Emerging and re-emerging infectious diseases in Iran

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Received: April 2017, Accepted: May 2017

ABSTRACT

Despite development of preventive and controlling strategies regarding infectious diseases, they are still considered as one of the most significant leading causes of morbidity and mortality, worldwide. Changes in humans’ demographics and behaviors, microbial and ecological alterations, agricultural development, international travels and susceptibility to infectious diseases have resulted in increased reports of emerging infectious diseases (EIDs) and reemerging infectious diseases (RIDs) in various geographical areas.

Because of the various types of geographic properties in Iran, substantial climatic variability, as well as unstable political situations and poor public health conditions in some of neighboring countries, EIDs and RIDs are serious public health problems; among them, zoonotic and drug resistant diseases are the most significant.

Hence, this review provides an overview of the significant bacterial, viral and fungal EIDs and RIDs in Iran regarding their epidemiological aspects.

Keywords: Epidemiology, Public health, Infectious diseases, Plague, Tuberculosis, Dengue

INTRODUCTION

Over the past century, even thought there was considerable development regarding prevention, control and elimination of some of the infectious diseases through proper use of hygiene and sanitation practices in addition to development of antibiotics and vaccination, some infectious diseases remained as the leading causes of morbidity and mortality worldwide. Furthermore, amongst the challenges in controlling these infectious diseases, emerging infectious diseases (EIDs) and reemerging infectious diseases (RIDs) could be pointed out (1).

EIDs are diseases that ocor for the first time in
the world, a defined region or a given population, or diseases that already existed but would emerge with a different pattern of virulence or resistance to current drugs (2-4). RIDs are infectious diseases which have been eradicated or reduced in a way that they did not cause any serious public health problem; however, once again, they show upward trends in incidence in a specific population or region (2, 3). Many EIDs and RIDs are zoonotic, can be transmitted from animals to human hosts. As the diseases in reservoirs of zoonotic EIDs or RIDs can be asymptomatic, the new reports of these diseases among human can reflect the infection of their reservoir hosts (3, 5, 6).

Changes in humans’ demographics and behaviors, microbial and ecological alterations, agricultural development, breakdown of public health measures, international commerce, war and famine and susceptibility to infectious diseases have resulted in increased reports of EIDs and RIDs in various geographical areas (2-4). In recent years, increased international travels have also led to spread of EIDs and RIDs; therefore, they were not easily controlled (7-9).

Like many other countries, EIDs and RIDs are considered a significant public health problem in Iran which is the 18th largest country in the world, geographically located in the Middle East. With over 77 million inhabitants, Iran is the world's 17th most populous country and shares land borders with Pakistan, Turkmenistan, Armenia, Azerbaijan, Turkey, Iraq, Afghanistan and maritime borders with Saudi Arabia, United Arab Emirates Kuwait, Kazakhstan and Russia. Each of these countries has some endemic infectious diseases that can be a threat to their neighboring countries, including Iran (10, 11). Unstable political conditions and wars in some of these countries have resulted in migrations and dislocations which are important factors in the spread of such endemic infectious diseases (6). Legal and illegal immigrants and refugees from these countries and international travels can be the source of some of EIDs or RIDs in Iran (12).

Therefore, this paper reviews the status of significant EIDs and RIDs, based on the existing reports. The review is divided into viral, bacterial, parasitic and fungal infectious diseases and can serve as a practical summary to be used by physicians, health care workers and researchers who would encounter these diseases in Iran.

Viral EIDs and RIDs

Crimean Congo Hemorrhagic Fever. Crimean Congo Hemorrhagic Fever (CCHF) is the most significant tick-borne viral human infection which is reported sporadically across a vast geographic area with endemic patterns in Asia, Africa, Eastern Europe and the Middle East (13).

The first infection by CCHF virus (CCHFV) in Iran was reported in the early 1970s, when CCHFV antibodies were detected in livestock and human serum samples (14-16). Between 1974 and 1975, seroconversion was founded among humans (13%), sheep (18%) and cattle (38%) in the northern parts of the country (17). In 1978, CCHFV was isolated from ticks in the North-east of Iran (18). The first confirmed human case of CCHF was reported in 1999 in Chaharmahal and Bakhtiari Province, central region of Iran, and also rebounded as the first case of nosocomial infection in the country (19). The number of CCHF-endemic provinces has substantially increased in recent years (20-22) and it is reported from almost all parts of the country (23, 24).

To date, several CCHF outbreaks have occurred in Iran (25, 26). The majority of confirmed human cases in Iran have been butchers, slaughterhouse workers and farmers, who mainly deal with infected livestock (27-31). Most of the infected cases have occurred in south-eastern Iran, Sistan and Baluchistan province, close to the borders of Afghanistan and Pakistan. The large number of confirmed cases in Sistan and Baluchistan province can be the result of a higher awareness among the physicians in respect with the infection in this region and the hyper-endemicity of CCHF in Afghanistan and Pakistan. An additional factor is the large number of afghan refugees and immigrants in this province in a way that some of them come to Iran just for CCHF treatment (24). Analyzing the CCHFV genome has led to the identification of more than five circulating CCHFV genomic variants in Iran (25, 29, 32-34).

Since 1975, the surveys on livestock have revealed 3.8 to 100% infection rate in different parts of the country (35-37). In 2007, ostriches were first identified as the probable host transmitting the disease to humans in Iran (38). The virus was also isolated among 4.3 to 28% of the ticks studied in different areas (36, 39-42). It was shown that an increase in the temperature and also a decrease in rainfall have enhanced the activity of ticks and raised the number
of reported CCHF cases (43).

To control the disease, the import of livestock into the country, especially via the eastern borders, should be monitored and the populations of livestock and ticks in high-risk areas and endemic regions should be systematically surveyed for further interventions.

**West Nile Fever.** West Nile Virus (WNV) is a mosquito-borne virus isolated from birds, horses, mosquitoes and human patients (44). Birds are the primary natural reservoirs of the virus and the infection is mainly found in wetland ecosystems (45). WNV is the most widespread Flavivirus, distributed in Africa, America, Australia, South of Europe, West of Asia and the Middle East and has been found in different neighboring countries of Iran (46, 47).

Serological investigations in the 1970s showed the presence of WNV antibody in human populations in several provinces in Iran (15, 48). A WNV survey from 2004 to 2007 on migratory wild birds of the wetlands in different parts of Iran has revealed the presence of 15% of WNV antibody among them (49). In a cross-sectional study performed on blood donors in Tehran in 2005, five percent of the donors were seropositive for WNV (50). Between 2008 and 2009, 1.2% of all patients with fever and loss of consciousness in Isfahan province, in the central part of the country, were WNV positive using RT-PCR (51). In a study in 2010-2011 in the northern and central provinces of Iran, 1.3% of the general population and 2.8% of the horses were seropositive for WNV (52). In 2009, a large-scale sero-survey of the equine population in various regions indicated that 23.7% of the horses were positive for WNV antibodies (53). Moreover, in southwestern Iran, WNV antibody was reported among 70% of the horses between 2011 to 2012 (54).

As the WNV antibody is shown in humans, wild birds and horses in different studies in recent years, it seems that the country is facing with this infectious disease in most parts and the surveillance system should be more active in case finding, reporting and treatment.

**Dengue Fever.** Dengue Fever (DF) is one of the most problematic arboviral diseases in human populations. The transmission of dengue virus (DV) is geographically extended over the recent decades in a way that all dengue virus serotypes (DVI-4) are now circulating in Asia, Africa and the Americas, as the result of global warming and changes in social behavior, urbanization and globalization and an increase in international travels (55, 56).

*Aedes aegypti,* which is the most significant vector of DV, has not been reported in Iran. In 2008, the first case of dengue fever was reported in Iran in a patient that had previously travelled to Malaysia (57). In a study among 300 Iranian patients tested negative for CCHFV between 2000 and 2012, 5% were serologically or molecularly positive for DF. In this study, most of the positive cases had travelled to endemic areas including Malaysia, India and Thailand (58). In another study in Sistan and Baluchestan province in southeastern Iran, approximately 6% of all blood donors were asymptomatically seropositive for DV (59).

Because of the important role of travelers in the import of DF cases in Iran, precautionary measures such as wearing insect repellent and applying protective cover should be recommended to travelers to endemic areas to avoid mosquito bites (58); more entomological studies is recommended in order to clarify the situation of potential vectors in Iran.

**HIV/AIDS.** Acquired Immune Deficiency Syndrome (AIDS), a globally distributed infectious disease, was first identified in hemophilia patients in 1986 in Iran (60). In 2013, it was estimated that there were almost 70,000 HIV-infected people in the country.

Iran is among countries with concentrated epidemic level of HIV; the infection remains low in the general population (<1%) (61), but certain groups such as injecting drug users (IDUs) (10.7%), prison inmates (13.2%), female sex workers (<5%) and homeless people (<4%) were shown to be at greater risk of the infection (62-68). HIV transmission by injecting drug use has affected a lot of people in Iran (69), however recent studies have shown that the transmission pattern is changing from drug injection to sexual practice (70). Harm reduction programs have been successful in reducing the transmission of HIV among high-risk groups in Iran (71).

Phylogenetic analysis of HIV indicates that HIV-1 subtype B and A are the frequent subtype among hemophilia patients and injecting drug users, respectively; suggesting that HIV infection in Iran has at least two origins (72).

Additionally, cultural changes and increased risky behavior among young people in this country have
increased the vulnerability of the country to HIV/AIDS (73-75).

As it is demonstrated that increasing the knowledge and awareness regarding HIV/AIDS transmission and prevention is one of the most crucial preventive methods among different groups (76), increasing the training programs and improving the quality of harm reduction programs are highly recommended to control the disease in Iran.

**Hepatitis C.** Hepatitis C virus (HCV) has affected about 175 million people worldwide and is considered as one of the leading cause of liver transplantation (77, 78). In Iran, the virus is introduced as an emerging viral infection amongst high risk populations like injecting drug users as this group has shown a higher prevalence of HCV in recent years (79).

A study conducted in 1994 on healthy blood donors, revealed 0.25% of seroconversion for HCV infection for the first time in Iran (79). HCV infection prevalence has a low rate in general population in Iran compared to the adjacent countries of Pakistan, Turkey and Iraq (80-82). The infection amongst blood donors is 0.1 to 0.5% in different cities of the country (83-86).

Different dialysis centers have had diverse frequency of HCV infection ranging from 5 to 23.9% (87, 88). The main route of HCV transmission among hemophilia and thalassemia patients is through blood products (89-93). In years 1999 and 2000, 0.9% of HCV antibody positive cases were confirmed in multi-transfused children with β-thalassemia in Shiraz blood bank (94). In 2005, a multicenter study pointed out that 19.3% of thalassemia patients suffered from HCV infection (91). In 2007, the infection rate varied between 15.7% and 63.8% (95). In recent years, other serological studies have shown that 15 to 91% of all patients with hemophilia have antibodies against HCV (96-99). This evidence emphasizes the importance of screening of hemophilic patients for HCV infection.

The HCV genome pattern has changed during recent years in Iran and it seems that such a change can be due to cross-border travels between Iran, Pakistan and Iraq (82).

To decrease the trend of infection, regular surveys and interventions should be done, focusing on high-risk groups such as IDUs, those who receive blood products and health care workers with occupational exposure (99).

**Occult hepatitis B virus infection.** Occult hepatitis B virus infection (OBI) is an emerging type of HBV infection when HBV DNA is detectable among HBsAg negative infected patients (100). Attention to OBI has increased due to its potential role in accelerating the progression of liver fibrosis and cirrhosis, ultimately leading to hepatocellular carcinoma (HCC); It is transmitted via blood transfusion and transplantation (100).

Introduction of the occult infection was the consequence of improvement of HBV DNA detection and introduction of more sensitive methods which were not available earlier than 1985 (101). OBI seems to be highly prevalent in Asia (102). The first evidence of OBI in Iran refers to 2001-2002 when 22% of chronic liver patients were revealed to be positive for HBV genome tests (103). It has been detected amongst 30% of high risk groups as well as hemodialysis patients and is considered common in HIV patients (104-106).

As OBI has been found among a large proportion of HBcAb positive healthy blood donors, thus the blood of these people should be screened in blood transfusion centers to prevent HBV transmission (84, 107-109).

**Human T-cell leukemia.** The Human T-cell leukemia virus (HTLV), the first known human oncogenic retrovirus, is the causative agent of HTLV-I-associated myelopathy/tropical spastic paraparesis (HAM/TSP) and adult T-cell leukemia (ATL) (110, 111). It is present all over the world with clusters of high endemicity in Japan, sub-Saharan Africa, South America, the Caribbean area and some foci in the Middle East (112). The HTLV-1 was first reported in the Middle East in 1983 and the first clinical report matching to ATL in Iran was from Mashhad, in northeastern Iran, in 1986 (113, 114). There were continuous reports of HTLV-1 infection among blood donors and various patients from Mashhad from 1991 to 1993 (115-122). A molecular study showed that the virus clustered in the cosmopolitan subtype (123). In 1993, a blood donor-based study showed a low rate (0-0.5%) of infection in other parts of the country. HTLV-1 then showed a slight increase (3%) among Mashhadi blood donors until 1995 (122). Afterwards, the rate of infection decreased during the next three years to 2%, 0.77% and 0.45%, respectively (124, 125).
study in 2011 revealed 2.12% HTLV-1 positive cases among the general population in Mashhad suggesting a reemerging status of the infection in this city and its neighboring city, Neyshabour (126-128).

