



The Multi-Epidemics in Yemen: the Ugly Face of the War

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Abstract

Background: The current war in Yemen resulting a world's worst humanitarian crisis, the conflict has resulted in over 10,000 deaths and two million people displaced. The other face of the war is occurrence a lot of epidemics in a country that has a catastrophic indicator of malnutrition. The aim of this paper is to highlight on the epidemiological aspects of the current war in Yemen.

Methods: Review the literature that either extracted from PubMed, Google search or the available local and international reports related to epidemics in Yemen.

Results: A total of 1,145,491 suspected cholera cases were reported during the period from 27 April 2017 to 19 August 2018 with 2379 deaths and attack rate (AR) of 402/10,000. A total of 2,203 probable diphtheria cases and 116 deaths were reported from 20 governorates during the period from 13 August 2017 to 19 August 2018 giving the CFR% of 5.3% and AR of 0.8/10,000. A sharp decline in coverage of measles and rubella vaccination to around 54% coverage nationally by late 2015 resulting that four measles outbreaks have been declared since the beginning of 2016. During the year 2017 a local meningitis outbreak hit 6 governorates in Yemen resulting 2854 suspected cases and 60 deaths (CFR% was 2.1%). The trend of dengue cases was increased in 2016 than 2015; the AR in 2016 and 2017 is increasing. The incidence of the total reported malaria cases (confirmed and clinical) was increased from 5/1000 population in 2015 to 8.1/1000 population in 2016.

Conclusion: From Humanitarian perspective the war in Yemen has another ugly face represented in the victims of epidemics of cholera, diphtheria, measles, meningitis, dengue and malaria. Malnutrition, inability of health system to achieve universal vaccination coverage, inadequate safe water supply and poor sanitation are main determinants of poor health.

Keywords: Epidemics; Yemen; Humanitarian crises

Introduction

Yemen currently has the greatest level of humanitarian needs in the world. Since armed conflict erupted in March 2015. The war in Yemen is now the world's worst humanitarian crisis, the conflict has resulted in over 10,000 deaths and two million people displaced, looking for shelter from disease and violence. Yemenis are struggling to survive as fuel, food and medical supplies are critically low due to the closure of land, sea and air routes [1]. This crisis has a negative impact on household income; the Yemen indicators of gross national income (GNI) were reduced by 33% from 2014 to 2016: The GNI for Yemen was reduced from 40.6 billion US\$ in 2014 to 36, 38 Billion \$ in 2015 to 27, 16 billion \$ in 2016 [2]. The GNI per capita was reduced from 1,040 \$ in 2016 to around 485 \$ by end of 2017 which mean that Households in Yemen –at least- lost 47% of income during 2015-2017. Yemen is among 47 countries in the world is considered by United Nations as a least developed country (LDC) in 2017 [3]. Moreover; the poverty incidence may have almost doubled nationally from 34.1% in 2014 to 62% in 2016, [4] and currently it increased to 80%. The World Bank stated that: "...the economy is badly hit by the prolonged conflict, depriving millions from their livelihoods and jobs and driving poverty levels to over 80 percent".

According to the 2018 Humanitarian Needs Overview (HNO), an estimated 22.2 million people, two-third population of country, are in need of some kind of humanitarian or protection assistance, including 11.3 million who are in acute need - an increase of more than one million people since June 2017. The most severe needs are in areas of ongoing conflict or areas with large numbers of IDPs and returnees [2]. Consequently the internal displaced persons (IDPs) were increasing. Generalized violence and armed conflict constitutes' 41% of the main reason for displacement in identified IDP locations. Malnutrition, diarrheal diseases and malaria were reported in identified IDP locations as the most commonly suffered illnesses among IDPs [5]. Moreover the current food crisis has left the population increasingly vulnerable and high levels of severe acute malnutrition

