

Transmissible Dermatological Diseases Affecting Syrian Refugees in Lebanon

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Abstract

The Syrian war led many to seek shelter in Lebanon, creating a major refugee crisis. Displaced populations in crowded unequipped settlements are vulnerable to infectious diseases. The burden and incidence of various transmissible skin conditions affecting Syrian refugees in Lebanon and their impact on the Lebanese public health system were evaluated. Literature regarding these conditions among Syrian refugees in host countries, and epidemiological data from the Lebanese Ministry of Public Health Surveillance Unit and primary health-care network were reviewed. Lebanon has witnessed skin disorder outbreaks associated with the Refugee crisis, mainly leishmaniasis, scabies and lice infestations with little data about bacterial and fungal infections and a minor surge in reports of Leprosy. Additional surveillance is needed to monitor disease prevalence, and the emergence of potential outbreaks. Preventive measures, early detection and treatment, improved living conditions, and coordination between the Lebanese health authorities and non-governmental organizations are essential for early intervention and management.

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Background

Following the 2011 war in Syria, a large number of individuals sought refuge in neighboring countries. Of the roughly 4,837,134 Syrian refugees spread around the world, over one million have been registered in Lebanon with the United Nations High Commissioner for Refugees (UNHCR) with approximately 314,482 children under the age of 18. [1] It is estimated that one third of Syrian refugees in Lebanon are not registered, amounting to an estimated one and a half million refugees in total. Lebanon is the country with the highest number of refugees per capita where approximately one in four persons living in the country is considered displaced. [2] Many refugees are currently residing in poorly equipped camps, shelters, or informal tented settlements while others have been integrated in the urban cities and into the Lebanese matrix. [3] This extensive migration has resulted in people living in extremely crowded areas with little access to proper hygiene, sanitation and water.

Over the last five years, the Syrian refugee population have experienced a multitude of health concerns as a result of unsanitary living conditions. [4] The main medical problems that threaten this population include respiratory illnesses, gastrointestinal and nutritional disorders, multisystem infectious diseases and most notably skin conditions. El-Khatib et al. demonstrated that cutaneous illnesses constitute up to 41% of the health complaints affecting Syrian refugees in Lebanon. [5] Studies evaluating health conditions of refugees arriving to Germany have also illustrated the major burden of cutaneous

infectious diseases. [6, 7] Different dermatologic entities with variable clinical manifestations may be found around the world in relation to specific populations, geographical regions and varying environmental conditions. A review done by the World Health Organization (WHO) revealed that, depending on the geographical location, different pathogens could be responsible for a single disease entity. [8] Another variable to account for is the prevalence of some infectious diseases that are already endemic in a certain population but may manifest later after displacement due to long incubation periods. [9]

In this paper, we highlight the transmissible dermatologic entities affecting the Syrian refugees in Lebanon, including leishmaniasis, scabies, lice and skin infections of fungal or bacterial etiology. It is imperative to focus on those skin conditions in this subset of the population given their strong association with poor hygienic living conditions and their ability to spread in crowded environments making them a significant public health concern. [10] Despite the serious health grievances associated with the Syrian war and their global effect, little data are available about transmissible dermatological diseases associated with the Syrian refugee situation. The interest of the mass media in the plight of the Syrian refugees and the associated health complications have not made their way into published data in peer-reviewed journals, further emphasizing the necessity to evaluate the health needs of those involved and to assess their access to proper care. [11]