Frequent blood recipients and hemodialysis patients remain the major high-risk groups for HTLV-1 infection (1-7%) around the country (129-131). In addition to blood transfusion, breast-feeding and sexual transmission, history of surgical procedures, hospitalization and traditional cupping were introduced as other main risk factors for HTLV-1 transmission in Iran (126, 132).

Iran has the second rank for HTLV-1 prevalence after Japan (133). Proper screening measures can be included in blood transfusion centers in the country. Educational programs, in addition to highly sensitive screening tests, seem necessary in health centers to reduce the transmission of the infection (134).

**H1N1 Flu.** A highly infectious type of Influenza virus, H1N1, was emerged in April 2009 in Mexico. The virus rapidly spread through USA and Canada and caused a pandemic. WHO announced a world threat of the disease and asked the countries to screen the infection in all suspected patients (135, 136).

Geographic distribution of the reported cases in Iran showed that the highest reported cases belonged to the central and eastern provinces. Till March 2010, 3672 cases of H1N1 were confirmed and 147 patients (4.0%) died in Iran accordingly (137, 138). The results of a surveillance system in Kurdistan, a west frontier province of Iran, during 2009-2010 showed 157 positive H1N1 cases among 1059 suspected patients. It seems that the virus had spread to Kurdistan after entering to Iran by traveling (139). A survey in Shiraz airport, south of Iran, on hajj pilgrims who returned from Mecca in 2009 revealed 1.6% of the infection with swine influenza (140).

Screening of travelers in entering borders is suggested for early detection and inhibition of the pathogen (140). On the other side, the surveillance system should be ready to screen the high risk groups and suspected cases to rapidly detect and control the disease.

**Middle East Respiratory Syndrome.** The Middle East Respiratory Syndrome-Corona virus (MERS-CoV), a newly recognized corona virus, emerged in Qatar and Saudi Arabia with a high fatality rate (50%) in 2012 (141).

The United Arab Emirates, Jordan, Oman, Kuwait and Egypt have all reported positive cases with recorded deaths (142). Several European and Asian countries such as the United Kingdom, France, Germany and Malaysia have also declared confirmed MERS-CoV patients (143, 144).

Dromedary camels (Camelus dromedarius) are considered as the natural reservoirs for MERS-CoV (145).

For the first time, the MERS-CoV RNA was confirmed in a woman in May 2014, who was admitted to a hospital in Kerman province in southern Iran. She died of progressive respiratory failure. The next three cases were the patient’s sister, nurse and physician who had close contact with her. The origin of the virus was contact with a woman who had an influenza-like illness and had traveled to Saudi Arabia two weeks earlier. The fifth patient was a 67-year-old woman who was admitted to the hospital and died of MERS-CoV (146).

By the end of 2014, eight MERS-CoV cases were confirmed among camels, illegally imported from Pakistan into Sistan and Baluchistan province in south-eastern Iran (147). Nosocomial infection is an important mode of transmission for respiratory viruses, thus special infection control measures should be performed to prevent the possible spread of MERS-CoV within health care centers (141, 148). Considering that camels are common livestock in some parts of the country, awareness among their owners regarding MERS-CoV is important to prevent the possible spread of the disease (149).

**Hantavirus Infection.** Hantavirus, an agent that is transmitted from rodents, has emerged with significant morbidity and mortality in humans as Hemorrhagic Fever with Renal Syndrome (HFRS) in Europe and Asia, and as Hantavirus Pulmonary Syndrome (HPS) in USA (150, 151). The disease has been reported in Turkey, a neighboring country of Iran (152, 153).

For the first time, in 2013, the existence of infection amongst individuals was shown by serological and molecular tests among the street cleaners in the central region of the country. In this study, the prevalence of rodents in the work place was a risk factor for being positive (154).

As there is no other report of Hantavirus infection in Iran, physicians and health care workers do not have enough information about the disease. Hence,
it is recommended to conduct seroepidemiological surveys in humans and rodents in various geographical regions of Iran in order to identify the true situation and risk factors for acquiring a Hantavirus infection.

**Bacterial EIDs and RIDs**

**Q Fever.** Coxiella burnetii is an obligate intracellular bacterium, developing spore-like forms that cause Q fever. It is a public health problem and an occupational zoonotic disease, globally (155).

The first human Q fever infection in Iran was reported in Abadan, southwestern Iran, in 1952 (161). The disease was reported in humans and domestic animals from most parts of the country during the period between 1954 and 1959 (156, 157). The next Q fever case was reported 50 years later in 2009, as an RID in Bardsir, southern Iran (157). Butchers and other slaughterhouse workers are considered high-risk groups in west and southeast of the country with 68% and 38% seropositivity, respectively (158-160).

Recent research has introduced goats as the major reservoir of the bacterium in Iran, having the highest seroprevalence (66-69%) among livestock (161). Sheep and bovine Q fever seropositivity ranges from 13 to 30% in different provinces in the central and border regions (158, 162). In addition, it is a major cause of abortion in animals with the C. burnetii genome being found in aborted fetuses in ten provinces (163). The contamination of raw milk with C. burnetii has been identified in different regions of Iran (164-166). Ticks would also play an important role in the transmission of Q fever, acting as the reservoirs and vectors of C. burnetii. A study on ticks collected from goats and sheep have shown *Hyalomma* and *Rhipicephalus* as the main contaminated vectors in Iran (167).

Because of the complications of differential diagnosis of Q fever with other infectious diseases, and limited educational plans for physicians and specialists, Q fever attracts relatively little attention from public health workers in Iran. Increasing the knowledge of the physicians and veterinarians regarding the diseases is important. Q-fever should be considered as a differential diagnosis in case of influenza-like symptoms, pneumonia, hepatitis or endocarditis.

**Plague.** Plague is caused by *Yersinia pestis*. Plague pandemics have killed millions of humans in Africa, Europe, Asia and America (168, 169).

Most of Iran’s neighbors have reported the disease during the last centuries; a recent outbreak of plague was reported in Afghanistan in 2007 (170). Iraq experienced multiple epidemics of plague in the eighth, eighteenth, nineteenth and twentieth centuries (171-173). Kazakhstan and Azerbaijan, to the north of the country, are important foci for the disease and are considered major potential sources of the infection (174, 175).

In Iran, plague is an ancient disease that has been recorded since the sixth century and has caused a vast range of mortality (176-178). Kurdistan and Kermanshah provinces in the west, Khorasan province in the east, East Azerbaijan, Zanjan and Ardabil provinces in the northwest and Bushehr in the south were profoundly affected by plague in the 19th century (176, 179-181).

In the 20th century, plague vaccination programs were conducted and resulted in the control of the disease, whilst it still remains endemic in Kurdistan province in western Iran (169, 182). *Y. pestis* has been isolated from wild rodents, as the main reservoirs, in Kurdistan province in various surveys (174, 183). A recent study in 2011-2012 showed persistence of plague infection in dogs and rodent population in Kurdistan (174, 184).

Plague should be considered as a potential RID in Iran and monitoring the disease, mainly in the western part of the country is important.

**Tularemia.** Francisella tularensis, the causative agent of Tularemia, is a zoonotic pathogen (185) which has been only detected in the Northern Hemisphere, including Asia, Europe and the U.S. (186). Farmers, veterinarians, hunters, butchers, cooks and laboratory staff have the most risk of the infection (187-189). There are human and animal tularemia reports from countries neighboring Iran including Azerbaijan, Afghanistan, Armenia and Turkey (190-192).

In Iran, the first serological evidence of tularemia infection in animals dates back to 1973, when tularemia antibodies were detected in sheep, cows and porcupine in the northwest and southeast of the country (193). The clinical form of tularemia was reported in a patient in Marivan, in Kurdistan province, in 1980 (189). There was no further report of Tularemia until 2011, when tularemia seroprevalence was detected in...
butchers and other slaughterhouse workers in Sistan and Baluchistan province (189) and among children in Chaharmahal and Bakhtiari province in southwestern Iran (194). In another survey in 2011-2012, 14.4% of seropositivity was shown among high-risk groups in Kurdistan province (195).

Considering the fact that tularemia is reported in neighboring countries and in different serological studies in Iran, improving the surveillance of the infection seems necessary and awareness of physicians and healthcare workers of the natural life cycle of *F. tularensis* and its clinical manifestations is highly recommended.

**Leptospirosis.** Leptospirosis is a zoonotic disease, caused by *Leptospira* spp., with a worldwide distribution. It has reemerged during the last decades in Iran (196, 197). The first isolation of *Leptospira* from men and cattle was performed in 1959 in this country (198). The infection was recorded in humans and animals in different regions of the country from 1959 through 1987 (199-202); the infection then re-emerged in Gilan, northern Iran, when 79 patients were confirmed for Leptospirosis in 1999 (203).

Today the seropositivity is found in humans and in a vast range of animals living in different parts of the country including Tehran, Azerbaijan, Khorasan, Isfahan, Chaharmahal and Bakhtiari and Bushehr provinces and Leptospirosis shows an endemic panel in Gilan and Khuzezan provinces in the north and southwest of Iran (204). The local Iranian serovars are *L. grippotyphosa*, *L. canicola*, *L. sejroeardjo*, *L. pomona* and *L. icterohaemorrhagiae* (205, 206).

In addition, Leptospirosis often remains unrecognized in most parts of the country, because of its unspecificity of sign and clinical symptoms. However, 14 to 53% of seropositivity is shown in different studies among the Iranian population (207-210). Most cases of the disease are reported in Mazandaran province, northern Iran (206). The main risk factors of the disease are working in paddy, keeping animals, contact with rodents and swimming in rivers (208, 209).

Different surveys of animals have revealed the Leptospirosis infection rate to be up to 43% in horses (211, 212), 37% in cattle (213-217), 37% in dogs (218), 18.5% in sheep and goats (219, 220), as well as infections in cats and donkeys (212, 221, 222).

Mazandaran, Gilan and Khuzezan provinces are ideal areas for transmission of this infection in Iran as a result of high humidity, high population, and rural agricultural (mostly rice farming) and fishing economic conditions (223).

Instruction of preventive measures to rice farmers, animal keepers and persons living and/or finding themselves near rivers can decrease the infection transmission to humans in the endemic regions of the country.

**Multidrug-Resistant Tuberculosis.** Tuberculosis (TB) has always caused great problems for healthcare systems globally, significantly in un-developed and developing countries. On average and annually, approximately 3.6% of 8.6 million new cases of TB are thought to be multidrug-resistant tuberculosis (MDR-TB) in the world (224). MDR-TB is the form of *Mycobacterium tuberculosis* that is resistant to at least Isoniazid and Rifampin, the two most powerful first-line anti-TB drugs (225). Emergence and spread of MDR-TB has become a threat to TB control strategies during the last two decades (224).

In Iran, the first MDR-TB cases were reported in Tehran in 2000 in a hospital where patients with failure treatment were admitted. In this study, about 4% of cases with recently detected TB were resistant to the first line TB antibiotics (225). At the same time, 14% of previously treated cases were diagnosed as MDR-TB in East Azerbaijan, northwestern Iran (226).

After establishment of national TB control programs in 1996, MDR-TB was found in 5.1% of new and 33.7% of retreated TB cases in Iran (224). In a study from 2010 to 2012, performed in five provinces (Tehran, Sistan and Baluchistan, Kermanshah, Hormozgan and Isfahan), it was revealed that 5% of the Ural type isolates were MDR-TB (227). The highest prevalence of MDR-TB was reported in Sistan and Baluchistan province (11.5%) and Isfahan (6.5%) in 2005 (228-230). Afterwards, this rate decreased amongst new cases, but the increasing trend was seen in previously treated patients (178, 231-233). Yet, MDR-TB has remained as a major challenge in TB controlling programs (233).

The trend of TB incidence has considerably shown lower rates in Iran than in the neighboring countries during the last decade and such an incidence has declined from 36 per 100,000 to 24 per 100,000 cases in 1990 and 2013, respectively. Sistan and Baluchistan province has the highest rate of MDR-TB rates.
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among all provinces (224).

In 2006, the existence and transmission of extensively drug-resistant tuberculosis (XDR-TB) among patients with MDR-TB were reported in Iran (234, 235).

Introduction of rapid tests for MDR-TB detection in addition to effective drugs is required for the treatment of these patients.