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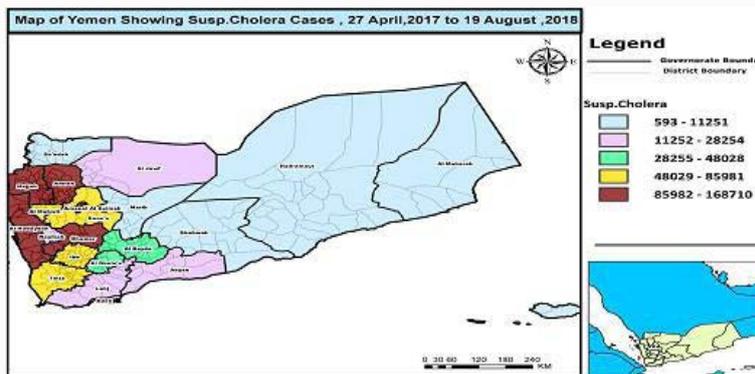


Figure 1: Distribution of cumulative suspected cholera cases in Yemen, 27 April 2017 to 19 August 2018 [10].

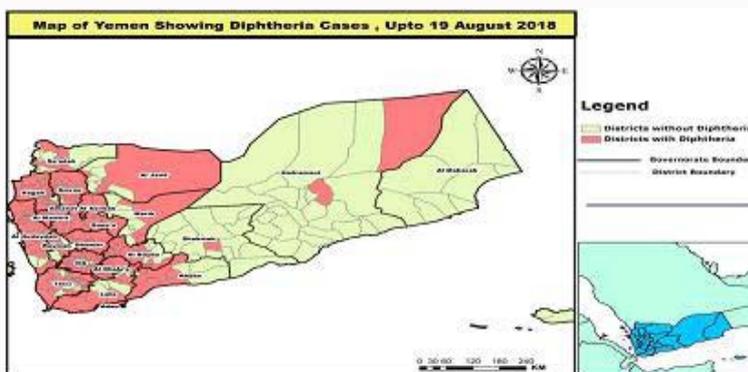


Figure 2: Geographic distribution of diphtheria cases 13 August 2017 - 19 August 2018 [10].

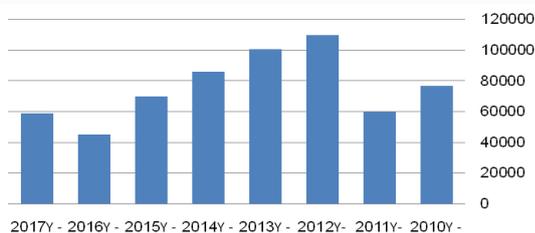


Figure 3: Annual confirmed falciparum malaria cases reported in Yemen, 2010-wk19 2017 [22].

(SAM) are occurring and anticipated to increase [5]. An estimated 400,000 children under 5 years suffer from severe acute malnutrition (SAM) in 2018 [6]. Today, the economy is near collapse, public and private services have all but disappeared, and Yemenis have lost most of their livelihoods and depleted most of their saving and 1.25 million public sector workers without pay for a year [7] 16 million people lack access to safe water [8].

This prolonged political crisis erupted millions of Yemeni's facing a triple tragedy from the spectra of famine, the world's largest ever single-year cholera and diphtheria outbreak, and conflict.

Cholera and diphtheria are the emerging epidemics in the years 2017 and 2018 among ongoing epidemics of dengue, malaria and other endemic diseases in Yemen. The aim of this paper is to highlight on the epidemiological aspects of the war in Yemen from humanitarian perspective [9,10].

Methods

The investigator reviewed all the recent literatures about

epidemics occurred in Yemen during the year 2017 and 2018 using Google search, PubMed and review the hard copies of the local and international reports and the eDEWS bulletin issued in Yemen and the technical reports issued since 2010. In this context We did a PubMed search for studies published in English using the search terms “cholera” AND (outbreak) OR Diphtheria, Or Dengue Or malaria OR meningitis OR measles. We then manually selected relevant articles on the basis of the title and by reading the abstracts.