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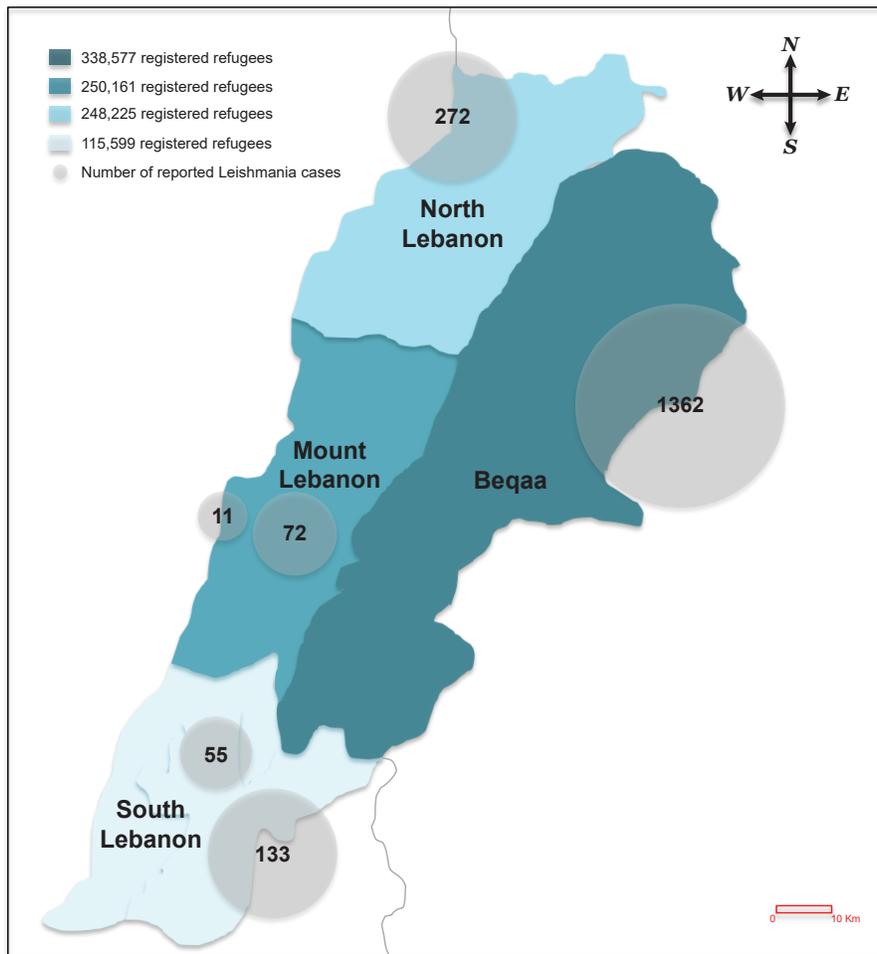


Figure 1 Map of Lebanon indicating number of registered refugees per governorate as per the United Nations High Commissioner for Refugees records; and total number of reported Leishmania cases between 2002 and 2017 (inclusive) as per the Lebanese Ministry of Public Health surveillance data.

Methods

Data relevant to transmissible dermatological entities associated with refugee population were compiled using search engines such as PubMed, Cochrane, Medline, EMBASE, and Google Scholar. Data related to the transmissible dermatologic diseases pertinent to the Syrian refugees in Lebanon between 2002 and 2017 were extracted from both the Epidemiological Surveillance Unit (ESU) and the Primary Healthcare System (PHS), two departments in the Lebanese Ministry of Public Health (LMoPH). Data from the Syrian Ministry of Public Health's epidemiological bulletin were also reviewed. These de-identified epidemiological data were collected by the ministries of health of the respective countries, are available to the public and were therefore not subject to any particular institutional review board. There is no financial support or conflict of interest to disclose.

Results

A. Leishmaniasis

Leishmaniasis is a neglected tropical disease caused by parasites of the *Leishmania* species. It is considered to be endemic and highly prevalent in Syria and often referred to as the "Aleppo boil". Available data from the Syrian Ministry of Public Health, although limited, illustrates the extent of spread of this disease where tens of thousands are annually affected. [12] In spite of geographical proximity and similar environmental

conditions, Lebanon before the Syrian War rarely experienced Leishmaniasis. Recently published studies showed that since the start of the war in Syria, the number of reported cases has exponentially escalated as of 2013, with children being the most affected group. [13] (Figures 1 and 2) In another study from Lebanon, *Leishmania tropica* (85%) and *Leishmania major* (15%) were the two most commonly identified species in infected Syrian refugees. [14]