Nontuberculous mycobacteria. Nontuberculous mycobacteria (NTM) infection is a public health problem in different parts of the world (236). NTM, also known as atypical mycobacteria, was recognized in the 19th century (237). Continuation of TB and MDR-TB led to the identification of NTM in Iran and reports of NTM infection rapidly increased due to the growing epidemics of HIV infection and the significant improvements in laboratory diagnostic methods (238, 239).

In Iran, however, NTM infection was identified among 11.43% of all patients suspected to have MDR-TB from 2002 to 2006 (240). Mycobacterium fortuitum, M. kansasi, M. abscessus and M. avium complex have been shown as the most frequent types of NTM in Iran (241). Since then, multiple species have been reported as emerging agents in the country; M. parascrofulaceum (242), M. lentiflavum (243), M. concretionese (244) and M. novocastrense (245), M. monacense (246), M. setense (247), M. elephantisfrom (248), M. europaeum (249), M. chelonae (250) and M. iranicum (251), M. celeriflavum (252) are recently isolated NTMs in Iran.

The misdiagnosis of NTM infection with MDR-TB may lead to wrong treatment of TB patients, so improvement of NTM laboratory detection methods is highly recommended in all parts of the country.

Glanders. Glanders, caused by Burkholderia mallei, is a zoonotic bacterial disease that occurs primarily in horses, mules and donkeys. This highly contagious pathogen is transmitted to humans by direct contact with infected animals and entry is through skin abrasions, nasal and oral mucosal surfaces, or by inhalation (253, 254). The occupational transmission of glanders can occur among farmers, veterinarians and laboratory technicians (255).

The history of glanders in Iran goes back to about a century ago when the disease was reported from almost all parts of the country. In this regard, Iran has conducted a national campaign of the test and slaughter of infected equines by B. mallei since 1961 by using mallein test. The outbreak of disease was reported among horses and humans in Kurdistan in 1974. After that, the infection was not reported up to 1994 when it was confirmed among horses in the central part of the country (256). Afterward, some cases of glanders were reported when four African lions and one Siberian tiger died in Tehran zoo with clinical signs of the disease in 2012 (257).

Unfortunately this disease has neither no vaccine or immunization method and the main controlling program is based on preventing any movement of infected equines and slaughtering of the confirmed animals.

Consequently, physicians must be aware of the clinical symptoms of glanders in case of visiting a patient with a history of equine contact in order to best diagnose the disease.

Parasitic and fungal EIDs and RID

Fasciolosis. Fasciolosis is a zoonotic disease caused by the liver flukes of the genus Fasciola (258). Fasciola hepatica is present in Europe, Africa, Asia, the Americas while Fasciola gigantica has been detected in Africa and Asia (259). Most human cases of Fasciolosis in Asia have been reported from Iran (260).

Fasciolasis was reported as an emerging disease in Gilan Province, northern Iran, in 1995 and the number of cases increased up to 10,000 patients in 1999 (261-263). The disease is at endemic levels in Mazandaran province, neighboring Gilan, and Khuzestan province, in the southwest of the country (264-267); such a similarity in the pattern of the disease arises from similar climatic conditions and animal husbandry management in these provinces. The disease is also reported among humans and animals in other provinces such as Kurdistan, Zanjan, Tehran and Azerbaijan (259). The emergence of Fasciolis, with renal failure, was reported in Kermanshah in 1998 (268). Later on, a new human outbreak was reported in Yasuj district in southwestern Iran (269).

F. hepatica and F. gigantica were isolated in different provinces of Iran; the most prevalent species, to date, has been F. gigantica (38.5-62%). Most liver condemnations due to a Fascioliasis infection are reported in slaughtered cattle (266-268, 270).
Aquatic snails of Lymnaeidae family are the intermediate hosts in the transmission of liver flukes (268). Ingesting contaminated, uncooked, fresh aquatic vegetables and water are the major sources of infection transmission among Iranian patients (271, 272).

Accurate diagnosis of infected animals and snails plays an important role in the control measures of Fasciolosis in livestock and humans in different parts of the country.

**Drug Resistant Malaria.** Malaria is a major global health problem. The most severe forms of the disease and almost all of related deaths from Malaria are due to *Plasmodium falciparum* (273). It has had an endemic pattern in the southern and southeastern regions of Iran, including Hormozgan, southern Kerman and Sistan and Baluchistan provinces (274). Consequently, drug resistant malaria is considered as a challenge in malaria control and elimination programs in these endemic regions (275).

Studies that have assessed the response of *P. falciparum* to chloroquine in the endemic region from 1968 to 1976 revealed that all malaria isolates were sensitive to chloroquine (180, 276). Yet, chloroquine-resistant cases were found for the first time among 5.7% of the infected cases in 1983 in the Iran-Shah district and Sistan and Baluchistan province (277). The rate of drug resistant malaria increased to almost 50% in south-eastern Iran in 1996 and 68%-84% during the period 1997-2001 in the south and southwest of the country (275, 278, 279). It is supposed that the resistant strains of *P. falciparum* were most probably originating from Southeastern Asia (280). In 1999, the rates of resistance to chloroquine, amodiaquine, sulfadoxine-pyrimethamine in the endemic regions were 33.4%, 15.2%, 17.9%, 2.2%, respectively (275). A sulfadoxine-pyrimethamine (SP) combination was introduced as the first-line drug after the development of resistance to chloroquine in the country (275).

During the period between 2000 and 2010, studies conducted in endemic provinces revealed a decreasing trend in Malaria while most of the cases were still chloroquine-resistant. Moreover, the tested samples have shown no sulfadoxine–pyrimethamine resistant in Iran (275, 281).

Although the reported cases of Malaria has decreased to less than 100 cases during the recent years, conducting continued routine drug resistance surveys are necessary in endemic regions to have updated information regarding the situation of Malaria resistant species in Iran.

**Microsporidiosis.** Microsporidiosis is an opportunistic intestinal infection caused by a group of obligatory intracellular parasitic fungi (282). It is considered as an emerging infectious disease (283) which is most frequently reported among immunocompromised people (282). It often results in weight loss and wasting syndrome and in certain cases in developing countries, it leads to death (284).

Since 1985, several reports have shown intestinal microsporidiosis due to *Enterocytozoon bieneusi*, a microsporidian species, as a frequent cause of chronic diarrhea amongst Iranian HIV positive patients (285).

More recently, microsporidiosis has been reported among 2.5 to 30% of Iranian HIV/AIDS patients in different studies (284-286). Microsporidiosis is also reported among chronic psychiatric cases and respiratory complicated patients (287).

By improvement of microsporidiosis diagnostic methods through higher sensitive techniques, it is expected that more cases be reported in the country in future.

## CONCLUSION

With rapidly increasing movement of people, pathogens, and vectors across borders, EIDs and RIDs are regularly introduced as public health concerns. Improvement of the surveillance system is needed to predict that such diseases would emerge in a special situation or during particular duration.

As some of the EIDs or RIDs in Iran are vector borne diseases such as Crimean Congo Hemorrhagic Fever, West Nile Fever, Dengue Fever, Q fever, Plague and Tularemia, it is highly needed to improve the vector surveillance system in the country in order to have a better monitoring and early warning systems for these diseases. Vectors in high risk areas and endemic regions should be systematically surveyed for further interventions and vector control programs should be implemented if required.

Some other EIDs or RIDs in Iran are blood borne or sexually transmitted diseases such as HIV/AIDS, Hepatitis C, Occult Hepatitis B and Human T-cell leukemia; consequently, continues bio-behavioral sur-
veys among high risk groups are essential to have a better view of their epidemiology and trend leading to better management and controlling. Moreover, one of the most successful preventive methods for these diseases is to increase the level of knowledge and awareness of different populations regarding preventive methods; hence, increasing training programs is highly recommended to more or less control these diseases in the country.

Other EIDs and RIDs in Iran are zoonotic diseases such as Leptospirosis, Glanders, Hantaviruses and Middle East respiratory syndrome. Controlling these aforementioned diseases necessitates a close collaboration of the Ministry of Health and the veterinary organization, since animals are the main reservoirs of these diseases. Presenting instructions about preventive measurements to occupations at high risk of these diseases plays an important role in decreasing the infection transmission to humans in endemic regions of the country. It is recommended to do more seroepidemiological surveys in animals in high risk areas in order to identify the true situation and risk factors for acquiring these zoonotic diseases.

For diseases such as Multidrug-Resistant Tuberculosis and Drug Resistant Malaria, continuing surveys on routine drug resistance is necessary in endemic regions. These emergencies bold the importance of appropriate use of antibiotics to reduce the probability of resistant pathogens in the country. Further efforts should be directed towards increasing the awareness of physicians in rapidly diagnosing, reporting and prescribing the correct drugs and antibiotics for treating these diseases. As Afghan refugees have an important role in importing and spreading of Multidrug-Resistant Tuberculosis and Drug Resistant Malaria in Iran, it is highly recommended to monitor the health status of Afghan immigrants when entering Iran, to reduce the spread of these diseases.

Developing specialized clinical laboratories in all parts of the country based on the reported EIDs and RIDs in the related regions is an important basis to diagnose the diseases in the shortest possible time. The development of an integrated response to multiple threats posed by climatic changes, vector-borne diseases, and emerging threats seems to be a realistic way forward. To achieve such integration, the Iranian Ministry of Health and other related organizations must increase investments in better data quality, methodologies, and tools to provide improved information services across key disciplinary areas (climate, environment, pathogens, people, vectors, livestock, etc.) with a primary focus on serving national decision-making needs.

REFERENCES

1. Desenclos JC, De Valk H. Emergent infectious diseases: importance for public health, epidemiology, promoting factors, and prevention. Med Mal Infect 2005; 35: 49-61.
2. Barrett R, Kuzawa CW, Mcdade T, Armelagos GJ. Emerging and re-emerging infectious diseases: The third epidemiologic transition. Annu Rev Anthropol 1998;27:247-271.
3. Jones KE, Patel NG, Levy MA, Storeygard A, Balk D, Gittleman JL, et al. Global trends in emerging infectious diseases. Nature 2008; 451: 990-993.
4. Stephen SM. Factors in the Emergence of infectious diseases. Emerg Infect Dis 1995; 1: 7.
5. Lashley FR. Emerging infectious diseases: vulnerabilities, contributing factors and approaches. Expert Rev Anti Infect Ther 2004; 2: 299-316.
6. Perez FM. Factors affecting the emergence and prevalence of vector borne infections (VBI) and the role of vertical transmission (VT). J Vector Borne Dis 2007; 44: 157-163.
7. Wilder-Smith A, Gubler DJ. Geographic expansion of dengue: the impact of international travel. Med Clin North Am 2008; 92: 1377-1390.
8. Barnett ED, Walker PF. Role of immigrants and migrants in emerging infectious diseases. Med Clin North Am 2008; 92: 1447-1458.
9. Chen LH, Wilson ME. The role of the traveler in emerging infections and magnitude of travel. Med Clin North Am 2008; 92: 1409-1432.
10. Wallace MR, Hale BR, Utz GC, Olson PE, Earhart KC, Thornton SA, et al. Endemic infectious diseases of Afghanistan. Clin Infect Dis 2002; 34(Suppl 5):S171-207.
11. Sultán F, Khan A. Infectious diseases in Pakistan: a clear and present danger. Lancet 2013; 381: 2138-2140.
12. Pourhossein B, Irani AD, Mostafavi E. Major infectious diseases affecting the Afghan immigrant population of Iran: a systematic review and meta-analysis. Epidemiol Health 2015; 37; e2015002.
13. Bente DA, Forrester NL, Watts DM, Mcauley AJ, Whitehouse CA, Bray M. Crimean-Congo hemorrhagic fever: history, epidemiology, pathogenesis, clinical syndrome and genetic diversity. Antiviral Res 2013; 100: 159-189.
14. Chumakov M, Belyaeva A, Voroshilova M, Butenko A, Shalunova N, Semashko I, et al. Progress in studying the etiology, immunology, and laboratory diagnosis of...
Crimean hemorrhagic fever in the USSR and Bulgaria. 
*Mater* 1968; 15: 100-103.

15. Saidi S. Viral antibodies in preschool children. *Iran J Public Health* 1974; 3: 89-91.

16. Chiniikar S, Ghiasi S, Ghalyanchi-Langeroudi A, Goya M, Shirzadi M, Zeinali M, et al. An overview of Crimean-Congo hemorrhagic fever in Iran. *Iran J Microbiol* 2009; 1: 7-12.

17. Saidi S, Casals J, Faghih M. Crimean hemorrhagic fever-Congo (CHF-C) virus antibodies in man, and in domestic and small mammals, in Iran. *Am J Trop Med Hyg* 1975; 24: 353-357.

18. Sureau P, Klein J, Casals J, Digoutte J, Salaun J, Piazak N, et al. Isolation of Thogoto, Wad Medani, Wanowrie and Crimean-Congo haemorrhagic fever viruses from ticks of domestic animals in Iran. *Annales de Virologie* 1980; 131: 185-200.