Results

Cholera epidemic

The Yemen’s Ministry of Public Health and Population (MoPHP) confirmed a cholera outbreak in Sana'a city (The capital of Yemen) in October 2016. Subsequently, the outbreak spread to close to 165 districts in 16 Governorates by the end of December 2016. The trend of the cholera outbreak and case-fatality rate then declined during the period January to March, with the number of districts reporting suspected cholera cases dropping to 25. The decline in the epidemic curve could be partly attributed to the Health and WASH interventions. A total of 24,504 suspected cases, including 143 associated deaths (with a case-fatality rate of 0.44%) were reported by the end of March 2017.

The worst wave of cholera epidemic occurred since 27 April 2017 and continues over the entire year then decline in 2018 but still occurring [11]. Twenty two out of twenty three governorates were affected. A total of 1,145,491 suspected cholera cases during the period from 27 April 2017 to 19 August 2018 with 2379 deaths and attack rate (AR) of 402/10,000, the trends was declined from in 2018 (Table 1). Western governorates are the most affected areas in Yemen

Table 1: Cumulative cholera epidemic in Yemen April 2017 -19 August 2018.

Indicators	Apri2017-August 2018` (eDEWS)	April –December 2017`	Apri2017-August 2018
cumulative cases	1,145,491	1,016,730	↓128,761
Deaths	2,379	2236	↓143
Confirmed cases	2,150	1050	↑1,100
Case fatality rate (CFR%)	0.21%	0.22%	↓ 0.11
Attack rate	402.6/10000	367/10,000	↓ 46/10,000

`eDEWS August 2018 [10], ``eDEWS bulletin Dec 2017 [11]

Table 2: Analysis of diphtheria epidemic data, August 2017 to 19 August 2018 [10].

Indicators	13 August 2017 – 19 August 2018	April to Dec 2017	Jan -19 August 2018
cumulative cases	2,203	433	↑ 1,770
Deaths	116	43	↑ 73
Case fatality rate (CFR%)	5.30%	9.90%	↓ 4.1%
Attack rate	0.8/10,000	0.15/10,000	↑ 0.64/10,000
gover	20	18	↑ 2
districts	214	94	↑ 120

(Figure 1).

Diphtheria: a hidden epidemic

Unfortunately; diphtheria occurring in Yemen as a fatal epidemic since 13 August 2017 where WHO team in Sana’a, Yemen received reports of suspected cases of Diphtheria from Ibb governorate [12]. In 2017; a total of 433 probable diphtheria cases and 43 deaths were reported from 18 governorates giving the CFR% of 9.9% and AR of 0.15/10,000, 24% of the cases are children less than 5 years while males constituted 51% of the cases. Ibb governorate reported the highest number of cases (224 cases during 2017). The cumulative diphtheria cases reported from the period 13 August 2017 till 19 August 2018 from 20 governorates were 2,203 probable cases, and 116 deaths (CFR% 5.3%) and AR of 8/10,000. Trends of diphtheria outbreak is increasing in 2018 comparing with 2017 (Table 2), western and southern governorates were mostly affected (Figure 2). About half of the probable cases (46%) and most of the related deaths (69%) were unvaccinated by diphtheria toxoid.

Risk to measles outbreaks

A year into the protracted and increasingly bloody conflict in Yemen, a sharp decline in coverage of measles and rubella vaccination poses a substantial threat to population health. Falls to around 54% coverage nationally by late 2015 have been noted elsewhere [13].

The number of confirmed measles cases in Yemen from the beginning of 2016 until 19 December 2016 is 144, while the number of suspected measles cases is 3,417. The vaccination profile of the suspected cases show that zero dose cases were heavily distributed in Sa’ada, Al Jawf, Shabwa, Al Hudaydah and Amran governorates. 61% of measles cases received no vaccination. The affected age group is mainly children under 15 years, with a greater number below the age of five. Four measles outbreaks have been declared since the beginning of 2016 [14].

