ABSTRACT

Objectives: As Afghans are the most common foreign nationals in Iran, the aim of this study was to assess the proportion of Afghan immigrant in the most important infectious disease in Iran.

Methods: The national and international online scientific data bases were searched until November 2013. Also the references lists of included studies were searched. All descriptive studies concerning the most infectious diseases including Tuberculosis, Multiple-drug-resistant tuberculosis, Malaria, Cholera, Crimean-Congo Hemorrhagic Fever, Leishmaniasis and hepatitis B in Iran were retrieved irrespective of nationality. Selection of studies and data extraction was performed by two authors separately. Results were reported by random effect model with 95% confidence interval.

Results: The overall proportion of Afghan immigrants with aforementioned infectious diseases was 29% [95% CI: 0.21, 0.37]. According to stratified analysis the proportion of Afghan immigrant was calculated for tuberculosis (29%), Multiple-drug-resistant tuberculosis (56%), malaria (40%), cholera (8%), Crimean-Congo Hemorrhagic Fever (25%), leishmaniasis (7%) and hepatitis B (14%).

Conclusion: It seems crucial to control the health status of the Afghan immigrants when coming to Iran, to prevent of communicable infectious diseases, which are viewed seriously by international health regulations.

Keywords: Afghan, immigrant, infection, health, systematic review, Iran
Introduction

According to statistics released by the United Nations in 2013, an estimated 232 million migrants living abroad worldwide. This amounts to approximately 3.2 percent of the world's population. Illegal immigration is considered a punishable crime by many governments. Illegal immigrant refers to undocumented immigrants, constitute and under certain conditions, a refugee population in a host country. Since undocumented immigration does not provide reliable statistics, it can only be estimated that about twenty to thirty million illegal immigrants exist worldwide. Afghans account for the majority of the immigrants in Iran.

After Iraq and Turkmenistan, Afghanistan shares the longest border with Iran. Due to the occupation of Afghanistan by the the Union of Soviet Socialist Republics (USSR) between 1980 and 1989 and subsequent internal wars in Afghanistan, around 2.9 million Afghans have immigrated to Iran. Over recent years, although a myriad of encouragements as well as threats have been presented to these nationals to return to Afghanistan, the repatriation process has been extremely slow. Poverty, unemployment and a lack of security in Afghanistan are amongst the most important factors that prevent Afghans from returning to their own country. According to Iranian government plans, the plan for Afghans’ gradual return was started in 1995. In a census conducted in 2001 in Iran, 2.5 million foreign nationals were counted and in 2007 this figure decreased to one million. Of these, more than 940,000 were Afghan. However, this figure reflects the official statistics; the number of undocumented nationals is much higher. Four hundred thousand Afghan residents are born in Iran and the mean duration of their residence is over fifteen years.
In spite of the longstanding presence of Afghan immigrants, they are in the lower levels of social, political and economic life in Iran. These immigrants work predominantly in jobs requiring little or no skills (7). The presence of these foreign nationals has imposed multiple challenges such as health risks and social problems. Of these challenges, the spread of infectious disease is a significant problem (8).

Immigration can negatively affect the state of health of immigrants, because of lack of availability of health services (9). The Iranian government has followed the surveillance and treatment of all foreign nationals regardless of their nationality.

Immigrants, particularly Afghans, have led to an increase in the amount of reports of some diseases in Iran. After the first wave of Afghan immigrants came to Iran (more than 30 years ago), immigrants have had access to essential health care, education, and employment opportunities (10).

According to the WHO report, the burden of most of the infectious diseases such as TB, leishmaniasis and malaria in Afghanistan is more than Iran (11-13). Several studies concerning infectious diseases, which were conducted in Iran, addressed the proportion of Afghan immigrants among the patients. However, results have been inconsistent and thus there is no accurate estimation of Afghan immigrants with infectious diseases in Iran. The aim of this systematic review and meta-analysis was to estimate the overall proportion of Afghan immigrants with the most common infectious diseases in Iran.

**Materials and Methods**

To conduct this study, the list of all infectious diseases that Afghans could potentially be infected with was drawn up, as this could pose a threat to the Iranian public health status. This list was
extracted via a web-based search and a primary search of related articles. Using Delphi method and after sending the list to ten experts in the Ministry of Health, the infectious diseases with the highest importance were selected.

To find articles related to these selected diseases, a systematic review was conducted.

