Infectious Diseases in the Syrian War
Individual study report

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1. Overview

The Syrian conflict started in March 2012, when children in Daraa started to spray slogans against the Syrian dictatorial Regime. These kids where then prisoned, and the city of Daraa started to demostrate to liberate these children. Many other Syrian cities fastly also started to demonstrate against the Syrian regime. Syria is ruled by the Baath party and specifically by the Assad family in a dictatorial way since around 40 years. Over 40 years this regime killed and tortured over 60.000 humans and jailed much more beyond, all to avoid any oppositional movements. The biggest massacre was in 1982 when in the city of Homs 40.000 humans were killed over a couple of days for demonstrating against the regime. Syrians sufferd under oppression, no human rights and no right of free speech, and all escalated after prisoning these children. Unlike in Tunesia the Syrian regime fought back and started killing demostrators. Then a bloody civil war started. Till now the war doesn’t seem to have an end, and many terroristic groups formed in the war zones, which are increasing the conflict. There are around 220.000 casualties, but activist groups have reported over 300.000\(^1\). And the number of wounded is over 1.000.000, which are mostly one of the over 9.000.000 refugees\(^2\). The health care system collapsed and the hospitals were mostly bombarded, that’s why secret field hospitals has formed. So Syria is the best place for infectious diseases to spread, also to the neighbouring countries, and worldwide through refugees. I worked myself in two field hospitals and faced a lot of severe war injuries. As I was working in the traumatology department I didn’t see many infectious diseases, but still I faced many wound infections, and wounds of melted flesh due to chemical weapons. But I heard a lot about reborn infectious diseases in Syria and that’s why I have chosen this topic for my essay.
2. Introduction

During this war, which started since four years and is ongoing the whole health care system has collapsed. Vaccination is poorly preformed and medications and health care could not reach many areas. In addition to this, poor water supply causes additional poor hygiene, as well as the electricity supply is cut from many areas which causes no usage for most medical machines.

“Measles, hepatitis A, leishmaniasis, poliomyelitis, meningitis, and scabies have spread through vulnerable populations in Syria and refugee camps in neighboring countries, creating a health crisis that will require immense resources to address”.

The lower Table illustrates the reported numbers of the mentioned diseases.

 Reported cases of communicable diseases per year between 2011 and 2014 in Syria, Lebanon, and Jordan.

<table>
<thead>
<tr>
<th></th>
<th>Syrian Arab Republic (a)</th>
<th>Lebanese Republic (b)</th>
<th>Syrian Refugees in Lebanon (c)</th>
<th>Hashemite Kingdom of Jordan (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poliomyelitis</td>
<td>0 0 35(a) 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td>Measles</td>
<td>n/a 13 n/a n/a</td>
<td>9 9 1760 219</td>
<td>232 92</td>
<td>30 24 205 n/a</td>
</tr>
<tr>
<td>Cutaneous Leishmaniasis</td>
<td>n/a 52,982 n/a n/a</td>
<td>5 2 1033 381</td>
<td>998 364</td>
<td>136 103 146 n/a</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>n/a 2203 n/a n/a</td>
<td>448 757 1551 738</td>
<td>220 127</td>
<td>418 509 1082 n/a</td>
</tr>
<tr>
<td>Typhoid Fever</td>
<td>n/a 1129 n/a n/a</td>
<td>362 426 407 102</td>
<td>21 7</td>
<td>2 4 4 n/a</td>
</tr>
</tbody>
</table>

\(a\) Data obtained from the Syrian Ministry of Health website in the Quarterly Report of Communicable Diseases
\(b\) Data obtained from the Global Polio Eradication Initiative website
\(c\) Data obtained from the Epidemiologic Surveillance Department of the Lebanese Ministry of Public Health
\(d\) Data obtained from the Communicable Diseases System on the Jordan Ministry of Health Website

Before the war there were governmental and private hospitals which covered most of the treatment and immunization, but most of them were destroyed because they treated opposition fighters as the government claimed and the field hospitals cannot fill that medical gap.

“According to the World Health Organization (WHO), 40% of Syria's ambulances are destroyed and 57% of public hospitals are severely damaged, with 37% remaining out of service. At least 160 doctors have been killed and hundreds jailed, leading to the emigration of an estimated 80,000 doctors. The 90% of pharmaceutical needs that were locally produced prior to the conflict has now been reduced to only 10%, contributing to significant drug shortages in essential medications”.