Leishmania in Syrian refugees has been reported in multiple studies involving individuals living in the Middle East, including camps located in Lebanon, Jordan and Turkey. [15-20] It has also been observed internationally, whereby studies from Germany and New Zealand demonstrated that a large proportion of screened patients suffer from this condition. [21-24] One study even alluded to the potential spread of cutaneous leishmaniasis into Northern Europe and the United States following anthroponotic transmission from human to local sandflies. More data needs to be collected in order to verify this hypothesis and eventually integrate this knowledge into screening programs [25-28]. A collaborative effort initiated by the LMoPH with the help of WHO was able to contain the leishmaniasis outbreak recognized in 2013. A total of 2,787 people were successfully treated between 2013 and 2015, only four of whom were Lebanese. This early response played a major role in containing the situation and has been suggested as a successful model for future interventions. [29]

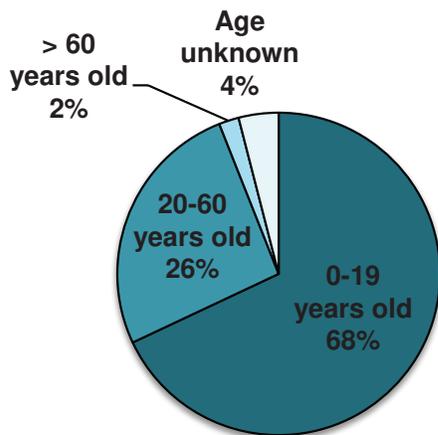


Figure 2 Age distribution of all individuals affected by Leishmania in Lebanon between 2002 and 2017 as per the Lebanese Ministry of Public Health.

B. Scabies

Scabies is a contagious superficial epidermal infestation by *Sarcoptes scabiei*, an obligate human parasite. The mite burrows into the affected individual's skin shortly after contact with an infected person or fomite. While the lifespan of these mites amounts to approximately four to six weeks, each female mite lays around three eggs daily within burrows formed in certain areas of predilection. [30] As a reaction to the mite, the skin becomes pruritic, especially at night, leading to excoriations and possible secondary infection. Published studies evaluating the prevalence of scabies in displaced population have illustrated the degree to which this problem can spread. In the case of a refugee group in Sierra Leone, children five to nine years of age were most frequently affected with 86% of that age group suffering from scabies. [31] Even if a single individual is affected by the condition, adequate management relies on treating the entire household with an appropriate scabicide agent such as permethrin, lindane, or ivermectin. This may become increasingly difficult in large groups of people living in settlements as compliance and potential re-infection come into play. [30]

The epidemiology and rapid spread of scabies has been described in the literature with regards to migrant populations and asylum seekers, some of which include the time frame of the current Syrian crisis. [32] However the majority of these studies were done in Germany and no published data have been found pertaining to Arab countries. [33, 34] Older observational studies pertaining to health response in the context of refugee crisis have shown that the spread of scabies was of great concern. [35]

According to the LMoPH primary healthcare network, 16,243 Syrian refugees sought free medical treatment for scabies in 2015. Meanwhile 10,524 refugees were treated in the period between January and July 2016. Education and distribution of treatment solutions were paramount for the management of the outbreaks. The International Medical Corps (IMC) operating in Lebanon among Syrian refugee groups was able to respond to such outbreaks in 2013 by distributing 1,731 hygiene kits and 4,098 doses of anti-lice and anti-scabies medications. [32]

C. Lice

Lice are specific varieties of ectoparasites that reside on different areas of the body and feed on human blood, causing affected individuals to suffer from pruritus. Treatment is necessary

given that female lice lay nits that hatch and mature soon after, allowing the condition to persist and easily spread in groups of people who remain in close contact with one another. [30] In fact, under usual circumstances, young school children are most likely to be infected due to close proximity to each other in classrooms. [36] However in the case of refugees, lice are also of concern due to the unusual living arrangements. Moreover, body lice can also serve as a vector for other infections such as typhus or relapsing fever, which was observed in homeless people and individuals during World War I. [37] The mainstay of treatment is based on medicated shampoos and lotions in addition to environmental control. In contrast with scabies, empiric treatment of contacts is not necessary unless infestation has been diagnosed.