**Searching:** The major national and international databases were searched using the following key words: emigrants and immigrants, refugees, Afghan, Iran, prevalence, incidence, tuberculosis, HIV, Acquired Immunodeficiency Syndrome, malaria, cholera, Crimean-Congo hemorrhagic fever (CCHF), hepatitis B, hepatitis C and leishmaniasis. The international databases included: Web of Knowledge (January 1945 to November 2013), ScienceDirect (January 1823 to November 2013), Medline (January 1950 to November 2013) and Scopus (January 1973 to November 2013). Moreover, the following national databases were searched: Science Information Database (up to November 2013), MagIran (up to November 2013), Iranmedex (up to November 2013) and Medlib (up to November 2013).

The reference lists of all included studies were searched in order to attain additional articles. Also the authors of included studies were contacted.

**Criteria for including studies:** All descriptive studies regarding the most significant infectious diseases in Iran including tuberculosis, cholera, hemorrhagic fevers, malaria, HIV/AIDS, hepatitis B, hepatitis C and leishmaniasis were retrieved irrespective of nationality of subject and language of the study. The main point of interest was the proportion of Afghan immigrants with the listed diseases in Iran.

**Data collection and validity assessment:** Two authors (ADI, BP) independently screened the title and abstract of all obtained studies and then reviewed the full texts of the retrieved studies that met the inclusion criteria of this review.
The authors were not blinded to the names of the studies’ authors and journals. All disagreements between authors about the final selection of studies were resolved by adjudication with a third author. The agreement rate of both authors was 88.44% and the kappa statistic for checking reliability was 76.47%.

The variables that were extracted for data analysis included: study design, year and location of the study, type of infectious disease, nationality of participants, sample size, number of Afghan patients and number of Iranian patients.

Six items from the checklist of STROBE (14) were selected and used for assessing the quality of reporting. They included: (a) describe the setting, location and related times; (b) describe the demographic characteristics of the people that participated in the study; (c) give the inclusion and exclusion criteria; (d) describe the methods for the measurement of the outcome; (e) present the key element of the study design; and (f) state how the study sample size was derived.

The studies that fulfilled all items were classified as high quality, studies that did not meet one item were classified as intermediate quality and studies that did not fulfil more than one item were classified as low quality.

The studies with a small number of patients were excluded from this review. For this purpose the minimum sample of 18 was considered the cut-off point for estimating the proportion of Afghan patients in Iran (assuming P to be 85% with statistical power of 80% and significant level of 5%). Thus, the studies with a sample size less than 18 were not eligible for this study and excluded from analysis.

**Statistical methods:** The measure of interest was the "proportion of Afghan immigrants afflicted with the infectious diseases including tuberculosis, multiple-drug-resistant tuberculosis (MDR TB), cholera, Crimean-Congo hemorrhagic fever (CCHF), malaria, hepatitis B and leishmaniasis
in Iran" with a 95% confidence interval (CI). Statistical heterogeneity was explored using Cochran's Q-test and Higgins' $I^2$ statistic. The analysis was performed using the statistical software Stata 11 (Stata Corp, College Station, TX, USA). Meta-analysis was performed to attain summary measure of “proportion of Afghan immigrants with prevalent infectious disease. The random effects model was used with 95% confidence interval (CI) for data analysis and report of results.

**Results**

**Description of studies:** Two hundred and twenty three studies were extracted up to November 2013, including: 101 through searching the international databases, 103 through searching national databases, 8 through checking the reference lists of the included studies and 11 through contact with authors of selected studies (Figure 1).

Of the 223 extracted studies, 50 studies were excluded because of duplication, 87 studies were excluded because they did not support the objective of this review, 40 studies did not meet the eligibility criteria for this review and 6 studies had too small sample size. In the end, 40 studies were included in the analysis (15-53). The combined included studies involved 125248 participants.

Twenty-nine percent of included studies were high quality, 42% were intermediate quality and 29% were low quality. A stratified analysis was performed according to the quality of the studies, date of performance of the study and type of infectious disease (Table 2).

**Proportion of Afghan immigrants with tuberculosis and MDR tuberculosis in Iran:** Twenty-two studies (17-19, 21-24, 29-34, 38, 41, 43-47, 49, 51) addressed the number of Afghan
immigrants in Iran with tuberculosis from 1997 to 2010. The pooled proportion estimate of Afghan immigrants with tuberculosis on the basis of random effect was 29% (95% CI: 23%, 34%). The lowest proportion, 4%, was reported in the Birjand study (22) in 2009 and the highest proportion, 55%, was reported in the Kashan study (38) in 2009. Two studies addressed the number of Afghan immigrants with MDR tuberculosis (27, 50). The pooled proportion estimate of Afghan immigrants in Iran with MDR tuberculosis on the basis of random effect was 56% (95% CI: 34%, 77%).