19. Alavi-Naini R, Mohtaderi A, Kooophayeh HR, Sharifi-Mood B, Naderi M, Metanat M, et al. Crimean-Congo hemorrhagic fever in Southeast of Iran. *J Infect* 2006; 52: 378-382.

20. Sadeghi M, Asgharzadeh SA, Bayani M, Alijanpour E, Javaniyan M, Jabbari A. Crimean congo hemorrhagic fever appearance in the north of Iran. *Caspian J Intern Med* 2013; 4: 617-620.

21. Ardalan MR, Tubbs RS, Chiniikar S, Shoja MM. Crimean-Congo haemorrhagic fever presenting as thrombocytic microangiopathy and acute renal failure. *Nephrol Dial Transplant* 2006; 21: 2304-2307.

22. Chiniikar S, Shayesteh M, Khakifirouz S, Jalali T, Rasi Varaie FS, Rafigh M, et al. Nosocomial infection of Crimean-Congo haemorrhagic fever in eastern Iran: case report. *Travel Med Infect Dis* 2013; 11: 252-255.

23. Chiniikar S, Ghiassi SM, Moradi M, Goya MM, Shirzadi MR, Zeinali M, et al. Geographical distribution and surveillance of Crimean-Congo hemorrhagic fever in Iran. *Vector Borne Zoonotic Dis* 2010; 10: 705-708.

24. Mostafavi E, Pourhossein B, Chiniikar S. Clinical symptoms and laboratory findings supporting early diagnosis of Crimean-Congo hemorrhagic fever in Iran. *J Med Virol* 2014; 86: 1188-1192.

25. Chiniikar S, Ghiasi SM, Naddaf S, Piazak N, Moradi M, Razavi MR, et al. Serological evaluation of Crimean-Congo hemorrhagic fever in humans with high-risk professions living in enzootic regions of Isfahan province of Iran and genetic analysis of circulating strains. *Vector Borne Zoonotic Dis* 2012; 12: 733-738.

26. Chiniikar S, Moghadam AH, Parizadeh SJ, Moradi M, Bayat N, Zeinali M, et al. Seroepidemiology of Crimean Congo Hemorrhagic Fever in Slaughterhouse Workers in North Eastern Iran. *Iran J Public Health* 2012; 41: 72-77.

27. Sharifi-Mood B, Metanat M, Alavi-Naini R. Prevalence of crimean-congo hemorrhagic Fever among high risk human groups. *Int J High Risk Behav Addict* 2014; 3: e11520.

28. Hadinia A, Ilami O, Mousavizadeh A, Akbartaar Tori M, Khosravani SA. Seroepidemiology of Crimean-Congo hemorrhagic fever in High Risk Professions in Yasuj. *J Mazandaran Univ Med Sci* 2012; 22: 45-50.

29. Chiniikar S, Persson SM, Johansson M, Bladh L, Goya M, Houshand B, et al. Genetic analysis of Crimean-congo hemorrhagic fever virus in Iran. *J Med Virol* 2004; 73: 404-411.

30. Chiniikar S, Shah-Hosseini N, Bouzari S, Jalali T, Shokrgozar MA, Mostafavi E. New circulating genomic variant of Crimean-Congo hemorrhagic fever virus in Iran. *Arch Virol* 2013; 158: 1085-1088.

31. Bokaie S, Mostafavi E, Haghdoot A, Keyvanfar H, Goya M, Meshkat M, et al. Crimean Congo hemorrhagic fever in northeast of Iran. *J Animal Vet Adv* 2008; 7: 354-361.

32. Mahzounieh M, Dincer E, Faraji A, Akin H, Akkutay AZ, Ozkul A. Relationship between Crimean-Congo hemorrhagic fever virus strains circulating in Iran and Turkey: possibilities for transborder transmission. *Vector Borne Zoonotic Dis* 2012; 12: 782-785.

33. Chiniikar S, Bouzari S, Shokrgozar MA, Mostafavi E, Jalali T, Khakifirouz S, et al. Genetic Diversity of Crimean Congo Hemorrhagic Fever Virus Strains from Iran. *J Arthropod Borne Dis* 2016; 10: 127-140.

34. Chiniikar S, Ghiasi SM, Moradi M, Goya MM, Reza Shirzadi M, Zeinali M, et al. Phylogenetic analysis in a recent controlled outbreak of Crimean-Congo hemorrhagic fever in the south of Iran, December 2008. *Euro Surveill* 2010; 15: pii: 19720.

35. Mostafavi E, Chiniikar S, Esmaeili S, Amiri FB, Tabrizi AM, Khakifirouz S. Seroepidemiological survey of Crimean-Congo hemorrhagic fever among sheep in Mazandaran province, northern Iran. *Vector Borne Zoonotic Dis* 2012; 12: 739-742.

36. Telmadarraiy Z, Ghiasi SM, Moradi M, Vatandoost H, Eshraghian MR, Faghili F, et al. A survey of Crimean-Congo hemorrhagic fever in livestock and ticks in Ardabil Province, Iran during 2004-2005. *Scand J Infect Dis* 2010; 42: 137-141.

37. Champour M, Mohammad G, Chiniikar S, Razmi G, Shah-Hosseini N, Khakifirouz S, et al. Seroepidemiology of Crimean-Congo hemorrhagic fever virus in one-humped camels (Camelus dromedarius) population in northeast of Iran. *J Vector Borne Dis* 2014; 51: 62.

38. Mostafavi E, Chiniikar S, Moradi M, Bayat N, Meshkat M, Fard MK, et al. A Case Report of Crimean Congo Hemorrhagic Fever in Ostriches in Iran. *Open Virol J* 2013; 7: 81-83.

39. Tahmasebi F, Ghiasi SM, Mostafavi E, Moradi M, Piazak N, Mozafari A, et al. Molecular epidemiology of Crimean- Congo hemorrhagic fever virus genome iso-
lated from ticks of Hamadan province of Iran. *J Vector Borne Dis* 2010; 47: 211-216.

40. Mehravaran A, Moradi M, Telmadarraiy Z, Mostafavi E, Moradi AR, Khakifirouz S, et al. Molecular detection of Crimean-Congo hemorrhagic fever (CCHF) virus in ticks from southeastern Iran. *Ticks Tick Borne Dis* 2013; 4: 35-38.

41. Fakoorziba MR, Golmohammadi P, Moradzadeh R, Moenembellah-Fard MD, Azizi K, Davabi B, et al. Reverse transcription PCR-based detection of Crimean-Congo hemorrhagic fever virus isolated from ticks of domestic ruminants in Kurdistan province of Iran. *Vector Borne Zoonotic Dis* 2012; 12: 794-799.

42. Telmadarraiy Z, Moradi A, Vatandoost H, Mostafavi E, Oshaghi M, Zahirnia A, et al. Crimean-Congo hemorrhagic fever: a seroepidemiological and molecular survey in Bahar, Hamadan province of Iran. *Asian J Anim Vet Adv* 2008; 3: 321-327.

43. Mostafavi E, Chinkar S, Bokaei S, Haghdoost A. Temporal modeling of Crimean-Congo hemorrhagic fever in eastern Iran. *Int J Infect Dis* 2013; 17: e524-e528.

44. Garmentia AE, Van Kruiningen HJ, French RA. The West Nile virus: its recent emergence in North America. *Microbes Infect* 2001; 3: 223-229.

45. Rappole JH, Derrickson SR, Hubalek Z. Migratory birds and spread of West Nile virus in the Western Hemisphere. *Emerg Infect Dis* 2000; 6: 319-328.

46. Campbell GL, Marfin AA, Lanciotti RS, Gubler DJ. West Nile virus. *Lancet Infect Dis* 2002; 2: 519-529.

47. Lanciotti RS, Ebel GD, Deubel V, Kerst AJ, Murri S, Meyer R, et al. Complete genome sequences and phylogenetic analysis of West Nile virus strains isolated from the United States, Europe, and the Middle East. *Virology* 2002; 298: 96-105.

48. Naficy K, Saiid S. Serological survey on viral antibodies in Iran. *Trop Geogr Med* 1970; 22: 183-188.

49. Fereidouni SR, Ziegler U, Linke S, Niedrig M, Modirrousta H, Hoffmann B, et al. West Nile virus monitoring in migrating and resident water birds in Iran: are common coots the main reservoirs of the virus in wetlands? *Vector Borne Zoonotic Dis* 2011; 11: 1377-1381.

50. Sharifi Z, Mahmoudian Shoshtari M, Talebian A. A study of West Nile virus infection in Iranian blood donors. *Arch Iran Med* 2010; 13: 1-4.

51. Chinkar S, Javadi A, Ataei B, Shakeri H, Moradi M, Mostafavi E, et al. Detection of West Nile virus genome and specific antibodies in Iranian encephalitis patients. *Epidemiol Infect* 2012; 140: 1525-1529.

52. Mehravaran A MM, Telmadarraiy Z, Mostafavid E, Moradie AR, Khakifirouz S, Shah-Hosseini N, Rasi-Varaie FS, Jalali T, Hekmat S, Ghiasi SM, Chinkar S. Molecular detection of Crimean-Congo haemorrhagic fever (CCHF) virus in ticks from southeastern Iran. *Ticks Tick Borne Dis* 2013; 4: 35-38.

53. Ahmadnejad F, Otorad V, Fallah MH, Lowensi S, Sedighi-Moghadam R, Zavareh A, et al. Spread of West Nile virus in Iran: a cross-sectional serosurvey in equines, 2008-2009. *Epidemiol Infect* 2011; 139: 1587-1593.

54. Pourmahdi M, Ghadrdan Mashadi A, Seifi Abad Shapouri M, Zeinvand M. Aserological survey on antibodies against West Nile virus in horses of Khuzestan province. *Iran J Vet Med* 2013; 7: 185-191.

55. Guzman MG, Halstead SB, Artsob H, Buchy P, Farrar J, Gubler DJ, et al. Dengue: a continuing global threat. *Nat Rev Microbiol* 2010; 8(12 Suppl):S7-16.

56. Wilder-Smith A, Renhorn KE, Tissera H, Abu Bakar S, Alphay L, Kittayapong P, et al. DengueTools: innovative tools and strategies for the surveillance and control of dengue. *Glob Health Action* 2012; 5.

57. Chinkar S GS, Moradi M, Goya Mm, Shirzadi Mr, Zeinali M, Meshkat M, Bouly M. Geographical distribution and surveillance of crimean-congo hemorrhagic fever in Iran. *Vector Borne Zoonotic Dis* 2010; 10: 705-708.

58. Chinkar S, Ghiasi SM, Shah-Hosseini N, Mostafavi E, Moradi M, Khakifirouz S, et al. Preliminary study of dengue virus infection in Iran. *Travel Med Infect Dis* 2013; 11: 166-169.

59. Aghaie A, Aaskov J, Chinkar S, Niedrig M, Banazadeh S, Mohammadpour HK. Frequency of dengue virus infection in blood donors in Sistan and Baluchestan province in Iran. *Transfus Apher Sci* 2014; 50: 59-62.

60. Cheraghali AM, Esghie P, Abolghasemi H. Social consequences of infected haemophilia cases in the Islamic Republic of Iran. *East Mediterr Health J* 2011; 17: 552-556.

61. Haghdoost AA , Mostafavi E, Mirzazadeh A, Navadeh S, Feizzadeh A, Fahimfar N, et al. Modelling of HIV/AIDS in Iran up to 2014. *J AIDS HIV Res* 2011; 3: 231-239.

62. Rahimi-Movaghar A, Razaghi EM, Sahimi-Izadi E, Amin-Esmaeili M. HIV, hepatitis C virus, and hepatitis B virus co-infections among injecting drug users in Tehran, Iran. *Int J Infect Dis* 2010; 14: e28-33.

63. Haghdoost AA, Mirzazadeh A, Shokooohi M, Sedaghat A, Gouya MM. HIV trend among Iranian prisoners in 1990s and 2000s; analysis of aggregated data from HIV sentinel sero-surveys. *Harm Reduct J* 2013; 10: 32.

64. Mirzazadeh A, Nedjat S, Navadeh S, Haghdoost A, Mansournia MA, Mcfarland W, et al. HIV and related risk behaviors among female sex workers in Iran: biomass-adjusted estimates from the 2010 National Bio-Behavioral Survey. *AIDS Behav* 2014; 18 Suppl 1:S19-24.

65. Amiri FB, Gouya MM, Saifi M, Rohani M, Tabarsi P, Sedaghat A, et al. Vulnerability of homeless people in Tehran, Iran, to HIV, tuberculosis and viral hepatitis.
NAJMEH PARHIZGARI ET AL.