Meningitis local outbreaks but fatal one

During the year 2017 a local meningitis outbreak hit 6 governorates in Yemen resulting 2854 suspected cases and 60 deaths (CFR% was 2.1%). About 69% of cases were among children under 5 years and 60% were males. The highest proportion of cases was reported in Sana'a City (the capital of Yemen) with 1012 suspected cases and 13

Table 3: Distribution of cases, Deaths and CFR% and AR of Meningitis outbreak, 2017 [11].

Governorate	Population	Cases	Deaths	CFR%	Attack rate/10,000
Aden	992,996	184	12	6.50%	1.85
Al-Hudiedah	3,238,199	252	13	5%	0.78
Sana'a City	2,827,824	1012	13	1.30%	3.57
Dhamar	2,012,264	405	5	1.20%	2
Hajjah	2,321,741	125	7	5.60%	0.54
Ibb	2,957,138	310	8	2.60%	1.04
Taiz	2,998,300	566	2	0.30%	1.88
Total	27,696,950	2854	60	2.10%	1.03

deaths giving the CFR% to 1.3%. The highest CFR% was 6.5% (12/184) in Aden following by 5.6% (7/125) in Hajjah and 5% (13/252) in Al-Hudeidah governorates. The attack rate (AR) at national level was 1.03/10,000. Although governorates of highest attack rate like Sana city (3.57/10,000) had low CFR% (1.3%) while governorate of low attack rate like Hajjah and Al-Huideidah (0.54/10,000 and 0.78/10,000 respectively) had high CFR% (5.6% and 5% respectively) (Table 3).

Dengue frequent epidemics

Historically Yemen was endemic for dengue. Recently Yemen is affected by the increasing frequency and geographic spread of epidemic dengue, and the number of cases has risen since the major DEN-3 epidemic that occurred in the western al-Hudeidah governorate in 2005 [15] and in Hadramout in 2010 [16,17].

During the year 2017, King Selman For humanitarian and relief centre in collaboration with MOPH&P and ALAWN foundation for development (NGO in Yemen) lunch a pilot program for dengue control including surveillance and outbreak response in the most six affected governorates by dengue outbreaks (Aden, Al-Hudiedah, Taiz, Lahj, Shabwah and Hadramout). The trend of dengue cases was increased in 2016 than 2015 then decreases in 2017 but the AR in 2016 and 2017 is increasing. CFR% was reduced from 1.3% in 2015 to 0.1% in 2017 (Table 4).

Malaria Incidence in Yemen: Trends increasing after 2015

The total reported malaria cases (confirmed and presumed) was

Table 4: Distribution of suspected dengue cases, deaths and CFR% and AR for the six governorates at risk to dengue 2015-2017*.

Indicators	Year 2015	Year 2016	Year 2017
cumulative cases	8408	23117	13520
Deaths	112	78	13
Case fatality rate (CFR%)	1.30%	0.34%	0.10%
Attack rate (AR)	3/10,000	8.3/10,000	4.9/10,000

*King Selman Humanitarian and relief center & AIAWN Foundation for development [17].

198,963 cases in 2010 and 165,678 cases in 2012 then declined in 2013 to 149,451 and 104,831 in 2015 then increasing in 2016 to 144,628 cases. There has been a decrease in the clinical cases and increasing the confirmation rate; percentage of the confirmed cases (by microscopy or RDT) was increases from 53.6% in 2010 and 68.8% in 2013 to 90.5% in 2015. This may not represent a real raise in malaria burden; it is rather attributed to better access to diagnostic tools including expanded use of RDTs since 2010. The confirmation rate and testing rate of suspected cases have increased (Table 5).

The incidence of the total reported malaria cases (confirmed and clinical) was decreasing from 10.2/1000 population in 2010 to 5/1000 population in 2015 then increase in 2016 to 8.1/1000 population; however it represent about 21% reduction in malaria incidence between 2010 and 2016 [18] although downward trend in Yemen is reversed in 2016 [19]. The increasing trends of malaria since 2016 was due to the critical situation facing Yemen and reduction in funding make progress toward malaria control and elimination in Yemen challengeable. The same trends were observed for the incidence of confirmed malaria cases (Table 5).