**Proportion of Afghan immigrants with malaria in Iran:** Six studies addressed the number of Afghan immigrants in Iran with malaria from 2003 to 2011 (26, 39, 40, 48, 52, 53). The pooled proportion estimate of Afghan immigrants in Iran with malaria on the basis of random effect was 40% (95% CI: 0.23, 0.57). The lowest proportion, 4%, was in the Sistan and Baluchistan study (52) in 2011 and the highest proportion, 99% was in the Rafsanjan study (53) in 2010 (Table 2).

**Proportion of Afghan immigrants with Crimean-Congo haemorrhagic fever (CCHF) in Iran:** Two studies addressed the number of Afghan immigrants in Iran with CCHF (16, 27). The pooled proportion estimate of Afghan immigrants with CCHF was 25% (95% CI: 0.20, 0.30).

**Proportion of Afghan immigrants with cholera in Iran:** Four studies addressed the number of Afghan immigrants in Iran with cholera (20, 28, 42, 54). The pooled proportion estimate of Afghan immigrants with cholera in Iran on the basis of random effect was 8% (95% CI: 0.004, 0.16). The lowest proportion, 2%, was in a national study (28) in 2007 and the highest proportion, 19%, was in the Zabol study (54) in 2005.

**Proportion of Afghan immigrants with leishmaniasis in Iran:**
Three studies were found concerning leishmaniasis that addressed the number of Afghan immigrants with leishmaniasis (15, 35, 36) The pooled proportion estimate of Afghan
immigrants with leishmaniasis was 7% (95% CI: 0.00, 0.13). The lowest estimate, 2%, was related by the Gorgan study (15) in 2004 and highest estimate was related by the Isfahan study (36) in 1994.

**Proportion of Afghan immigrants with hepatitis B in Iran:** One study concerning hepatitis B had eligibility criteria for including in this review (25) The proportion of Afghan immigrants with hepatitis B in this study was 14%.

**Discussion**

Tuberculosis, MDR tuberculosis, malaria, cholera, CCHF, leishmaniasis and hepatitis B are the most common infectious diseases among the afghan immigrants in Iran. Iran spends much annually for the prevention, control and treatment of these infectious diseases. It has been estimated that the government spends more than 100,000 dollars annually just to treat Afghan immigrants with tuberculosis (55). The results of this meta-analysis indicated that a high proportion of cases of infectious disease in Iran are Afghan immigrants. They constituted 29% of patients with these infectious diseases in Iran. Furthermore these findings indicated that 55% of multi-drug resistant TB patients, 40% of malaria patients, 29% of tuberculosis patients and 25% of CCHF patients in Iran are Afghan immigrants respectively.

Also the proportion of Afghan immigrants has been increasing since 1994. It means that the high proportion of Afghan immigrants in infectious diseases is a critical public health issue in Iran. The main reason for this high proportion of Afghan immigrants in major infectious diseases in Iran may be their life style. It has been indicated that Afghan immigrants have little interaction with healthcare centres in Iran and therefore do not receive adequate healthcare/treatment (56). This, in turn, facilitates the spreading of infectious diseases in the community.
Afghanistan is known as a country with a high prevalence of TB. The latest reports indicate the annual incidence of TB in Afghanistan is 325 cases out of 100,000 population (57). Over recent years, TB has been well controlled in Iran, but due to the excessive traffic of Afghans with TB infection, Iran is once again facing a spread of the disease (58). The prevalence of MDR TB among the TB patients in Iran is reported 5.1% (59). The finding in this meta-analysis indicated that 29% (95% CI: 23%, 34%) of TB patients and 55% (95% CI: 34%, 77%) of multi-drug resistant TB patients in Iran are Afghan immigrants. Poor health conditions and services over the past three decades in Afghanistan have caused an increase in multi-drug resistant TB (MDR TB) amongst Afghans. Some of the immigrants that come to Iran lack a stable residence. This factor may cause a situation in which the Iranian health service personnel cannot follow up them during the treatment period (60).

One study conducted in Golestan province in north-east Iran also revealed that the incidence rate of all types of TB in Afghan families was significantly higher than the Iranian families (42 and 17 cases in each 100000 population, respectively) (61). A study in Tehran city carried out on 1028 patients with TB showed that Afghan patients with pulmonary TB were younger than the Iranian patients and Afghan patients with a positive smear had a more severe type of the disease according to the degree of their sputum smear (60).

