilitating the rapid spread of infectious disease.

Conclusions: The potential way of transmission was supposed, and preventive measures for infection control were adopted. The measures adopted are an example of best practice for outbreak management, and the microbiological surveillance is recommended for public health improvement.

© 2018 The Royal Society for Public Health. Published by Elsevier Ltd. All rights reserved.

* Corresponding author. Unit of Clinical Laboratory Science, University Campus Bio-Medico of Rome, Via Alvaro del Portillo 200, 00128 Roma, Italy.

E-mail address: s.angeletti@unicampus.it (S. Angeletti).

ⁱ These authors equally contributed.

<https://doi.org/10.1016/j.puhe.2018.05.026>

0033-3506/© 2018 The Royal Society for Public Health. Published by Elsevier Ltd. All rights reserved.

The debate on migrant population health condition at arrival in the hosting country is an actual topic. The status of ‘healthy migrant’ depends on different factors such as the countries of origin, the access to healthcare service, or the socio-economic status.¹

Refugees have to face long heavy journeys deteriorating their initial good status of health for psychological or post-traumatic stress.² Moreover, refugees can acquire levels of health similar to those of the host population, consequently leading to environmental and behavioral changes.^{1–3}

Given that a large number of migrants, on their arrival, are housed at the asylum seeker centers (ASCs), where subjects live in strict contact with each other for a variable period waiting to obtain the necessary documents to have refugee status, the infection control of those enclaves is recommended to avoid outbreak development.^{1–4}

This study provides a picture of an outbreak of acute pharyngitis–febrile syndrome that started in May 2017 in the Asylum Seekers Centre of Castelnuovo di Porto (Rome, Italy). The search for the potential pathogen, the clinical evaluation of the patients, the potential route of transmission, and the strategies for containing the outbreak have been described.

At this aim, the clinical data were obtained by the Internal Healthcare Facility (IHF) archive of the ASC. The IHF team, including specialists in internal medicine and infectious diseases, evaluated all patients with suspicious diseases and took care of public health issues within the ASC. Pharyngeal swab and whole-blood samples were collected from all patients with a fever higher than 38°C along with one or more of the following symptoms: headache, pharyngeal pain, arthralgia, rhinorrhea, and/or nasal congestion to identify the causal pathogen.

Automated hematology analyzer Sysmex XN3000 was used for the blood cell count (Dasit Group S.p.A, Italy). Pharyngeal swab samples were analyzed for standard bacterial cultures and for the following respiratory viruses: adenovirus, bocavirus 229E, enterovirus, influenza type A (H2N2, H1N1, and H1N1/2009), influenza type B, influenza type C, metapneumovirus (A/B), parainfluenza (1–4), rhinovirus, respiratory syncytial virus (RSV) (A/B), coronavirus OC43 by qualitative CLART PneumoVir2 microarray (Genomica, Italy). Moreover, the presence of human herpesviruses cytomegalovirus (CMV), varicella zoster virus (VZV), herpes simplex virus (HSV) (1/2), human herpesviruses (HHV6, HHV7, and HHV8) was evaluated by qualitative CLART Entherpex microarray (Genomica, Italy). Both the assays (PneumoVir2 and Entherpex) are based on a multiple polymerase chain reaction system able to detect respiratory or neurotropic pathogens simultaneously.

From May 27th to June 12th 2017, 22 cases with symptoms of prodromal rhinorrhea and nasal congestion followed by fever (higher than 38°C), headache, pharyngeal pain while swallowing, and arthralgia presented at the IHF. The median age of the cases was 23 years old, mostly men coming from Pakistan, Bangladesh, and Nigeria (Table 1). All of them were in healthy status at their arrival at ASCs from 17th February to 26th May 2017.

The index case was a 28-year-old man coming from Mali, who arrived at the ASC 17 days before. Two days later, a 26-year-old Nigerian man presented the same symptoms. Furthermore, 20 people complained the same disease with

Table 1 – Epidemiological and clinical characteristics of the 22 refugees described in the outbreak and microorganisms identified by CLART Entherpex microarray.

Variables	N (%) patients
Age (years)	
Mean	22
95% CI for the media	17–26
Median	23
Interquartile range	18–27
Gender	
Male	20 (91)
Female	2 (9)
Nationality	
Pakistan	5 (23)
Bangladesh	4 (18)
Nigeria	4 (18)
Mali	3 (14)
Ivory Coast	3 (14)
Guinea	2 (9)
Palestine	1 (5)
Date of arrival	From 17th February to 26th May 2017
Date of symptom appearance	From 27th May to 12th June 2017
Symptoms	
Mean body temperature (°C)	38
Headache	18 (82)
Rhinorrhea	10 (45)
Arthralgia	10 (45)
Pharyngitis	10 (45)
Pharyngeal swabs	
All positive for respiratory pathogens	12 (54)
Influenza B	8 (36)
Bacteria (<i>Streptococcus pneumoniae</i> 2, <i>Haemophilus influenzae</i> 1, <i>H. influenzae</i> + <i>S. pneumoniae</i> 1)	4 (18)
Pharyngeal swabs	
HHV7	7 (32)
HHV6	2 (9)
EBV + HHV7	7 (32)
EBV + HHV6 + HHV7	1 (4.5)
HHV6 + HHV7	1 (4.5)
HSV-1+HHV7	2 (9)
HSV-1+EBV	2 (9)
Blood samples	
EBV + HHV7	5 (23)
HHV6	1 (4.5)
HHV6 + HHV7	1 (4.5)
Negative	15 (68)