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3. War and Infectious Diseases

Many diseases which are spreading in Syria are vaccine preventable; these include poliomyelitis and measles. The vaccination coverage has dropped to more than a half in some regions. Around 2 million children were born since the start of the conflict, but only the half is vaccinated. Some 36 cases of poliomyelitis were reported after it was eradicated for 15 years in Syria. As the virus lives in waters and sewage and contaminated food it spread over the Euphrates River. The strain is linked to wild-type poliovirus 1 (WTP1) which could have come from Pakistan over fighters. “WHO estimates that over 7,600 Syrians are currently infected, since poliomyelitis thrives in unsanitary, crowded conditions and among malnourished children”⁴. Many campaigns tried to vaccinate many children, but the disease is still not eradicated⁷.

A second risk is cutaneous Leishmaniasis due to malnutrition, poor housing, displacement, and poverty. The reports of this disease are continuing to rise with 52.982 confirmed cases in 2012. As well as in Lebanon and other neighbouring countries cases were reported mostly affecting Syrian refugees.

Another small study in Jordan made by the Medecins Sans Frontieres (MSF), tested Syrian patients who came for reconstructive surgeries for the presents of multi-drug isolates. “For the 61 patients, a total of 67 bacterial isolates were identified from cultures of surgical specimens. Overall, 45 (74%) patients had at least 1 positive culture, and 6 (13%) patients had polymicrobial results. Gram-negative organisms represented 24 (56%) of 43 isolates; 10 (23%) were P. aeruginosa, 8
(19%) were *E. coli*, and 6 (14%) were *A. baumannii*. Gram-positive bacteria, including MRSA, represented 19 (44%) of 43 isolates. Overall, 31 (69%) of 45 patients with confirmed infection were positive for MDR organisms. Within this group, MRSA represented 8 (42%) of 19 staphylococcal isolates. Yet the reason for this result is unknown, but a prior connection between war-injuries and multi-drug resistant isolates was made in other studies.

In the army of the Syrian regime there was a small controlled outbreak of the black plague, *Yersenia pestis*. It’s questioned if the outbreak was caused while developing Bioweapons, as the regime is already known for his heavy chemical weapons. And around 131 war prisoners died due to pneumonic plague in the prison, according to “Syrian democratic Union” in 2014.

4. About the Infectious diseases

4.1. Measles

Measles is a highly contagious infectious disease, also known as rubeola. It affects usually children, but may affect all ages. Infection is spread through respiratory droplet, either airborne or on surfaces. Then the virus replicates in the tracheal or bronchial cells, and later in the regional lymph nodes. It causes immunosuppression, delayed-hypersensitivity and IL-12 production. In immunocompromised it may cause fatal giant cell pneumonia, but in immunocompetent individuals the infection will clear and cause a life-long immunity. It affects 30,000,000 children worldwide and causes 1,000,000 deaths and 60,000 blindness cases yearly. Onset of measles may range from 7-14 days after exposure to the virus. Patients are contagious 1-2 days after onset of symptoms. The first sign is usually high fever (40°C) which lasts up to 7 days. Then in the prodromal phase malaise, anorexia, conjunctivitis, cough, coryza and photophobia may occur. A characteristic enanthem appears 2-4 days after the onset of prodrome and lasts till 5 days. Koplik spots are seen in the internal side of the cheeks at this stage.1-2 days after the appearance of this Koplik spots the exanthem which is a rash which starts in the face and continues to the upper and then lower extremities. Complications usually are connected to the depression of host’s immune system and occur due to a superinfection by a bacterial pathogen. This can range from pneumonia, otitis media, pleural effusion, conjunctivitis, blindness and up to encephalitis. It may be diagnosed by physical examination or antibody assays or viral culture (swab) or PCR. Usually it is treated by just maintaining good hydration via i/v infusion if necessary and nonspecific care for avoiding a superinfection. Ribavirin may be used in vitro, which is necessary only in immunocompromised patients. A vitamin A supplement may reduce the risk of eye damage and blindness and is recommended to all children by WHO. The disease can be prevented easily by a measles-mumps-rubella vaccine.
In Syria even the vaccine sometimes is contaminated or not transported well under correct temperatures and the date is expired sometimes, which cause regular deaths after vaccination of the children, like in that article the 34 children died due to contaminated vaccine.

4.2. Hepatitis A

This virus is a common cause for acute hepatitis infection. Prognosis is usually excellent and is accompanied by long term immunity. Death is rare and connected to underlying hepatic disease. Greatest impact on infection has hygiene, nutrition and water supply, which are all a problem right now in Syria. Prodromal symptoms are usually flulike, nausea, vomiting, and fever till 40°C. In the icteric phase dark urine appears (bilirubnuria), pale stool and mostly jaundice, itching, hepatomegaly and abdominal pain. Sometimes a rash occurs on the lower limbs. A physical work up, complete blood count and serologic test are usually enough for diagnosis. Supportive care and an adequate liver-friendly diet are usually enough. To prevent the infection an immunization through vaccine is the best method, as well as high gene.