PLoS One 2014; 9: e98742.
66. Zadeh AO, Seyedalineghi S, Hassanzad FF, Hajizadeh M, Mohamadi S, Emanzadeh-Fard S, et al. Prevalence of HIV infection and the correlates among homeless in Tehran, Iran. Asian Pac J Trop Biomed 2014; 4: 65-68.
67. Ramezani A, Amirmoezi R, Volk JE, Aghakhanli A, Zarinfar N, Mcfarland W, et al. HCV, HBV, and HIV seroprevalence, coinfections, and related behaviors among male injection drug users in Arak, Iran. AIDS Care 2014; 26: 1122-1126.
68. Moradi AR, Emdadi A, Soori B, Mostafavi E. Prevalence of Human Immunodeficiency Virus Infection among Injection Drug Users Released from Jail. Addict Health 2012; 4: 181-185.
69. Khajehkazemi R, Osooli M, Sajadi L, Karamouzian M, Sedaghat A, Fahimifar N, et al. HIV prevalence and risk behaviours among people who inject drugs in Iran: the 2010 National Surveillance Survey. Sex Transm Infect 2013;89 Suppl 3:iii29-32.
70. Nasrian M, Doroudi F, Gooya MM, Sedaghat A, Haghdoot AA. Modeling of human immunodeficiency virus modes of transmission in Iran. J Res Health Sci 2012; 12: 81-87.
71. Esrati B, Asl RT, Dell CA, Alshar P, Millson PM, Kamali M, et al. Preventing HIV transmission among Iranian prisoners: initial support for providing education on the benefits of harm reduction practices. Harm Reduct J 2008; 5: 21.
72. Sarrami-Forooshani R, Das SR, Sabahi F, Adeli A, Esmaeili R, Wahren B, et al. Molecular analysis and phylogenetic characterization of HIV in Iran. J Med Virol 2006; 78: 853-868.
73. Naderi HR, Tagliamonte M, Tornesello ML, Ciccozzi M, Rezza G, Farid R, et al. Molecular and phylogenetic analysis of HIV-1 variants circulating among injecting drug users in Mashhad-Iran. Infect Agent Cancer 2006; 1: 4.
74. Kanda K, Jayasinghe A, Silva KT, Priyadarshani NG, Delpiitya NY, Obayashi Y, et al. Religious leaders as potential advocates for HIV/AIDS prevention among the general population in Sri Lanka. Glob Public Health 2013; 8: 159-173.
75. Rhodes T. Risk theory in epidemic times: sex, drugs and the social organisation of ‘risk behaviour’. Social Health Illn 1997; 19: 208-227.
76. Khajehkazemi R, Haghdoot AA, Navadeh S, Setayesh H, Sajadi L, Osooli M, Mostafavi E. Risk and vulnerability of key populations to HIV infection in Iran; knowledge, attitude and practices of female sex-workers, prison inmates and people who inject drugs. Sex Health 2014;11(6):568-574.
77. Munir S, Saleem S, Idrées M, Tariq A, Butt S, Rauff B, et al. Hepatitis C Treatment: current and future perspectives. Virol J 2010; 7:296.
78. Perz JF, Armstrong GL, Farrington LA, Hutin YJ, Bell BP. The contributions of hepatitis B virus and hepatitis C virus infections to cirrhosis and primary liver cancer worldwide. J Hepatol 2006; 45: 529-538.
79. Rezvan. H, Ahmadi. J, Farhari. M, S. T. A preliminary study on the prevalence of anti-HCV amongst healthy blood donors in Iran. Vox Sang 1994:100.
80. Anwar MI, Rahman M, Hassan MU, Iqbal M. Prevalence of active hepatitis C virus infections among general public of Lahore, Pakistan. Virol J 2013; 10: 351.
81. Lavanchy D. Evolving epidemiology of hepatitis C virus. Clin Microbiol Infect 2011; 17: 107-115.
82. Afzal MS, Ahmed T, Zaidi NUSS. Comparison of HCV Prevalence in Pakistan and Iran; An Insight into Future. Hepat Mon 2014; 14: e11466.
83. Alavian SM, Gholami B, Masarrat S. Hepatitis C risk factors in Iranian volunteer blood donors: a case-control study. J Gastroenterol Hepatol 2002; 17: 1092-1097.
84. Kafi-Abad SA, Rezvan H, Abolghasemi H, Talebian A. Prevalence and trends of human immunodeficiency virus, hepatitis B virus, and hepatitis C virus among blood donors in Iran, 2004 through 2007. Transfusion 2009; 49: 2214-2220.
85. Khodabandehloo M, Roshani D, Sayehmiri K. Prevalence and trend of hepatitis C virus infection among blood donors in Iran: A systematic review and meta-analysis. J Res Med Sci 2013; 18: 674-682.
86. Shakeri MT, Nomani H, Ghayour Mobarhan M, Sima HR, Gerayli S, Shahbaz S, et al. The prevalence of hepatitis C virus in mashhad, iran: a population-based study. Hepat Mon 2013; 13: e7723.
87. Alavian SM, Einollahi B, Hajizadeh B, Bahktiari S, Nafar M, Ahrabi S. Prevalence of hepatitis C virus infection and related risk factors among Iranian haemodialysis patients. Nephrology 2003; 8: 256-260.
88. Shamshirsaz AA, Kangar M, Bekheirnia MR, Ayazi F, Hashemi SR, Bouzari N, et al. The role of hemodialysis machines dedication in reducing Hepatitis C transmission in the dialysis setting in Iran: a multicenter prospective interventional study. BMC Nephrol 2004; 5: 13.
89. Tamaddoni A, Mohammadzadeh I, Ziaei O. Seroprevalence of HCV antibody among patients with beta-thalassemia major in Amirkola Thalassemia Center, Iran. Iran J Allergy Asthma Immunol 2007; 6: 41.
90. Javadzadeh Shahshahani H, Vaziri M, Mansouri F. Seven Years Trends in Prevalence of Transfusion-Transmissible Viral Infections in Yazd blood Transfusion Organization. Iran J Ped Hematol Oncol 2013; 3: 119-124.
91. Hajarizadeh B, Alavian S, Mirmomen S. Hepatitis B and C among thalassemic patients in Iran: A multicenter study. Am J Infect Control 2005; 33: e94.
EMERGING INFECTIONS DISEASES IN IRAN

92. Sharifi-Mood B, Eshghi P, Sanei-Moghaddam E, Hashemi M. Hepatitis B and C virus infections in patients with hemophilia in Zahedan, southeast Iran. *Saudi Med J* 2007; 28: 1516-1519.

93. Mousavian S, Mansouri F, Saraei A, Sadegheh A, Merat S. Seroprevalence of hepatitis C in hemophilia patients referring to Iran Hemophilia Society Center in Tehran. *Govaresh* 2011; 16: 169-174.

94. Karimi M, Ghavanini AA. Seroprevalence of hepatitis B, hepatitis C and human immunodeficiency virus antibodies among multitransfused thalassaemic children in Shiraz, Iran. *J Paediatr Child Health* 2001; 37: 564-566.

95. Alavian SM. Control of Hepatitis C in Iran: Vision and Missions. *Hepat Mon* 2007; 7: 57-58.

96. Joukar F, Besharati S, Mirpour H, Mansour-Ghanaei F. Hepatitis C and hepatitis B seroprevalence and associated risk factors in hemodialysis patients in Guilan province, north of Iran: HCV and HBV seroprevalence in hemodialysis patients. *Hepat Mon* 2011; 11: 178-181.

97. Kalantari H, Ebadi S, Yaran M, Maracry MR, Shahshahan Z. Prevalence and risk factors of hepatitis B and C viruses among hemodialysis patients in Isfahan, Iran. *Adv Biomed Res* 2014; 3: 73.

98. Somi MH, Etemadi J, Ghojazadeh M, Farhang S, Farzamzari M, Foroutan S, et al. Risk Factors of HCV Seroconversion in Hemodialysis Patients in Tabriz, Iran. *Hepat Mon* 2014; 14: e17417.

99. Alavian SM, Kabir A, Ahmadi AB, Lankarani KB, Shahbabaie MA, Ahmadzad-Asl M. Hepatitis C infection in hemodialysis patients in Iran: a systematic review. *Hemodial Int* 2010; 14: 253-262.

100. Shahmordi S, Yahyapour Y, Mahmoody M, Alavian SM, Fazeli Z, Jazayeri SM. High prevalence of occult hepatitis B virus infection in children born to HBsAg-positive mothers despite prophylaxis with hepatitis B vaccination and HBIG. *J Hepatol* 2012; 57: 515-521.

101. Habibollahi P, Safari S, Daryani NE, Alavian SM. Occult hepatitis B infection and its possible impact on chronic hepatitis C virus infection. *Saudi J Gastroenterol* 2009; 15: 220-224.

102. Torbenson M, Thomas DL. Occult hepatitis B. *Lancet Infect Dis* 2002; 2: 476-486.

103. Honarkar Z, Alavian SM, Samiee S, Saeedkar K, Zali MR. Occult hepatitis B among chronic liver disease patients. *Saudi Med J* 2005; 26: 601-606.

104. Ramezani A, Banifaz M, Esfamiyar A, Aghakhani A. Serumological pattern of anti-HBe alone infers occult hepatitis B virus infection in high-risk individuals in Iran. *J Infect Dev Ctries* 2010; 4: 658-661.

105. Azadmanesh K, Mohraz M, Aghakhani A, Edalat R, Jam S, Esfamiyar A, et al. Occult hepatitis B virus infection in HIV-infected patients with isolated hepatitis B core antibody. *Intervirology* 2008; 51: 270-274.

106. Aghakhani A, Banifaz M, Kalantar E, Esfamiyar A, Ahmadi F, Razeghi E, et al. Occult hepatitis B virus infection in hemodialysis patients with isolated hepatitis B core antibody: a multicenter study. *Ther Apher Dial* 2010; 14: 349-353.

107. Jafarzadeh A, Arababadi MK, Pourazar MMA. Occult hepatitis B virus infection among blood donors with antibodies to hepatitis B core antigen. *Acta Medica Iranica* 2008; 46: 27-32.

108. Behzad-Behbahani A, Mafi-Nejad A, Tabei S, Lankarani K, Rashidi M, Rasouli M, et al. Indication of anti-HBC antibody screening and HBV-DNA detection in diagnosing latent hepatitis B virus infection. *Iran J Med Sci* 2015; 30: 28-33.

109. Pourazar A, Salehi M, Jafarzadeh A, Arababadi MK, Oreizi F, Shariatinezhad K. Detection of HBV DNA in HBsAg negative normal blood donors. *IJH* 2005; 2: 172-176.

110. Gessain A, Barin F, Vernant JC, Gout O, Maurs L, Calender A, et al. Antibodies to human T-lymphotropic virus type-I in patients with tropical spastic paraparesis. *Lancet* 1985; 2: 407-410.

111. Hinuma Y, Nagata K, Hanaoka M, Nakai M, Matsutomo T, Kinoshita KI, et al. Adult T-cell leukemia: antigen in an ATL cell line and detection of antibodies to the antigen in human sera. *PNAS* 1981; 78: 6476-6480.

112. Gessain A, Cassar O. HTLV-1 world distribution and estimation of the number of asymptomatic infected carriers. *Retrovirology* 2014; 11(Suppl 1): O14.

113. Popovic M, Sarin PS, Robert-Gurroff M, Kalyanaraman VS, Mann D, Minowada J, et al. Isolation and transmission of human retrovirus (human T-cell leukemia virus). *Science* 1983; 219: 856-859.

114. Farid R, Poryamoth N, Godarzi A, Rafatpanah H, Amin H, Gessain A. Familial sereopidemiological survey of HTLV-I in Mashhad, Northeastern Iran suggested an important mother to childtransmission. *J AIDS Hum Retrovol* 1995; 10: 209-212.

115. Achiorn A, Pinhas-Hamiel O, Doll L, Djaldetti R, Chen A, Ziv I, et al. Spastic paraparesis associated with human T-lymphotropic virus type I: a clinical, serological, and genomic study in Iranian-born Mashhadi Jews. *Ann Neurol* 1993; 34: 670-675.

116. Meytes D, Elgat M, Schochat B, Sidi Y, Shaklai M, Kilim Y, et al. Serological and molecular survey for HTLV-I infection in a high-risk Middle Eastern group. *Lancet* 1990; 336: 1533-1535.

117. Sidi Y, Meytes D, Shohat B, Fenig E, Weisbort Y, Lee H, et al. Adult T-cell lymphoma in Israeli patients of Iranian origin. *Cancer* 1990; 65: 590-593.