With regard to prior research, prevalence studies evaluating the spread of lice infestations have been performed in countries such as Thailand and Albania. [38] A review of the literature demonstrated the existence of a few recent international case reports centered on refugees suffering from the sequelae of louse infestation. Such cases described louse borne relapsing fever in Somali refugees in Germany, Bavaria and Italy. [39-41] No similar studies have been found with regards to the current Syrian refugee crisis in Lebanon. Media reports have discussed the current rise in lice outbreaks in crowded camps while several NGOs have taken matters into their own hands. The American Near East Refugee Aid, an NGO that mainly provides assistance in Palestinian refugee settlements, noted a surge in the number of cases of lice with the inflow of Syrian refugees into the Palestinian camps in Lebanon. This prompted new anti-lice campaigns and mass screening. [42]

The LMoPH reports astounding rates of refugees seeking therapy for louse infestation. In 2015, a total of 19,696 cases were managed by the primary healthcare network, in addition to another 10,991 in the first half of 2016.

D. Fungal and Bacterial Skin Infections

Easy spread of parasitic infections, environmental factors such as heat and humidity, and unusual living conditions (e.g., crowding, poor hygiene and water supply) contribute to the skin infections affecting refugees. [43] Studies addressing the importance of general hygiene in prevention and control of skin related infections have shown the great impact that access to clean water and sanitation have on prevalence of skin infections such as tinea corporis and staphylococcal skin infections. [44]

Superficial fungal infections are common and may affect any part of the body. Their etiology is mainly linked to three dermatophytic genera: Trichophyton, Microsporum, and Epidermophyton and to a lesser extent Candida and Malassezia. [45] Some of these agents are transmissible by close contact in the setting of a warm and humid environment. [46]

Although these conditions may sometimes respond to topical treatment, the need for prolonged oral therapy is acknowledged in many instances. There exist no data from Syrian refugees in Lebanon regarding the burden of these infections, however treatment with oral agents may be expensive and necessitate good compliance, which is not always available for this susceptible group of individuals. In fact, previous research evaluating medication compliance pointed out the strong relationship between lower socioeconomic status, literacy and education and poor adherence to prescribed medication. [47]

Other possible bacterial pathogens may include *Staphylococcus aureus*, *Streptococcus pyogenes* and *Pseudomonas aeruginosa* among others organisms leading to complicated skin infections such as impetigo. These entities, although serious and contagious, are not reportable diseases and as such, their prevalence will be hard to determine in both the host population and refugees. [13]

In Lebanon, the prevalence of Methicillin Resistant *Staphylococcus aureus* is estimated to be around 30%. [48] The overuse of fluoroquinolones has rendered some pseudomonal isolates resistant to these oral agents. Although little is known about the prevalence of these skin infections and their microbiology among Syrian refugees, the antibiotic sensitivity profiles in Lebanon suggest that some of the antimicrobial agents needed for treatment may not be easily accessible to Syrian refugees. [49]

Bacterial infections of the skin are linked to morbid complications including deep tissue infections, scarlet fever and glomerulonephritis. This may necessitate systemic antibiotic therapy with oral or parenteral drugs. Furthermore, the emergence of antibiotic resistance will render the treatment of these conditions more difficult and costly.

The Mycobacteria associated with skin diseases include *Mycobacterium leprae* (the agent of leprosy), *Mycobacterium tuberculosis* (TB), and *Mycobacterium* spp. other than tuberculosis (MOTT). Leprosy is a reportable disease in Lebanon, the scope of which can range from simple skin lesions to disfigurement. It is associated with stigma and discrimination. Data from the LMoPH spanning from 2004 to 2015 suggested the recognition of one to two cases annually. However, between 2015 and 2017, a total of ten cases were reported to the LMoPH and started on triple therapy. Because of the long incubation period, it is extremely difficult to trace the origin of these reported cases of leprosy and evaluate the impact of the Syrian refugee crisis on its prevalence. [9]

Despite low infectivity, close encounters with affected people may lead to transmission via oral and nasal droplets. There are sparse data published in the literature about leprosy in both Lebanon and Syria. Hence, long term observation and follow up is necessary.