CI, confidence interval.

different clinical evolution until June 12th. A graphic representation of the number of cases registered during the outbreak period is reported in Fig. 1. The physical examination showed mean body temperature of 38.6°C, mean oxygen saturation of 98% on room air and tachycardia. The oral cavity inspection showed a hyperemic pharynx without exudate, while lungs, abdomen, and neurological examination was normal. The large and small joints showed no signs of local inflammation, despite being painful. A symptomatic therapy with paracetamol or non-steroidal anti-inflammatory drugs

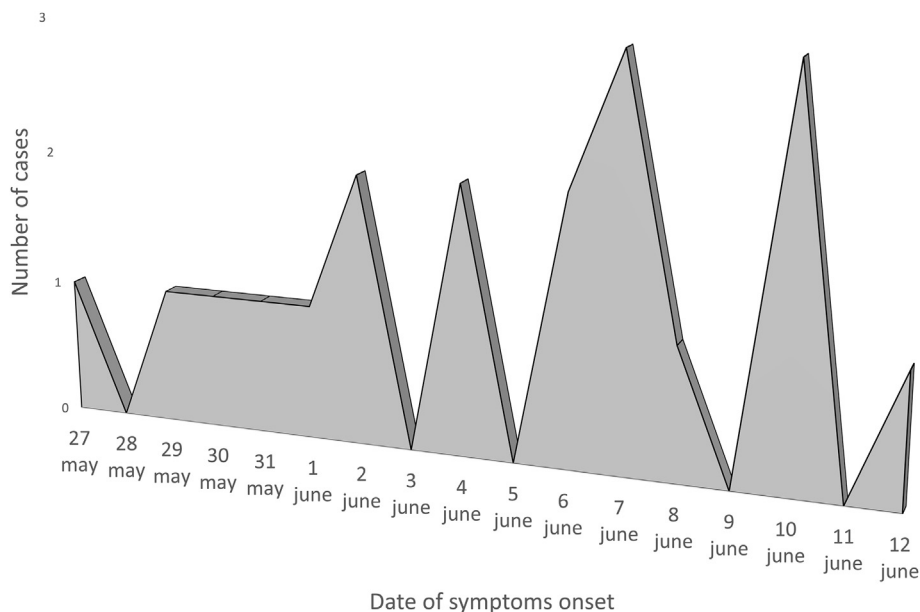


Fig. 1 – Representation of the number of cases of acute febrile syndrome registered during the outbreak period.

was administered in most of the cases; no antibiotic therapy was prescribed. A spontaneous and complete remission of the symptomatology was observed in all patients in a median of 7 days (min 6, max 9 days).

Blood tests showed a median value of white blood cells of $8.500 \times 10^3/\mu\text{L}$ (n.r. 4000–10.000 cells $\times 10^3/\mu\text{L}$), with 30.5% of neutrophils (n.r. 40–80%), 54% of lymphocytes (n.r. 20.0–40.0%), and 12% of monocytes (n.r. 2.0–10.0%).

Because many bacteria and viruses may cause pharyngitis either as a single manifestation or as a part of more generalized illness, pharyngeal swabs and blood samples were screened for both respiratory and herpesviruses. In several cases, pharyngitis has been observed in course of herpesvirus infections.^{5,6}

The presence of respiratory pathogens (eight cases of influenza type B and four cases of bacterial infections) was detected in 12/22 swabs (54%), as in Table 1.

Pharyngeal swabs tested all positive for herpesvirus infection with HHV7 as the most prevalent one, detected alone or in coinfection (82% of cases). In 7/22 (32%) blood samples, herpesviruses were detected mostly as coinfection by Epstein barr virus (EBV)-HHV7 (Table 1).

A respiratory-transmitted infection was the most probable hypothesis based on the symptoms observed, results of laboratory tests, and spontaneous remission in the absence of antibiotic therapy.

During the febrile outbreak, a generalized reactivation of multiple herpetic virus, especially involving HHV7, was observed. Interestingly, in 36% of cases, influenza B virus, considered a mild pathogen, was detected. We suppose that the pathogenesis of a mild virus could be exacerbated by the local reactivation of human herpesvirus.^{7–10}

From a public health point of view, in the Asylum Seekers Centre of Castelnuovo di Porto, one of the largest in Europe, between 600 and 750 migrants are hosted (during the outbreak

period 653). The center is housed in a two-storey building divided into sectors with separate access routes. In each room, there are around four to eight people. Small cultural and linguistic enclaves are housed in the different sectors of the center. Although there are no formal separations, it is infrequent that the different groups share the spaces dedicated to housing. Even the common areas such as meeting rooms, spaces dedicated to religious practices, and the canteen are generally frequented at different times by the different enclaves. The division of the building into separate sectors and the previously described behaviors of the various cultural communities probably prevented the spread of the epidemic and allowed the health professionals to concentrate on the prevention efforts to close contacts of the observed febrile syndrome cases.