118. Farid R, Shirdel A, Tabei S. Clinical manifestation of adult T cell lymphoma/leukemia associated with HTLV-I in north-eastern Iran. *Iranian J Med Sci* 1992;
17: 105-108.
119. Gabarre J, Gessain A, Raphael M, Merle-Beral H, Dubourg O, Fourcade C, et al. Adult T-cell leukemia/lymphoma revealed by a surgically cured cardiac valve lymphomatous involvement in an Iranian woman: clinical, immunopathological and virological studies. *Leukemia* 1993; 7: 1904-1909.
120. Farid R, Ettemadi M, Baradaran H, Nikbin B. Seroepidemiology and virology of HTLV-I in the city of Mashhad, northeastern Iran. *Serodiag Immun Inf D* 1993; 5: 251-252.
121. Rezvan H, Ahmadi J, Farhadi M. A cluster of HTLV-I infection in northeastern of Iran. *Transfusion Today* 1996; 7: 8-9.
122. Safai B, Huang J-L, Boeri E, Farid R, Raafat J, Schutzer P, et al. Prevalence of HTLV type I infection in Iran: a serological and genetic study. *AIDS Res Hum Retroviruses* 1996; 12: 1185-1190.
123. Abbasazadegan MR, Gholamin M, Tabatabaea A, Farid R, Houshmand M, Abbasazadegan M. Prevalence of human T-lymphotropic virus type I among blood donors from Mashhad, Iran. *J Clin Microbiol* 2003; 41: 2593-2595.
124. Tarhini M, Khour G, Zanjani DS, Rafatpanah H, Otrock ZK, Bazarbachi A, et al. Declining tendency of human T-cell leukaemia virus type I carrier rates among blood donors in Mashhad, Iran. *Pathology* 2009; 41: 498-499.
125. Rafatpanah H, Hedayati-Moghaddam MR, Fathimoghadam F, Bidkhori HR, Shamsian SK, Ahmadi S, et al. High prevalence of HTLV-I infection in Mashhad, Northeast Iran: a population-based seroepidemiology survey. *J Clin Virol* 2011; 52: 172-176.
126. Azarpazhooh MR, Hasanpour K, Ghanbari M, Rezaee SA, Mashkani B, Hedayati-Moghaddam MR, et al. Human T-lymphotropic virus type I prevalence in northeastern Iran, Sabzevar: an epidemiologic-based study and phylogenetic analysis. *AIDS Res Hum Retroviruses* 2012; 28: 1095-1101.
127. Hedayati-Moghaddam MR, Fathimoghadam F, Eftekhazadeh Mashhadi I, Sohghani L, Bidkhori HR. Epidemiology of HTLV-I in Neyshabour, Northeast of Iran. *Iran Red Crescent Med J* 2011; 13: 424-427.
128. Karimi A, Naficy M, Imani R. Comparison of human T-cell leukemia virus type-I (HTLV-I) seroprevalence in high risk patients (thalassemia and hemodialysis) and healthy individuals from Charmahal-Bakhtiari province, Iran. *Kuwait Med J* 2007; 39: 259.
129. Khameneh ZR, Baradaran M, Sepehrvand N. Survey of the seroprevalence of HTLV I/II in hemodialysis patients and blood donors in Urmia. *Saud J Kidney Dis Transpl* 2008; 19: 838-841.
130. Abedian F, Yavarian M, Shakhizadeh A, Khalvati B, Asadi A. A pilot Seroepidemiologic study of HTLV in thalassemia, hemophilia, and hemodialysed patients in Hormozgan. *HMJ* 2009; 13: 75-80.
131. Kendall EA, Gonzalez E, Espinoza I, Tipismana M, Verdorck K, Clark D, et al. Early neurologic abnormalities associated with human T-cell lymphotropic virus type I infection in a cohort of Peruvian children. *J Pediatr* 2009; 155: 700-706.
132. Proietti FA, Carneiro-Proietti AB, Catalan-Soares BC, Murphy EL. Global epidemiology of HTLV-I infection and associated diseases. *Oncogene* 2005; 24: 6058-6068.
133. Vrielink H, Reesink HW. HTLV-I/II prevalence in different geographic locations. *Transfus Med Rev* 2004; 18: 46-57.
134. Trifonov V, Khiabanian H, Rabadan R. Geographic dependence, surveillance, and origins of the 2009 influenza A (H1N1) virus. *N Engl J Med* 2009; 361: 115-119.
135. Dawood FS, Jain S, Finelli L, Shaw MW, Lindstrom S, Garten RJ, et al. Emergence of a novel swine-origin influenza A (H1N1) virus in humans. *N Engl J Med* 2009; 360: 2605-2615.
136. Gooya MM, Soroush M, Mokhtari-Azad T, Haghdoot AA, Hemati P, Moghadami M, et al. Influenza A (H1N1) pandemic in Iran: report of first confirmed cases from June to November 2009. *Arch Iran Med* 2010; 13: 91-98.
137. Dashti-Khavidaki S, Khalili H, Gholamalipour F, Soudbakhshe A, Talasaz AH, Hajabdolbaghi M, et al. Approach to Pandemic 2009 influenza: first report from a main referral hospital for Pandemic H1N1 influenza care in Iran. *J Infect Dev Ctries* 2010; 4: 629-635.
138. Afsariabian S, Mohsenpour B, Bagheri KH, Barari M, Ghaderi E, Hashemi R, et al. Epidemiological survey on pandemic influenza A (H1N1) virus infection in Kurdistan province, Islamic Republic of Iran, 2009. *East Mediterr Health J* 2014; 20: 169-174.
139. Ziyaeeyan M, Alborzi A, Jamilidoust M, Moeini M, Pouladfar GR, Pourrabbas B, et al. Pandemic 2009 influenza A (H1N1) infection among 2009 Hajj Pilgrims from Southern Iran: a real-time RT-PCR-based study. *Influenza Other Respir Viruses* 2012; 6: e80-84.
140. Haghdoot AA, Gooya MM, Baneshi MR. Modelling of H1N1 flu in Iran. *Arch Iran Med* 2009; 12: 533-541.
141. Assiri A, Megeer A, Perl TM, Price CS, Al Rabeeah AA, Cummings DA, et al. Hospital outbreak of Middle East respiratory syndrome coronavirus. *N Engl J Med* 2013; 369: 407-416.
142. Cunha CB, Opal SM. Middle East respiratory syndrome (MERS): a new zoonotic viral pneumonia. *Virology* 2014; 5: 650-654.
143. Ithete NL, Stoffberg S, Corman VM, Cottontail VM, Richards LR, Schoeman MC, et al. Close relative of human Middle East respiratory syndrome coronavirus
EMERGING INFECTIONS DISEASES IN IRAN

in bat, South Africa. Emerg Infect Dis 2013; 19: 1697-1699.

144. Mailles A, Blanckaert K, Chaud P, Van Der Werf S, Lina B, Caro V, et al. First cases of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) infections in France, investigations and implications for the prevention of human-to-human transmission, France, May 2013. Euro Surveill 2013; 18(24): 20502.

145. Haagmans BL, Al Dhahiry SH, Reusken CB, Raj VS, Galiano M, Myers R, et al. Middle East respiratory syndrome coronavirus in dromedary camels: an outbreak investigation. Lancet Infect Dis 2014; 14: 140-145.

146. Yavarian J, Rezaei F, Shadab A, Soroush M, Gooya MM, Azad TM. Cluster of Middle East respiratory syndrome coronavirus infections in Iran, 2014. Emerg Infect Dis 2015; 21: 362-364.

147. Tabatabaei S, Zahraei M, Ahmadnia H, Ghotbi M, Rahimi F. Principles of disease prevention and surveillance. Tehran: roohe ghamal, 2007.

148. Guery B, Poissy J, El Mansouf L, Séjourné C, Ettahar N, Lemaire X, et al. Clinical features and viral diagnosis of two cases of infection with Middle East Respiratory Syndrome coronavirus: a report of nosocomial transmission. Lancet 2013; 381: 2265-2272.

149. OIE. Available at: http://www.OIE.int/wahis_2/public/wahid.php/Review/report/Review?page_refer=MapEventSummary&reportid=16747 Accessed December 8, 2014. 2014.

150. Weigler BJ. Zoonotic hantaviruses; new concerns for the United States. J Am Vet Med Assoc 1995; 206: 979-986.

151. Hu XQ, Li SG, Liu H, Wang J, Hua RM. Diversity and distribution of host animal species of hantavirus and risk to human health in Jiuhua mountain area, China. Biomed Environ Sci 2014; 27: 849-857.

152. Oncul O, Atalay Y, Onem Y, Turhan V, Acar A, Uyar Y, et al. Hantavirus infection in Istanbul, Turkey. Emerg Infect Dis 2011; 17: 303-304.

153. Gozalan A, Kalaycioglu H, Uyar Y, Sevindi DF, Turkylilmaez B, Cakir V, et al. Human puumala and dobra hantavirus infections in the Black Sea region of Turkey: a cross-sectional study. Vector Borne Zoonotic Dis 2013; 13: 111-118.

154. Chintak S, Javadi AA, Hajiannia A, Ataei B, Jalali T, Khakifirooz S, et al. First Evidencne of Hantaviruses in Central Iran as an Emerging Viral Disease. Advences in Infectious Diseases 2014; 4: 173.

155. Arricau-Bouvery N, Rodolakis A. Is Q fever an emerging or re-emerging zoonosis? Vet Res 2005; 36: 327-349.

156. Kaplan MM, Bertagna P. The geographical distribution of Q fever. Bull World Health Organ 1955; 13: 829-860.

157. Caughey J, Harootunian S. Q fever in Iran. Lancet 1976; 2(7986):638.

158. Esmaeili S, Pourhossein B, Gooya MM, Amiri FB, Mostafavi E. Seroepidemiological survey of Q fever and brucellosis in Kurdistan Province, western Iran. Vector Borne Zoonotic Dis 2014; 14: 41-45.

159. Khalili M, Mosavi M, Diali HG, Mirza HN. Serologic survey for Coxiella burnetti phase II antibodies among slaughterhouse workers in Kerman, southeast of Iran. Asian Pac J Trop Biomed 2014; 4(Suppl 1):S209-12.

160. Mostafavi E, Rastad H, Khalili M. Q Fever: An emerging public health concern in Iran. Asian J Epidemiol 2012; 5: 66.

161. Khalili M, Sakahe E. An update on a serologic survey of Q Fever in domestic animals in Iran. Am J Trop Med Hyg 2009; 80: 1031-1032.

162. Sakahe E, Khalili M. The first serologic study of Q fever in sheep in Iran. Trop Anim Health Prod 2010; 42: 1561-1564.

163. Asadi J, Kafi M, Khalili M. Seroprevalence of Q fever in sheep and goat flocks with a history of abortion in Iran between 2011 and 2012. Vet Ital 2013; 49: 163-168.

164. Rahimi E, Doosti A, Ameri M, Kabiri E, Sharifian B. Detection of Coxiella burnetti by nested PCR in bulk milk samples from dairy bovine, ovine, and caprine herds in Iran. Zoonoses Public Health 2010; 57(7-8):e38-41.

165. Ghalyanchi Langeroudi A, Babkhani N, Zolfaghari MR, Majidzadeh Arbadli K, Morovvati A, Soleimani M. Detection of Coxiella burnetii in bulk tank milk samples from dairy bovine farms using nested-PCR in Qom, Iran, 2011. Iran J Arthropod Borne Dis 2013; 7: 207-211.

166. Khalili M, Sakahe E, Aflatoonian MR, Shahabi-Nejad N. Herd-prevalence of Coxiella burnetti (Q fever) antibodies in dairy cattle farms based on bulk tank milk analysis. Asian Pac J Trop Med 2011; 4: 58-60.

167. Fard SRN, Khalili M. PCR-Detection of Coxiella burnetti in Ticks Collected from Sheep and Goats in Southeast Iran. Iran J Arthropod Borne Dis 2011; 5: 1-6.

168. Bos KI, Schuenemann VJ, Golding GB, Burbano HA, Wagglechner N, Coombes BK, et al. A draft genome of Yersinia pestis from victims of the Black Death. Nature 2011; 478: 506-510.

169. Nekouie H, Razavi MR, Seyyedipoor G. Investigation of Yersinia pestis in Xenopsylla aysta. Southeast Asian J Trop Med Public Health 2003; 34: 158-161.

170. Leslie T, Whitehouse CA, Yingst S, Baldwin C, Hakar F, Moffeh J, et al. Outbreak of gastroenteritis caused by Yersinia pestis in Afghanistan. Epidemiol Infect 2011; 139: 728-735.

