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Short Communication

Infectious disease risks among refugees from North Korea

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ABSTRACT

Objectives: The characteristics of disease in North Korea, including severe malnutrition and infectious disease risks, have not been openly and widely analyzed. This study was performed to estimate the risks of infectious diseases among refugees from North Korea.
Methods: A literature review of clinical studies among North Korean defectors was conducted to statistically estimate the risks of infectious diseases among North Korean subjects.
Results: A total of six groups of data from five publications covering the years 2004 to 2014 were identified. Tuberculosis and viral hepatitis appeared to be the two most common infectious diseases, especially among adult refugees. When comparing the risks of infectious diseases between North Korean and Syrian refugees, it is critical to remember that *Plasmodium vivax* malaria has been endemic in North Korea, while cutaneous leishmaniasis has frequently been seen among Syrian migrants.
Conclusions: Valuable datasets from health surveys of defectors were reviewed. In addition to tuberculosis and viral hepatitis, which were found to be the two most common infectious diseases, a special characteristic of North Korean defectors was *Plasmodium vivax* malaria. This needs to be added to the list of differential diagnoses for pyretic patients.

Introduction

With its intensifying military exercise and nuclear programs, the political climate in North Korea has become unstable. Considering the possibility of refugees in this region in the future, preparedness for a sudden change is required, along with an appropriate risk assessment (Stares and Wit, 2009). In particular, it is critical to anticipate the infectious disease risks triggered by sudden and large-scale human migration events. However, the characteristics of disease in North Korea, including severe malnutrition, have not been openly and widely analyzed, and disease structures are likely to be rather different from those of surrounding countries (Lee et al., 2013).

The most pressing public health questions may be: (1) For what infectious diseases are the risks high? (2) How does the composition of diseases compare to those of other humanitarian crisis events?

The present study was performed to estimate risks of infectious diseases among refugees from North Korea by means of a literature review.

Materials and methods

While epidemiological datasets from the North Korea population have not been openly shared with other countries, the current risks of infectious diseases in North Korea can be inferred from the health status of defectors, i.e., North Korean individuals who have managed to defect for political, ideological, or other reasons and relocate to South Korea or elsewhere. As of July 2017, a total of 8891 male and 21,914 female defectors had entered South Korea, with more than 90% of these defections having occurred since 2002 (Ministry of Unification, Korea, 2017). The average age of male and female defectors has been 30.2 years and 33.6 years, respectively, with 25.1% of male defectors and 11.9% of female defectors being minors aged <20 years (Ministry of Unification, Korea, 2017).

In this study, all publications reporting infectious disease risk estimates for North Korea, i.e., estimates of incidence or prevalence for different infectious diseases, were identified and analyzed. Many of the publications reporting infectious diseases in North

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Korea have been written in Korean and have not been published as original research articles, thus the present study was not able to follow a formal method of systematic search using MEDLINE or other databases. References cited by specialized articles on North Korea (Stares and Wit, 2009; Lee et al., 2013) and published reports on North Korean defectors since 2002 were first tracked (Kim, 2010). Their reference lists were subsequently investigated further to search for potentially useful articles. This search was repeated as many times as necessary until no further references were identified. The publications obtained were limited by the following inclusion criteria: the publication must (1) report the risks of two or more infectious diseases as statistical estimates, (2) clarify the time and subject of the study, and (3) explicitly document a survey method by which the clinical diagnosis was made. Information with respect to the year of the survey, number and characteristics of subjects, and the survey method was retrieved from each selected study.

Although not specific to North Korea, contemporary understanding of the infectious disease risks among refugee populations in general is currently well-documented (European Centers for Disease Prevention and Control (ECDC), 2009). In particular, due to the ongoing civil war in Syria, which began in around 2011, European countries have already accepted a large number of Syrian refugees and have experience of exposures to a number of imported infectious diseases (Petersen et al., 2013). Using the GeoSentinel surveillance results for Syrian refugees that were collected from several European countries (Mockenhaupt et al., 2016), it was sought to identify any special infectious disease risks that could characterize the health of North Korean defectors.

Results

A total of six groups of data from five publications covering the years 2004–2014 were identified (Table 1), including five survey results and one governmental report dataset (Lee et al., 2013; Ministry of Unification, Korea, 2017; Yoon and Kim, 2005; Hwang et al., 2012; Dorman et al., 2017). Among the five survey studies, four had included defectors in South Korea as the source of information (and defectors were interviewed about themselves and their household members in North Korea), while the remaining one study had implemented a laboratory examination of defectors attending a clinic in Toronto. With the exception of the Toronto study, which collected data based on medical attendance, all of the other surveys were based on cross-sectional interviews of defectors including healthy individuals. While early studies in 2004 and 2004–2007 included healthy individuals ($n = 306$ and $n = 6087$ persons, respectively) and examined the yearly incidence, a later study covering the years 2008–2010 and a Toronto study for the years 2011–2014 examined only those who had at least one medical complaint ($n = 524$ children and $n = 583$ adults according to a survey of 345 defectors in South Korea and 117 persons in Toronto, respectively). The Toronto study relied on laboratory

Table 1
Infectious disease risks among North Korean defectors.[a]

Year of survey	2004	2004–2007	2008–2010	2008–2010	2011	2011–2014
First author (Ref.)	Yoon (Yoon and Kim, 2005)	Police Science Institute (Ministry of Unification, Korea, 2017)	Hwang (Hwang et al., 2012)	Hwang (Hwang et al., 2012)	Lee (Lee et al., 2013)	Dorman (Dorman et al., 2017)
Sample size, *n*	306	6087	524	583	NA	117
Subjects	Defectors in SK	Defectors in SK and their family members	Symptomatic children	Symptomatic adults	Governmental report	Refugees in Canada
Method	Cross-sectional interview of defectors	Serial cross-sectional interviews of defectors	Cross-sectional survey of symptomatic subjects	Cross-sectional survey of symptomatic subjects	Latest governmental reports	Attendance at a clinic
Diseases/clinical syndromes						
Viral hepatitis	25 (8.2)	669 (11.0)	9 (1.7)	119 (20.4)	–	16 (14)
TB	19 (6.2)	130 (2.1)	22 (4.2)	172 (29.5)	345/100 000	–
Malaria	–	–	–	–	10 000 per year	–
STI	–	137 (2.3)	–	–	–	Chlamydia 10, syphilis 3
HIV	–	–	–	–	–	0
Acute gastroenteritis	35 (11.4)	–	44 (8.4)	16 (2.7)	–	–
Cholera	–	–	6 (1.1)	–	–	–
Typhoid fever	–	–	11 (2.1)	14 (2.4)	–	–
Paratyphoid	–	–	–	24 (4.1)	–	–
Intestinal parasites	–	–	–	–	–	11 (22)
Chickenpox	–	–	16 (3.1)	–	–	–
Measles	–	–	18 (3.4)	–	–	–
Influenza	–	–	–	20 (3.4)	–	–
Acute flaccid paralysis	–	–	15 (2.9)	–	–	–
Rickettsiosis	–	–	15 (2.9)	–	–	–
Sinusitis	11 (3.6)	–	–	–	–	–
Skin infections	11 (3.6)	–	–	–	–	–
Oral infectious diseases	9 (2.9)	–	–	–	–	–

NA, not applicable; SK, South Korea; TB, tuberculosis; STI, sexually transmitted infections.
[a] Data are presented as the number (percentage) among the total.