The epidemiological investigation showed that all refugees were hosted within two different floors, twelve on the ground floor and ten on the first floor, of the ASC building and in neighboring rooms. In six cases, they divided the same room, and all usually frequented some common meeting rooms. This accommodation probably facilitated the rapid spread of the infectious disease in a small group of migrants but prevented the spread on a large scale depending on the functional isolation of the guests in small linguistic and cultural clusters and the division of the building into sectors.

Moreover, on the basis of the characteristic of the symptoms observed, the IHF team hypothesized that the disease had an air transmission, and the team chose to isolate previously in single rooms (and subsequently with cohort isolation) the people with the same symptomatology. All patients underwent clinical and blood tests aimed at identifying the possible pathogen. All possible close contacts with sick people were asked to visit within 24 h of onset of symptoms: in detail, ‘close contacts’ were considered in those who had shared rooms and people visiting patients routinely. These people, if

asymptomatic, were monitored daily at the clinic in the following 7 days. The prevention measures adopted by the IHF team were put in place at the time of detection of the third case of febrile syndrome. The implementation of the preventive measures such as air isolation, contact tracing, and active clinical surveillance of close contacts allowed to get evident decrease of the number of cases and rapid control of the outbreak within about two weeks. Interestingly, we believe that a key factor in the management of the epidemic has been the availability of an adequate ratio between the number of subjects evaluated and the size of the medical staff available. In fact, the total health workforce-to-population hosted ratio was 0.026 (17–653). Considering that the organization of the ASC healthcare service provided for the presence of a doctor and two nurses 24 h a day, the daily ratio was 1 healthcare professional to 217.6 asylum seekers. Furthermore, during the epidemic spread, the medical staff was boosted with a second medical doctor, completely devoted to the screening of close contacts.

Conclusions

This report represents an example of lesson learned to manage epidemic events by adequate surveillance and preventive measures in refugee ASCs. It is conceivable that microbiological culture and molecular testing should be a requisite to improve infection control and epidemic prevention. Refugees at their arrival in a new country, even in good health status, can be more vulnerable to disease especially when living in close contact with each other. In these conditions, epidemiological monitoring and microbiological surveillance are recommended to avoid outbreaks or epidemics potentially spreading also in community and to guarantee public health.

Author statements

Ethical approval

None sought.

Funding

None declared.

Competing interests

None declared.

REFERENCES

1. Ciccozzi M, Cella E, Ceccarelli G, Vita S, Dicuonzo G, Lopalco M, et al. Sentinel surveillance data from Eritrean refugees in Italy: the theory of “Healthy refugees”. *Travel Med Infect Dis* 2017;**89**:30153–9.
2. Angeletti S, Cella E, Lai A, Fogolari M, Azarian T, Prosperi M, et al. Whole-genome sequencing of *Klebsiella pneumoniae* MDR strain isolated in a Syrian refugee. *Pathog Glob Health* 2017;**111**:212–5.
3. Ceccarelli G, Vita S, Riva E, Cella E, Lopalco M, Antonelli F, et al. Susceptibility to measles in migrant population: implication for policy makers. *J Travel Med* 2018;**25**(1).
4. Angeletti S, Ceccarelli G, Vita S, Dicuonzo G, Lopalco M, Dedej E, et al. Unusual microorganisms and antimicrobial resistances in a group of Syrian Refugees: sentinel surveillance data from an asylum seekers centre in Italy. *Travel Med Infect Dis* 2016;**14**:115–22.
5. Bruynseels P, Jorens PG, Demey HE, Goossens H, Pattyn SR, Elseviers MM, et al. Herpes simplex virus in the respiratory tract of critical care patients: a prospective study. *Lancet* 2003;**362**:1536–41.
6. Bisno AL. Acute pharyngitis. *N Engl J Med* 2001;**344**:205–11.
7. Thomasini RL, Martins Jde M, Parola DC, Bonon SH, Boin Ide F, Leonardi LS, et al. Detection of human herpesvirus-7 by qualitative nested-PCR: comparison between healthy individuals and liver transplant recipients. *Rev Soc Bras Med Trop* 2008;**41**:556–9.
8. Grinde B. Herpesviruses: latency and reactivation – viral strategies and host response. *J Oral Microbiol* 2013;**5**:22766.
9. Traore L, Tao I, Bisseye C, Diarra B, Compaore TR, Nebie Y, et al. Molecular diagnostic of cytomegalovirus, Epstein Barr virus and Herpes virus 6 infections among blood donors by multiplex real-time PCR in Ouagadougou, Burkina Faso. *Pan Afr Med J* 2016;**4**:298.
10. Textoris J, Mallet F. Immunosuppression and herpes viral reactivation in intensive care unit patients: one size does not fit all. *Crit Care* 2017;**21**:230.