171. Dols MW. Plague in early Islamic history. J Am Orient Soc 1974:371-383.

172. Heggs TB. Pneumonic plague in Iraq. Trans R Soc
Trop Med Hyg 1924; 18: 45-49.
173. Drancourt M, Raoult D. Molecular insights into the history of plague. Microbes Infect 2002; 4: 105-109.
174. Gurbano S, Akhmedova S. Especially dangerous infections in Azerbaijan. Emerging and Endemic Pathogens: Springer; 2010 39-43.
175. Aikimtajav A, Meka-Mechenk T, Temiraliyeva G, Bekeno J, Sagiyev Z, Kelany K, et al. Plague In Kazakhstan at the present time. Przegl Epidemiol 2003; 57: 593-598.
176. Lotfy WM. Plague in Egypt: Disease biology, history and contemporary analysis: A minireview. J Adv Res 2013; 15(4):549-554.
177. Perry RD, Fetherston JD. Yersinia pestis—etiologic agent of plague. Clin Microbiol Rev 1997; 10: 35-66.
178. Théodorides J. Un grand epidemiologiste franco-mauricien: Joseph Désiré Tholozan (1820-1897). Bull Soc Pathol Exot 1998; 91: 104-108.
179. Azizi MH, Azizi F. A history of the human plague in Iran. Arch Iran Med 2010; 13: 563-569.
180. Kohn GC. Encyclopedia of plague and pestilence: from ancient times to the present: Infobase Publishing; 2007.
181. Yousefi Behzadi M, Mostafavi E. A Historical Report of Plague Outbreak in Northern Kermanshah Province, Western Iran, in 1952. J Hist Med Allied Sci 2014; 3.
182. Drancourt M, Raoult D. Molecular insights into the history of plague. Microbes and infection 2002; 4: 105-109.
183. Y K. Plague and its Epidemiology. 1 th ed. Tehran: Pasteur Institute of Iran. 1976.
184. Esmaeili S, Azadmanesh K, Naddaf SR, Rajerison M, Carniel E, Mostafavi E. Serologic Survey of Plague in Animals, Western Iran. Emerg Infect Dis 2013; 19(9): 10.3201/eid1909.12182.
185. Sjostedt A. Tularemia: history, epidemiology, pathogen physiology, and clinical manifestations. Ann N Y Acad Sci 2007; 1105: 1-29.
186. Sandstrom G, Sjostedt A, Forsman M, Pavlovich NV, Mishankin BN. Characterization and classification of strains of Franciscella tularensis isolated in the central Asian focus of the Soviet Union and in Japan. J Clin Microbiol 1992; 30: 172-175.
187. Katherine AF, Donna S-E, Kathleen J, Bela TM, Sam RT, May CC, et al. Tularemia on Martha’s Vineyard: Seroprevalence and Occupational Risk. Emerg Infect Dis 2003; 9: 350.
188. Ohara Y, Sato T, Homma M. Epidemiological analysis of tularemia in Japan (yato-byo). FEMS Immunol Med Microbiol 1996; 13: 185-189.
189. Esmaeili S, Esfandiar B, Maurin M, Gouya MM, Shirzadi MR, Amir FB, et al. Serological survey of tularemia among butchers and slaughterhouse workers in Iran. Trans R Soc Trop Med Hyg 2014; 108: 516-518.
190. Helvaci S, Gedikoglu S, Akalin H, Oral H. Tularemia in Bursa, Turkey: 205 cases in ten years. Eur J Epidemiol 2000; 16: 271-276.
191. Clark DV, Ismailov A, Seyidova E, Hajiyeva A, Bakhishova S, Hajiyev H, et al. Seroprevalence of tularemia in rural Azerbaijan. Vector Borne Zoonotic Dis 2012; 12: 558-563.
192. Farhang-Azad A, Mesarjekova I, Neronov V. Afghan hedgehog, a new reservoir of tularemia. Bull Soc Pathol Exot Filiaries 1973; 66: 266-269.
193. Arata A, Chamsa H, Farhang-Azad A, Mesarjekova O, Neronov V, Saidi S. First detection of tularemia in domestic and wild mammals in Iran. Bull World Health Organ 1973; 49: 597-603.
194. Khoshtedl A, Saedi Dezaki E, Ganji F, Habibian R, Imani R, Taheri E, et al. First Seroprevalence Survey of Children with Tularemia Infection in Chaharmahal va Bakhtiari Province, Iran. Iran J Pathol 2014; 9: 23-27.
195. Esmaeili S, Gouya MM, Shirzadi MR, Esfandiar B, Amir FB, Behzadi MY, et al. Seroepidemiological survey of tularemia among different groups in western Iran. Int J Infect Dis 2014; 18: 27-31.
196. Khozravi M, Bastani B. Acute renal failure due to leptospirosis in a renal transplant recipient: a brief review of the literature. Transplant Proc 2007; 39: 1263-1266.
197. Adler B, De La Pena Mocetzuma A. Leptospirosis and leptospirosis. Vet Microbiol 2010; 140: 287-296.
198. Rafyi A, Maghami G. On the frequency of leptospirosis in Iran. Isolation of Leptospira grippotyphosa in men and in cattle. (Second note). Bull Soc Pathol Exot Filiaries 1959; 52: 592-596.
199. Rafyi A, Maghami G. On the incidence of leptospirosis in Iran. III. Isolation of Leptospira grippotyphosa (L. bovis) in sheep. Bull Soc Pathol Exot Filiaries 1961; 54: 179-181.
200. Maghami GH, Hooshmand-Rad P, Farhang-Azad A. Leptospirosis in small mammals of Iran: II: isolation of Leptospira grippotyphosa from Mus musculus. J Wildl Dis 1977; 13: 286-289.
201. Hooshmand-Rad P, Maghami G. Leptospirosis in small mammals of Iran: I. Serologic tests and isolation of Leptospira hebdomadis from Apodemus sylvaticus. J Wildl Dis 1976; 12: 34-38.
202. Seebek Z, Bashiribod H, Chaffari M, Sepasi F, Sixl W. The occurrence of leptospirosis in Iran. J Hyg Epidemiol Microbiol Immunol 1987; 31: 498-503.
203. Mansour-Ghanea F, Sarshad A, Fallah MS, Pourhabibi A, Pourhabibi K, Yousefi-Mashhoor M. Leptospirosis in Guilan, a northern province of Iran: assessment of the clinical presentation of 74 cases. Med Sci Monit 2005; 11: CR219-223.
204. Honarmand H, Mansour GF, Heydarzadeh A, Asmar M. Isolation and Serotyping of endemic leptospires of eastern part of flat area of Guilan province, Iran. J Gor-
205. Aghaiypour K, Safavieh S. Molecular detection of pathogenic Leptospira in Iran. *Arch Razi Inst* 2016; 62: 191-197.

206. Zakeri S, Sepahian N, Afsharpass M, Esfandiarib A, Ziapour P, Djafari ND. Molecular epidemiology of leptospirosis in northern Iran by nested polymerase chain reaction/restriction fragment length polymorphism and sequencing methods. *Am J Trop Med Hyg* 2010; 82: 899-903.

207. Esfandiarib A, Ziapour S, Assmar M, Youssefi M, Amirbozorgi G, Navaie BA, et al. Leptospirosis in Mazandaran province, northern Iran, 2008-2009. *J Infect Dis Med* 2010; 14: 211-212.

208. Alavi SM, Khoshkhoo MM. Seroprevalence Study of Leptospirosis Among Rice Farmers in Khuzestan Province, South West Iran, 2012. *Jundishapur J Microbiol* 2014; 7: e11536.

209. Garoussi MT, Vando-Usefjee F, Mehrzad J. Seroprevalence of Leptospiral Infection in Rodents of Dairy Cattle Herds Complexes in Suburb of Mashhad-Iran. *J Appl Anim Res* 2006; 30: 109-111.

210. Ziapour S, Esfandiarib A, Abdollahpour G, Assmar M, Youssefi M, Amirbozorgi G, et al. The survey of leptospirosis in Mazandaran province, north of Iran by Microscopic agglutination test, 2006-2007. *J Infect Dis Med* 2010; 14: e206.

211. Khousheh Y, Hassampour A, Abdollahpour G, Mogaddam S. Seroprevalence of Leptospira Infection in Horses in Ardabil-Iran. *Glob Vet J* 2012; 9: 586-589.

212. Hajikolaei MRH, Haidari M, Abdollahpour G. Comparison of leptospirosis infection in the horse and donkey. *Bull Vet Inst Pulawy* 2005; 49: 175-178.

213. Shafiqi T, Abdollahpour G, Salehi TZ, Tadjbaksh H. Serological and bacteriological study of leptospirosis in slaughtered cattle in north of Iran (Rasht). *Afr J Microbiol Res* 2010; 4: 2118-2121.

214. Ebrahimia A, Naser Z, Kojouri GA. Seroinvestigation of bovine leptospirosis in Shahrekord district, central Iran. *Iran J Vet Res* 2004; 4: 370-371.

215. Abdollahpour G, Shafiqi ST, Sattari Tabrizi S. Serodiagnosis of leptospirosis in cattle in north of Iran, Gilan. *Iran J Vet Med* 2009;3: 7-10.

216. Khalili M, Sahaee E, Aflatoonian MR, Abdollahpour G, Tabrizi SS, Damanek EM, et al. Seroprevalence of bovine leptospirosis antibodies by microscopic agglutination test in Southeast of Iran. *Asian Pac J Trop Biomed* 2014; 4: 354-357.

217. Hamali H, Jafari Joozani R, Abdollahpour G. Serodiagnosis and molecular survey on leptospirosis abortions in the dairy cattle of tabriz. *Iranian J Vet Res* 2012; 13: 120-125.

218. Rad M, Zeinali A, Vandy T, Tabatabayi A, Bokaie S. Seroprevalence and bacteriological study of canine lepto-

tospirosis in Tehran and its suburban areas. *Iranian J Vet Res* 2004; 5: 1383-1389.

219. Alavi SM, Khoshkhoo MM. Seroprevalence Study of Leptospirosis Among Rice Farmers in Khuzestan Province, South West Iran, 2012. *Jundishapur J Microbiol* 2014; 7: e11536.

220. Toooli M, Abdollahpour G, Karimi H, Hasanpour A. Prevalence of serum antibodies against six Leptospira serovars in sheep in Tabriz, Northwestern Iran. *Adv Anim Vet Sci* 2008; 8: 333-336.

221. Jamshidi S, Akhavizadegan M, Maazi N, Ali AG, Bokaie S. Serologic study of feline leptospirosis in Tehran, Iran. *Iran J Microbiol* 2009;1: 32-36.

222. Mosallanejad B, Avizeh R, Abdollahpour G, Abadi K. A serological survey of Leptospirosis infection of cats in Ahvaz, south-western of Iran. *Iran J Vet Med* 2011; 5: 49-52.

223. Alavi L, Alavi SM, Khoshkhoo MM. Risk Factors of Leptospirosis in Khuzestan, South West of Iran, 2012. *Int J Enteric Pathog* 2013; 1: 68-71.

224. Nasiri MJ, Dabiri H, Darban-Sarokhalil D, Rezadehbashi M, Zamani S. Prevalence of drug-resistant tuberculosis in Iran: Systematic review and meta-analysis. *Am J Infect Control* 2014; 42: 1212-1218.

225. Bahrmand AR, Velayati AA, Bakayev VV. Treatment monitoring and prevalence of drug resistance in tuberculosis patients in Tehran. *Int J Tuberc Lung Dis* 2000; 4: 544-549.

226. Heidarnejad H, Nagli B. Primary Resistance of *Mycobacterium tuberculosis* to isoniazid, streptomycin, rifampin, and ethambutol in pulmonary tuberculosis. *Arch of Iranian Med* 2001 4: 1-4.

227. Haeili M, Darban-Sarokhalil D, Fooladi AA, Javapour S, Hashemi A, Siavoshi F, et al. Spoligotyping and drug resistance patterns of *Mycobacterium tuberculosis* isolates from five provinces of Iran. *Microbiologypen* 2013; 2: 988-996.

228. Nameei MH, Sadeghian A, Naderinasab M, Ziaee M. Prevalence of primary drug resistant *Mycobacterium tuberculosis* in Mashhad, Iran. *Indian J Med Res* 2006; 124: 77-80.

229. Farivar TN, Naderi M, Fard AM, Oweist H, Moud BS. Drug resistance of *Mycobacterium tuberculosis* strains isolated from patients with pulmonary tuberculosis in South Eastern of Iran. *Am J Med Sci* 2006; 6: 275-278.

230. Shamaei M, Marjani M, Chitsaz E, Kazempour M, Esmaeili M, Farnia P, et al. First-line anti-tuberculosis drug resistance patterns and trends at the national TB referral center in Iran-eight years of surveillance. *Int J Infect Dis* 2009; 13: e236-240.

231. Metanat M, Sharifi-Mood B, Shahraki S, Dawoudi SH. Prevalence of multidrug-resistant and extensively drug-resistant tuberculosis in patients with pulmonary tuberculosis in zahedan, southeastern Iran. *Iran Red
232. Sharifi Yazdi MK. Primary drug resistance patterns in newly diagnosed tuberculosis patients in Yazd, southern province of Iran. *Afr J Biotechnol* 2012; 11: 702-706.

233. Gandhi NR, Nunn P, Dhaeta K, Schaaf HS, Zigeln M, Van Soolingen D, et al. Multidrug-resistant and extensively drug-resistant tuberculosis: a threat to global control of tuberculosis. *Lancet* 2010; 375: 1830-1843.

234. Masjedi MR, Farkhania P, Soroosh S, Pooramir MV, Mansoori SD, Zarifi AZ, et al. Extensively drug-resistant tuberculosis: 2 years of surveillance in Iran. *Clin Infect Dis* 2006; 43: 841-847.