The proportion of Afghan immigrants in malaria cases in recent years in Iran was 40% (95% CI: 0.23, 0.57). The reason for this high proportion may be due to the high incidence of malaria in Afghanistan, around 300 to 400 thousand cases yearly (62). Frequent travel among foreign nationals and immigrants from eastern neighbouring countries has become a major barrier to successfully controlling malaria in Iran (63). A study in southeast Iran indicated that the Afghan immigrants have significantly less knowledge and practice regarding the malaria transmission
and prevention comparing the Iranian general population. Also 37.9% of Iranians used bed nets, whereas only 10.3% of the Afghans did (64). Previous experience has revealed that controlling the eastern borders and limiting of excessive travel of Afghan nationals have been extremely effective in controlling the distribution of infectious diseases. For instance, reported cases of malaria in 2001 in Rafsanjan, in eastern Iran, were 62,000, but this figure dropped to 29,000 in 2006 after the return of Afghans to their country and some other Afghans who remained in Iran followed their treatment (53).

CCHF is also known as a significant endemic disease in Afghanistan. The results of this meta-analysis show that 25% (95% CI: 0.20, 0.30) of CCHF cases in Iran were Afghan immigrants. The most important factor for this high number is that most cases of CCHF in Iran have been reported from Sistan and Baluchistan province, neighbouring Afghanistan and Pakistan; most of the studies nationwide have counted trafficking of infected livestock from Afghanistan and Pakistan as one of the main reasons behind epidemics of this disease (65-67).

The findings of this study indicated that 8% (95% CI: 0.004, 0.16) of cholera patients in Iran have been Afghan immigrants. Afghanistan is one of the six countries accounting for eighty percent of all reported cases of cholera worldwide (68). Therefore, it appears that Afghan immigrants may play an important role in the initiation of cholera outbreaks in Iran (28).

The proportion of Afghan immigrants with leishmaniasis in this review was 7% (95% CI: 0.00, 0.13). Infected humans can act as a reservoir of this disease. According to a report published by WHO in 2002, leishmaniasis cases were estimated to be 200,000 in Kabul (69). Most of the outbreaks reported were anthroponotic cutaneous leishmaniasis (ACL) and zoonotic cutaneous leishmaniasis (ZCL) between 1987 and 2006 from various regions of Afghanistan (70). Then Afghan immigrants with leishmaniasis can be significant reservoirs of leishmaniasis in Iran.
Due to laboratory facility limitations, the real scope of the threat of certain hepatitis B in Afghanistan is not at all clear, therefore the prevalence of hepatitis B may be underestimated in Afghanistan but it can be assumed that around 10% of Afghans are infected with hepatitis B (71). Only one study addressed the proportion of hepatitis B that included in this review (25). According to this study 14% of patients with hepatitis B were Afghan immigrants. The prevalence of HBV infection in Afghan immigrants (4.92%) was significantly higher than the Iranians (1.21%). (P=0.046). Therefore the prevalence of hepatitis B in Afghan immigrants in Iran may be high due in particular to injection drug use among Afghan immigrants (72). Injection drug use (IDU) counts as one of the main reasons behind hepatitis B (71).

There have been several educational workshops for social health workers, licensed health staff and midwives to increase the health knowledge of more than three thousand Afghans living in Iran. It would seem advisable that such programmes and similar educational plans be continued so as to increase the general knowledge of Afghan immigrants.

**Limitation**

The proportion of Afghan immigrants with HIV/AIDS and HCV, that were two of the target infectious diseases in the beginning of this study, was not estimated because of the lack of related studies and documents.

Although the studies reviewed in this article mainly discussed reported cases of different diseases among immigrant Afghans, it was rare to find studies that mentioned the incidence and prevalence of these diseases in this population and compared them with the Iranian population.
All the demographic information of the Afghan immigrants, such as age, education, employment, etc., was not available so the results could not be interpreted based on the demographic information of the Afghan immigrants.

Conclusion
The overall pooled proportion of Afghan immigrants with TB, MDR TB, malaria, CCHF, cholera, leishmaniasis and hepatitis B in Iran was 29%. But it seems that this estimate is lower than of true proportion. Considering the long common border between Iran and Afghanistan and the high prevalence of travel between these two countries, it is crucial to develop and equip surveillance centres on the borders for early diagnosis of suspicious cases of infections and also for the prevention of the distribution of disease from these locations to other points in Iran. During epidemics of infectious diseases in Afghanistan, careful attention should be paid to the entry points and evaluation regulations for examining those people intending to enter Iran from Afghanistan should be strengthened.

In general, more studies on knowledge, attitude and practice among Afghan nationals and a comparison between them and the Iranian population with regard to infectious disease is absolutely necessary to gain enough evidence for better interventions.

Acknowledgments
This work was financially supported by the Pasteur Institute of Iran (Grant No. 582). The authors of this study would like to express their gratitude to Dr. A. Akbar Haghdoost and Dr. Ali
Mirzazadeh from Kerman university of Medical sciences, for reading the first draft of this article and sharing their invaluable comments. The study was supported by a grant from the Pasteur Institute of Iran (Grant No. 582).

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