Discussion

Dermatological infections associated with the Syrian refugees in Lebanon are difficult to assess since most clinical entities are not reportable transmissible diseases. The recent Leishmania outbreak, although successfully contained, can clearly be linked to the large influx of Syrian refugees to Lebanon. The increased number of scabies and lice affected individuals can be also linked to poor living conditions associated with Syrian refugees in Lebanon. More data are needed to address the burden of bacterial and fungal infections in this subpopulation. The poor living conditions and lack of sanitary infrastructure in addition to crowding may be favorable to the propagation of these diseases.

The German model for early detection and treatment could be useful in order to manage these simple infectious diseases before they spread within the closed communities of refugees or to host populations. This could lead to decreased long-term morbidity and healthcare cost, in addition to potentially improved

productivity. The LMoPH, local NGOs and the international community have duties and obligations to monitor the spread of transmissible dermatological conditions among displaced Syrian groups. Early treatment is paramount to protect this vulnerable population as well as host communities.

References

1. UNHCR Syria Regional Refugee Response [Internet]. Lebanon. 2013. – [updated December 2018]. Available from <http://data.unhcr.org/syrianrefugees/country.php?id=122>
2. Dobbs L. The number of Syrian refugees in Lebanon passes the 1 million mark [Internet]. Lebanon: United Nations Higher Commission for Refugees (UNHCR); 2014. Available from: <https://www.unhcr.org/news/latest/2014/4/533c1d5b9/number-syrian-refugees-lebanon-passes-1-million-mark.html>
3. Coutts A, Fouad, FM, Batniji, R. Assessing the Syrian Health Crisis: The Case of Lebanon. *Lancet*. 2013;381:6-7.
4. Beldjebel I. Infectious diseases in refugees coming from Syria and Iraq to Lebanon. *Int J Infect Dis*, 2014;21:26.
5. El-Khatib Z, Scales D, Vearey J, Forsberg BC. Syrian refugees, between rocky crisis in Syria and hard inaccessibility to healthcare services in Lebanon and Jordan. *Confl Health*. 2013;7:18
6. Theuring S, Friedrich-Jänicke B, Pörtner K, Trebesch I, Durst A, Dieckmann S et al. Screening for infectious diseases among unaccompanied minor refugees in Berlin, 2014-2015. *Eur J Epidemiol*. 2016;31:707-10.
7. Grote U, Wildenau G, Behrens G, Jablonka A. Primary care for refugees in Germany - First data on demographics and reasons for treatment after the establishment of basic health care in refugee camps. *Anesthesiologie und Intensivmedizin* 2015;56:654-60
8. Mahe A, Hay RJ. Epidemiology and Management of Common Skin Diseases in Children in Developing Countries. *Discussion Papers on Child Health*. Geneva: World Health Organization (WHO), 2005. 62p.
9. Lockwood DN, Reid AJ. The Diagnosis of Leprosy Is Delayed in the United Kingdom. *QJM*. 2001;94:207-12
10. Talukdar K, Rupali B. Health Status Of Primary School Children: A Community Based Cross Sectional Study In Rural Areas Of Kamrup District, Assam. *Journal of Evolution of Medical and Dental Sciences*. 2015;4:2093-100.
11. MSF reports show more assistance is needed to meet healthcare needs. [Internet] Canada. Médecins Sans Frontières (MSF). Nov 2017 Available from: <https://www.msf.org/syria-msf-reports-show-more-assistance-needed-meet-healthcare-needs>
12. Syrian Epidemiological Bulletin [Internet]. Syria: Syrian Epidemiological Bulletin. Ministry of Health Syria, 2013. Available from: <http://www.moh.gov.sy/pages/EpidemicBulletin/201304/indexe.html>
13. Lebanese Ministry of Public Health [Internet]. Lebanon: Ministry of Public Health Epidemiologic Surveillance Department. Available from: <https://www.moph.gov.lb/en/Pages/2/193/esu>
14. Alawieh A, Musharrafieh U, Jaber A, Berry A, Ghosn N, Bizri AR. Revisiting leishmaniasis in the time of war: the Syrian conflict and the Lebanese outbreak. *Int J Infect Dis*. 2014; 29:115–19
15. Saroufim M, Charafeddine K, Issa G, Khalifeh H, Habib