4.3. Leishmaniasis

This disease is caused by an intracellular protozoan parasite, transmitted by the bite of female sandfly. The clinical spectrum ranges from self-limiting cutaneous ulcer to widely disseminated lesion of the skin, to a mutilating mucocutaneous disease and even to lethal systemic illness. There are two main categories divided by geographical occurrence, the Old World and New World leishmaniasis. In Syria the Old World leishmaniasis is the main pathogen, causing cutaneous and visceral disease, which are ulcers with crusted papules. After the inoculation by sandflies, the flagellated promastigotes bind to the facial macrophages. Extend of the disease is according to the immune responses, virulence of the infected species, and the parasite burden. L. tropica and L. major are most common for the Middle East. Localized cutaneous leishmaniasis usually resolves spontaneously after 3-6 month, but may get to a chronic and lethal problem if a superinfection occurs. Diffuse cutaneous leishmaniasis, post-kala-azar leishmaniasis are chronic and resistant to treatment. Complications include secondary bacterial infection incl. pneumonia and tuberculosis, septicemia, disfigurement, uncontrolled bleeding, splenic rupture, tissue destruction. For diagnosis a routine laboratory study and a biopsy are usually enough. A Leishmanin skin test may also be performed. The treatment is individual and depends on the severity of the case. Antiparasitic pentavalent antimonial agents or liposomal amphotericin B or oral miltefosine or pentamidine or topical paromomycin may be administered. After being infected patients acquire immunity in most cases. A killed leishmania vaccine is also available, but is not protective against visceral leishmaniasis.
### 4.4. Poliomyelitis$^{13,14}$

Around 36 cases of poliomyelitis were reported in Syria. Most of the parts of the world are considered nowadays as polio-free. The disease is caused by a small RNA virus of the enterovirus group of the Picornavirus family. RNA is covered by a capsid but no lipid envelope which make it resistant to lipid solvents and stable in low pH. There are three types and if infected with one immunity is acquired for that particular strain lifelong. Poliovirus is spread by fecal-oral-route and by aerosol droplets, and it destroys the anterior horn cells in the spinal cord. There is a minor and major illness caused by the virus. The minor one is causing GIT complains, nausease, vomiting, abdominal pain, and diarrhea. Also systemic manifestations like fever, malaise and headache may occur. After 3 days then usually paralysis occurs. This symptoms may last for 2 month. The Major illness can cause a lot of CNS defects including, aseptic meningitis, polio encephalitis, bulbar polio, and paralytic poliomyelitis, alone or in combination. After paralysis recovery occurs, and muscles start to recover slowly, and afterwards in the residual-paralysis stage many deformities occur, due to muscle atrophy, imbalance of muscle power, and poor posture. Most deformity in lower limbs is called genu recurvatum. Treatment include supportive treatment specially due to breathing paralysis, re-establishing muscle balance around the joints to prevent deformities, muscle transplantation, stabilization, limb lengthening, and joint replacement surgery.

![Syrian child with muscle atrophy right leg due to polio$^{15}$](image)

### 4.5. Scabies$^{16}$

Is a pruritic skin disease caused by mite Sarcoptes scabiei hominis. Around 300 million cases are reported yearly worldwide. The female mite produces intraepidermal tunnels, which appear as serpiginous, greyish, threadlike elevations in the superficial epidermis. Burrows are located in spaces between the fingers, elbows, axillae, belt line, feet, scrotum, and areolae. The appearance may be nodular or crusted, and it can cause many secondary infections and lesions. It is diagnosed by clinical examination and microscopy. The treatment includes scabidical agents like permethrin or lindane.
5. Review
This is a wakeup call for all of us, on an individual level, to help and donate, as much we can, as diseases don’t know positions or borders and any refugee can be the carrier to our child! As well this shows another dark page of war, which happens usually in the background. It shows a total political and humanistic failure of solving a problem. As well it shows the failure of international governments and societies which are even supporting this war by weapons and making a business out of it. That’s reality… diagnosing is the first step for a correct treatment.

6. References (used between the 10th and 19th of April 2015)
3. http://www.motherjones.com/files/imagecache/node-gallery-display/photoessays/03-wounded-man-boy_0.jpg
12. http://sdu-syria.org/%D8%A7%D9%84%D9%85%D9%88%D8%AA-%D8%A7%D9%84%D8%A3%D8%B3%D9%88%D8%AF-%D9%85%D8%B1%D8%B6-%D8%A7%D9%84%D8%B7%D8%A7%D8%B9%D9%88%D9%86-%D8%A7%D9%84%D8%B1%D8%A6%D9%88%D9%8A-%D9%8A%D9%87%D8%AF%D8%AF/ (Arabic article by a democratic Syrian movement)