***source:** UN/population division. World Population Prospects (2017 Revision) - United Nations population estimates and projections (available at: <http://worldpopulationreview.com/countries/yemen-population/>) accessed in 24/5/2018 [20]

****Source:** World malaria reports 2011-2017 [19].

***another source give expected incidence of 4.6/1000 for the year 2016 (the source: WHO. Eastern Mediterranean Region. Framework for health information systems and core indicators for monitoring health situation and health system performance 2017) [21,22]. So the estimated population at risk for the year 2017 may be inconclusive.

Note: the reported total confirmed a case of 2016 was extracted from the obtained incidence rate that is extracted from the above source No 3.

Discussion

Yemen is in the grip of a multi-dimensional humanitarian crisis,

currently judged to be the worst in the world [23]. Even before the armed conflict that broke out in 2015, Yemenis were suffering high levels of poverty, weak state services, a faltering economy and severe food insecurity - compounded by the political instability that followed the ‘Arab Spring’ of 2011. The current conflict, and the means by which it has been pursued, has intensified the humanitarian situation to the point where famine is a real possibility, and fatal diseases - notably cholera and diphtheria - have been allowed to spread. The health system is near collapse, health worker salaries are not being paid, and broken or inadequate water supply and sewage systems mean that access to clean water (always a challenge in Yemen) and a safe environment has been increasingly hard to ensure. Meanwhile, 8.4 million Yemenis are totally dependent on food assistance, and severe acute malnutrition is affecting over 400,000 children, rendering them vulnerable to fatal diseases.

The above mentioned description explains the determinants to the epidemics that occurred after 2015. Which can be grouped into three main reasons after insecurity and political instability; these are: socio-economic factors (Poverty), environmental (poor sanitation, inadequate of safe water supply and climatic changes) and thirdly is the health system factor (low vaccination coverage).

Response of the global community to Yemen crises is acknowledged, but it is not enough as the crises is still described as the worst world crises especially cholera and malnutrition. The crises in Yemen are of a global concern rather than a local event. It needs a global responsibility to promote health through universal health coverage and to up-grade the Yemen economy to be able to achieve the global commitments to sustainable development goals. The concept of humanitarian support need to be expanded and not separated from the political and development context. Stopping the war, rehabilitating the Yemen infrastructure and human resource development are mandatory humanitarian actions needed.

Conclusion

From Humanitarian perspective the war in Yemen has another ugly face represented in the victims of epidemics of cholera, diphtheria, measles, meningitis, dengue and malaria. Malnutrition, inability of health system to achieve universal vaccination coverage, inadequate safe water supply and poor sanitation are main determinants of poor health. From humanitarian perspective this crises is a global responsibility. Falciparum malaria is the fatal form of malaria, in Yemen trends of falciparum malaria is re-increasing after 2015 (Figure 3). The number of reported malaria attributed deaths decreased gradually since 2010 (92 deaths), in 2012 (72 deaths) and in 2013 (55 deaths) in 2015 (14 deaths) and unfortunately increased in 2016 to 63 deaths.

Table 5: Trends of malaria incidence 2010-2016.

Year	Population*	Population at risk**	Total reported malaria cases**	Incidence /1000 population	Confirmed malaria cases (microscopy and RDT)	Incidence of confirmed malaria cases/1000 population
2016	27,584,213	17,791,815	144,628	8.1	98701	5.5***
2015	26,916,207	20,899,635	104,831	5	94867	4.5
2014	26,246,000	20,350,000	122,812	6	86707	4.3
2013	25,576,000	19,000,000	149,451	7.9	102778	5.4
2012	24,910,000	15,650,000	165,678	10.6	104908	6.7
2011	24,252,000	16,260,000	142,147	8.7	90410	5.6
2010	23,606,779	19,470,000	198,963	10.2	106697	5.5

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