- RH, Berry A, et al. Ongoing Epidemic of Cutaneous Leishmaniasis among Syrian Refugees, Lebanon. *Emerg Infect Dis* 2014;20
16. Amraoui M, Boui M. Mucocutaneous leishmaniasis of the child in a refugee camp. *Pediatr Dermatol.* 2016; 33(1, Suppl. 1) S47-S48
 17. Koçarslan S, Turan E, Ekinci T, Yesilova Y, Apari R. Clinical and Histopathological Characteristics of Cutaneous Leishmaniasis in Sanliurfa City of Turkey including Syrian Refugees. *Indian J Pathol Microbiol.* 2013;56:211-15
 18. Koltas IS, Eroglu F, Alabaz D, Uzun S. The Emergence of Leishmania Major and Leishmania Donovanii in Southern Turkey. *Trans R Soc Trop Med Hyg.* 2014;108:154-58.
 19. Salman IS, Vural A, Unver A, Saçar S. Cutaneous Leishmaniasis Cases in Nizip, Turkey after the Syrian Civil War. *Mikrobiyol Bul.* 2014;48:106-13.
 20. Al-Salem WS, Pigott DM, Subramaniam K, Haines LR, Kelly-Hope L, Molyneux DH, et al. Cutaneous Leishmaniasis and Conflict in Syria. *Emerg Infect Dis.* 2016;22:931-33.
 21. Mahon CD, Maurice PDL, Keefe M. Three Cases of Cutaneous Leishmaniasis in Christchurch. *Australasian Journal of Dermatology.* 2012;53:A2
 22. Krcmery V. Infectious Diseases in Refugees and Migrants during the European Migrant Crisis 2015. *Int J Infect Dis.* 2016;45:57
 23. Alberer M, Wendeborn M, Löscher T, Seilmaier M. Spectrum of Diseases Occurring in Refugees and Asylum Seekers: Data from Three Different Medical Institutions in the Munich Area from 2014 and 2015. *Dtsch Med Wochenschr.* 2016;141:8-15
 24. Leblebicioglu H, Ozaras R. Syrian Refugees and Infectious Disease Challenges. *Travel Med Infect Dis.* 2015;13:443-44.
 25. Mockenhaupt FP, Barbe KA, Jensenius M, Larsen CS, Barnett ED, Stauffer W, et al. Profile of Illness in Syrian Refugees: A GeoSentinel Analysis, 2013 to 2015. *Euro Surveill.* 2016;21
 26. Stamm LV. Human Migration and Leishmaniasis On the Move. *JAMA Dermatol.* 2016;152:373-74
 27. Jacobson RL. Leishmaniasis in an Era of Conflict in the Middle East. *Vector Borne Zoonotic Dis.* 2011;11:247-58.
 28. Afghan AK, Kassi M, Kasi PM, Ayub A< Kakar N, Marri SM. Clinical Manifestations and Distribution of Cutaneous Leishmaniasis in Pakistan. *J Trop Med.* 2011:1-8.
 29. Hiddleston, S. An Old Disease Rears Its Ugly Head. *Nature Middle East.* 2016
 30. Wolff K, et al. *Fitzpatrick's Color Atlas and Synopsis of Clinical Dermatology.* New York: McGraw-Hill Medical Pub. Division, 2005.
 31. Terry BC, Kanjah F, Sahr F, Kortequeue S, Dukulay I, Gbakima AA. Sarcptes Scabiei Infestation among Children in a Displacement Camp in Sierra Leone. *Public Health.* 2001;115:208-11.
 32. International Medical Corps (Lebanon) Syrian Refugee Response, January-June 2013. Lebanon. United Nations Higher Commission for Refugees. Report. 30 June 2013.
 33. Kühne A, Gilsdorf A. Infectious disease outbreaks in centralized homes for asylum seekers in Germany from 2004-2014 *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz.* 2016;59:570-77.