235. Velayati AA, Farkhania P, Masjedi MR, Ibrahim TA, Tabarsi P, Haroun RZ, et al. Totally drug-resistant tuberculosis strains: evidence of adaptation at the cellular level. *Eur Respir J* 2009; 34: 1202-1203.

236. Bostanabad SZ, Shekarabei M, Nojoumi SA, Jabbarzadeh E, Ghalami M, Kazemi VM, et al. Study of genetic evolution in *Mycobacterium tuberculosis* isolates from patients with active pulmonary tuberculosis in the Iran and Belarus. *Open Microbiol J* 2011; 5: 32-42.

237. Shojaei H, Heidariar P, Hashemi A, Feizabadi MM, Daei Naser A. Species identification of neglected non-tuberculous mycobacteria in a developing country. *Jpn J Infect Dis* 2011; 64: 265-271.

238. Samra Z, Kaufman L, Pitlik S, Shalit I, Bishara J. Emergence of *Mycobacterium simiae* in respiratory specimens. *Scand J Infect Dis* 2005; 37: 838-841.

239. Piersimoni C, Scarparo C. Pulmonary infections associated with non-tuberculous mycobacteria in immunocompetent patients. *Lancet Infect Dis* 2008; 8: 323-334.

240. Tabarsi P, Baghaei P, Farkhania P, Mansouri N, Chitzae S, Sheikhholeslam F, et al. Nontuberculous mycobacteria among patients who are suspected for multidrug-resistant tuberculosis need for earlier identification of non-tuberculosis mycobacteria. *Am J Med Sci* 2009; 337; 182-184.

241. Hashemi-Shahrazi A, Bostanabad SZ, Heidariar P, Titov LP, Khorasani AD, Sheikh H, et al. Species spectrum of nontuberculous mycobacterial isolated from suspected tuberculosis patients, identification by multi locus sequence analysis. * Infect Genet Evol* 2013; 20: 312-324.

242. Shojaei H, Hashemi A, Heidariar P, Daei-Naser A. Chronic pelvic pain due to *Mycobacterium parascrofulaceum* in an Iranian patient: first report of isolation and molecular characterization from Asia. *Braz J Infect Dis* 2011; 15: 186-187.

243. Shamaei M, Marjani M, Farkhania P, Tabarsi P, Mansouri D. Human infections due to *Mycobacterium lentiflavum*: first report in Iran. *Iran J Microbiol* 2010; 2: 27-29.

244. Shojaei H, Hashemi A, Heidariar P, Ataei B, Naser AD. Pulmonary and extrapulmonary infection caused by *Mycobacterium conceptionense*: the first report from Iran. *JRSM short reports* 2011; 2: 31.

245. Shojaei H, Hashemi A, Heidariar P, Daei-Naser A. *Mycobacterium novocastrense*-associated pulmonary and wound infections. *Emerg Infect Dis* 2011; 17: 550-551.

246. Shojaei H, Hashemi A, Heidariar P, Hosseini N, Daei Naser A. Chronic pulmonary disease due to *Mycobacterium monacense* infection: the first case from Iran. *Ann Lab Med* 2012; 32: 87-90.

247. Shojaei H, Hashemi A, Heidariar P, Feizabadi MM, Ataei B, Naser AD. First report on isolation and molecular characterization of clinical *Mycobacterium setenae* isolates in Asia. *Jpn J Infect Dis* 2011; 64: 234-236.

248. Heidariar P, Shojaei H, Hashemi A, Feizabadi MM, Daei-Naser A, Ataei B. First report of isolation of *Mycobacterium elephantis* from bronchial lavage of a patient in Asia. *JRSM Short Rep* 2011; 2: 26.

249. Pourahmad F, Shojaei H, Heidariar P, Khoosravi A, Hashemi A. Report of two cases of *Mycobacterium europaeum* from Iran. *Jpn J Infect Dis* 2012; 65: 539-541.

250. Saeed Zaker B. Isolation of *Mycobacterium Chelonae* in the Sputum and Cervical Lymph Nodes of Patient with Metastatic Breast Cancer. *Mycobact Diseases* 2012; 2: 106.

251. Shojaei H, Daley C, Gitti Z, Hashemi A, Heidariar P, Moore ER, et al. *Mycobacterium iranicum* sp. nov., a rapidly growing scotochromogenic species isolated from clinical specimens on three different continents. *Int J Syst Evol Microbiol* 2013; 63: 1383-1389.

252. Shahrahi AH, Çavuşoğlu C, Borroni E, Heidariar P, Koksalan OK, Cabibe AM, et al. *Mycobacterium celeriflavum* sp. nov., a rapidly growing scotochromogenic bacterium isolated from clinical specimens. *Int J Syst Evol Microbiol* 2015; 65: 510-515.

253. Nierman WC, Deshazer D, Kim HS, Tettelin H, Nelson KE, Feldblyum T, et al. Structural flexibility in the *Burkholderia mallei* genome. *PNAS* 2004; 101: 14246-14251.

254. Srinivasan A, Kraus CN, Deshazer D, Becker PM, Dick JD, Spacek L, et al. Glands in a military research microbiologist. *N Engl J Med* 2001; 345: 256-258.

255. Control CFD. Prevention. Laboratory-acquired human glanders-Maryland, May 2000. *MMWR Morb Mortal Wkly Rep* 2000; 49: 532.

256. Kashani-Sabet F. “City of the Dead”: The Frontier Polemics of Quarantines in the Ottoman Empire and Iran. *Comparative Studies of South Asia, Africa and the Middle East* 1998; 18: 51-58.

257. Khaki P, Mosavari N, Khajeh NS, Emam M, Ahouran M, Hashemi S, et al. Glanders outbreak at Tehran Zoo, Iran. *Iran J Microbiol* 2012; 4: 3-7.
EMERGING INFECTIONS DISEASES IN IRAN

258. Marcilla A, Bargues MD, Mas-Coma S. A PCR-RFLP assay for the distinction between Fasciola hepatica and Fasciola gigantica. Mol Cell Probes 2002; 16: 327-333.
259. Mas-Coma S. Epidemiology of fascioliasis in human endemic areas. J Helminthol 2005; 79: 207-216.
260. Rokni MB, Massoud J, O'Neill SM, Parkinson M, Dalton JP. Diagnosis of human fascioliasis in the Gilan province of Northern Iran: application of cathepsin L-ELISA. Diagn Microbiol Infect Dis 2002; 44: 175-179.
261. Massoud J. The importance of helminthic diseases in Iran. Pro-ceedings of the 2nd National Congress of Parasitic Diseases in Iran. Tehran, Iran, pp 74, 1997.
262. Delkhosh J, Noorsalehi S. Report of human fascioliasis in Gilan Province (1984-1995). 2nd National Congress of Parasitic Diseases, Tehran, Iran. October 17, 1997.
263. Bahonar A, Poya B. A descriptive epidemiology of patients infected with fasciolis in Rasht and Bandar Anzali in 1999. 3rd National Congress of Medical Parasitology, 2000, Sari, Iran, April 9-11, 2000.
264. Ahmadi NA, Meshkehkar M. Prevalence and long term trend of liver fluke infections in sheep, goats and cattle slaughtered in Khuzestan, southwestern Iran. J Paramed Sci 1: 26-31.
265. Moghaddam AS, Massoud J, Mahmoodi M, Mahvi AH, Perigro MV, Artigas P, et al. Human and animal fascioliasis in Mazandaran province, northern Iran. Parasitol Res 2004; 94: 61-69.
266. Sakhi J, Khademvatan S, Yousefi E. Molecular identification of animal Fasciola isolates in Southwest of Iran. Aust J Basic Appl Sci 2011; 5: 1878-1883.
267. Amor N, Halajian A, Farjallah S, Merella P, Said K, Ben Slimane B. Molecular characterization of Fasciola spp. from the endemic area of northern Iran based on nuclear ribosomal DNA sequences. Exp Parasitol 2011; 128: 196-204.
268. Imani-Baran A, Yakhchali M, Malekzadeh Viazeh R, Paktarmani R. Molecular study for detecting the prevalence of Fasciola gigantica in field-collected snails of Radix gedrosiana (Pulmonata: Lymnaeidae) in north-western Iran. Vet Parasitol 2012; 189: 374-377.
269. Sarkari B, Ghobakhloo N, Moshefa A, Eilami O. Serorelevance of human fascioliasis in a new-emerging focus of fascioliasis in yasuj district, southwest of Iran. Iran J Parasitol 2012; 7: 15-20.
270. Rahimi P, Ghavami M, Haniloo A, Nowrani A, Biglari A. Identification of Fasciola Species by PCR-RFLP Assay. ZJMS Journal 2009; 16: 41-48.
271. Ashrafi K, Valero M, Forghan-Parast K, Rezaeean M, Shahtaheri S, Hadjiani M, et al. Potential transmission of human fascioliasis through traditional local foods, in northern Iran. Iran J Public Health 2006; 35: 49-56.
272. Ashrafi K, Valero MA, Massoud J, Sobhani A, Solaymani-Mohammadi S, Conde P, et al. Plant-borne human contamination by fascioliasis. Am J Trop Med Hyg 2006; 75: 295-302.
273. Snow RW, Guerra CA, Noor AM, Myint HY, Hay SI. The global distribution of clinical episodes of Plasmodium falciparum malaria. Nature 2005; 434: 214-217.
274. Vatandoost H, Emami S, Oshaghi M, Abari M, Raeisi A, Piazzak N, et al. Ecology of malaria vector Anopheles culicifacies in a malarious area of Sistanva Baluchestan province, south-east Islamic Republic of Iran/Écologie du vecteur du paludisme Anopheles culicifacies dans une région impaludée de la province du Sistan-Balutchistan, au sud-est de la République islamique d'Iran. East Mediterr Health J 2011; 17: 439.
275. Afscharpad M, Zakeri S, Pirahmadi S, Djaidid ND. Molecular monitoring of Plasmodium falciparum resistance to antimalarial drugs after adoption of sulfadoxine-pyrimethamine plus artemesas as the first line treatment in Iran. Acta Trop 2012; 121: 13-18.
276. Suroso T, Hamidi AN, Manouchehri AV. The activity of chloroquine against Plasmodium falciparum in Bandar Abbas, Southern Iran, 1976. Bull Soc Pathol Exot Filiaries 1978; 71: 164-171.
277. Edrisian G. Malaria in Iran: Past and present situation. Iran J Parasitol 2006; 1: 1-14.
278. Edrisian GH, Nateghpour M, Afshar A, Seyedzadeh A, Mohseni G, Satvat M, et al. Monitoring the response of Plasmodium falciparum and Plasmodium vivax to antimalarial drugs in the malarious areas in south-east Iran. Arch Iran Med 1999; 2: 61-66.
279. Edrisian GH, Afshar A, Kanani A, Satvat MT, Mohseni G, Nasserhi-nejad K, et al. The response of Plasmodium falciparum to chloroquine and mefloquine in Bandar-Abbas and Minab areas, Hormozgan Province, southern Iran. J Trop Med Hyg 1989; 92: 75-79.
280. Wilson CM, Volkman SK, Thaitong S, Martin RK, Kyle DE, Milhous WK, et al. Amplification of pfmdr1 associated with mefloquine and halofantrine resistance in Plasmodium falciparum from Thailand. Mol Biochem Parasitol 1993; 57: 151-160.
281. Raeisi A, Ringwald P, Safa O, Shahbaz A, Ranjbar M, Keshavarz H, et al. Monitoring of the therapeutic efficacy of chloroquine for the treatment of uncomplicated Plasmodium falciparum malaria in Iran. Ann Trop Med Parasitol 2006; 100: 11-16.
282. Tabatabaei F, Abrehdari Tafreshi Z, Shahmohammad N, Pirestani M. Molecular detection of microsporidiosis in various samples of Iranian immunocompromised patients. J Parasit Dis 2015; 39: 634-638.
283. Jamshidi S, Tabrizi AS, Bahrami M, Momtaz H. Microsporidia in household dogs and cats in Iran; a zoo-notic concern. Vet Parasitol 2012; 185: 121-123.
284. Agholi M, Hatam GR, Motazedian MH. HIV/AIDS-associated opportunistic protozoal diarrhea.
NAJMEH PARHIZGARI ET AL.

285. Mirjalali H, Mohebali M, Mirhendi H, Gholami R, Keshavarz H, Meamar AR, et al. Emerging Intestinal Microsporidia Infection in HIV(+)/AIDS Patients in Iran: Microscopic and Molecular Detection. *Iran J Parasitol* 2014; 9: 149-154.

286. Ghorbanzadeh B, Sadraie J, Emadi Kuchak H. Diagnosis of *Cryptosporidium* and intestinal Microsporidia in HIV/AIDS patients with staining and PCR methods on 16srRNA gen. *AMUJ* 2012; 15: 37-47.

287. Khalili B, Imani R, Boostani S. Intestinal Parasitic Infections in Chronic Psychiatric Patients in Sina Hospital Shahre-Kord, Iran. *Jundishapur J Microbiol* 2013; 6: 252-255.