 34. Alberer M, Wendeborn M, Löscher T, Seilmaier M. Spectrum of diseases occurring in refugees and asylum seekers: data from three different medical institutions in the Munich area from 2014 and 2015. *Dtsch Med Wochenschr.* 2016;141:8-15.
 35. Greco D, Caputo SL, Binkin N, Panatta M, Squarcione S, Germinario C. Health Response to a Large and Rapid Influx of Albanian Refugees in Southern Italy, 1991. *Disasters.* 1993;17:61-9.
 36. Falagas ME, Matthaïou DK, Rafailidis PI, Panos G, Pappas G. Worldwide Prevalence of Head Lice. *Emerg Infect Dis.* 2008;14:1493-494.
 37. Brouqui P, Lascola B, Roux V, Raoult D. Chronic Bartonella quintana bacteremia in homeless patients. *N Engl J Med.* 1999;340:184-9.
 38. Head Lice [Internet]. Atlanta. Centers for Disease Control and Prevention. 2013 Sep [updated September 2013; cited December 2017]. Available from <https://www.cdc.gov/parasites/lice/head/>
 39. Keller C, Zumblick M, Streubel K, Eickmann M, Muller D, Kerwat M et al. Hemorrhagic Diathesis in Borrelia Recurrentis Infection Imported to Germany. *Emerg Infect Dis.* 2016;22:917-19.
 40. Lucchini A, Lipani F, Costa C, Scarvaglieri M, Balbiano R Carosella S, et al. Louseborne Relapsing Fever among East African Refugees, Italy, 2015. *Emerg Infect Dis.* 2015;20:298-301.
 41. Hoch M, Wieser A, Löscher T, Margos G, Pürner F, Zühl J, et al. Louse-borne Relapsing Fever (Borrelia Recurrentis) Diagnosed in 15 Refugees from Northeast Africa: Epidemiology and Preventive Control Measures, Bavaria, Germany, July to October 2015. *Euro Surveill.* 2015;20
 42. Treating Lice and Scabies Infestations in Lebanon Camps [Internet]. ANERA Feb. 2014. Available from: <https://www.anera.org/stories/treating-lice-and-scabies-infestations-in-lebanon-camps/>
 43. Bailie RS, Stevens MR, McDonaals E, Halpin S, Brewster D, Robinson G, et al. Skin infection, housing and social circumstances in children living in remote Indigenous communities: testing conceptual and methodological approaches. *BMC Public Health.* 2005;5:128.
 44. Davis DM, Garcia RL, Riordon JP, Taplin D. Dermatophytes in Military Recruits. *Arch Dermatol.* 1972;105:558-60.
 45. Foster KW, Ghannoum MA, Elewski BE. Epidemiologic surveillance of cutaneous fungal infection in the United States from 1999 to 2002. *J Am Acad Dermatol.* 2004;50:748-52
 46. Jain A, Jain S, Rawat S. Emerging Fungal Infections among Children: A Review on Its Clinical Manifestations, Diagnosis, and Prevention. *J Pharm Bioallied Sci.* 2010;2:314-20.
 47. Avery K. Medication Non-Adherence Issues with Refugee and Immigrant Patients [Internet]. Washington: EthnoMed University of Washington. August 2007 [updated august 2008]. Available from: <https://ethnomed.org/clinical/pharmacy/medication-non-adherence-issues-with-refugee-and-immigrant-patients>
 48. Harastani HH, Araj GF, Tokajian ST. Molecular Characteristics of Staphylococcus Aureus Isolated from a Major Hospital in Lebanon. *Int J Infect Dis.* 2014;19:33-38.
 49. Chamoun K, Farah M, Araj G, Daoud Z, Moghnieh R, Salameh P, et al. Surveillance of Antimicrobial Resistance in Lebanese Hospitals: Retrospective Nationwide Compiled Data. *Int J Infect Dis.* 2016;46:64-70.