

Destruction of Socio-economic, Educational and Health Infrastructure including Pipelines may lead to Cholera Outbreaks in Mariupol and other Damaged Towns in Ukraine

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Abstract:

Cholera always accompanies huge displacements due to war conflicts and natural anthropogenic disasters such as volcanic eruptions, earthquakes, tsunamis, etc. The aim of this review is to assess the risk of cholera outbreaks and other waterborne public health related threats due to disrupted water pipelines and supplies due to armed conflicts in Ukraine last spring/summer.

Introduction

Disruption of water supplies due to bombing or war conflict activities or due to earthquake is commonly followed by waterborne outbreaks, e.g. cholera norovirus or Salmonella/Shigella in tropics and Campylobacter in subtropics.

Here we submit an early warning system to react quickly to cholera outbreak and other waterborne infections following armed conflicts.

Past conflicts versus waterborne outbreaks

We will omit potential use of cholera, anthrax, polio as potential biological weapons, as they currently cannot be used due to availability of vaccines and treatment available for all UN or NATO troops present in conflict areas, which led to zero outbreaks in 3 last large wars in Afghanistan, Iraq, Syria.

Table 1 shows natural disasters, armed conflicts worldwide and association with waterborne.

Fortunately, war in Bosna and Kosovo, 1995, 2000 were associated only with a small Hepatitis outbreak, however a Volcano eruption in DRC/Rwanda 1988-1992 after armed genocide in Rwanda, and a Post Earthquake in Haiti followed by civil unrests caused the largest cholera outbreak. The last huge cholera outbreak was noted in Yemen 2 years ago, 2019-2020. Threat of cholera after water supply to Mariupol and Severodonetsk Ukrainian cities area be a real threat which may affect not only civilians but also act vice versa as a natural biological weapon against occupation forces, diseases. However, we have examples in countries with good health infrastructure, highly vaccinated proportion of mi-

Table 1 Examples of waterborne outbreaks within the last 40 years

Country	Type of disaster	Type of outbreak source	Year
Bosna/Herzegovina war	Hepatitis A	well surface water	1992-1996
Rwanda (DR Congo war, volcano)	Cholera	lake Kiwou	1988, 1990, 1996
Afghanistan war	Campylobacter (sporadic)	wells	2010
Iraq, Syria war	none	none	2012-2018
Yemen war	Cholera	pipeline destruction	2016-2020
Karabakh war	none	none	2019
Kosovo war	none	none	2020
Sudan war	none	none	1970-2005
Haiti earthquake (unrests)	Cholera	UN troops, river	2012-2015
Somalia tribal conflicts	Salmonella/Shigella/Cholera		1990-2020

grants and access of WHO or UNHCR into conflict areas, where no epidemics has been noted (Kosovo, Karabakh, Syria, Iraq, 2014-2019).

Paradoxically, cholera has been imported into Haiti by UN troupes from Nepal, mis-constructing toilets next to the sources of Artibonite Rivers. However, this was an exception, and all other 10 outbreaks has been directly related by bombing, shelling and other armed activities and was affecting civil population.(1-5)

Conclusions

Fortunately, many war conflicts were not related with infectious diseases outbreaks, because they were either short, e.g. Karabakh, Kosovo, Rwanda, I); or in health infrastructure stable countries (Kosovo, Bosna, Karabakh, I); or educated and vaccinated population migrating into areas with health infrastructure (iii) e.g. Turkey, Greece, Italy (from North Africa, Iraq and Syria). However, in places with mass destruction of civilian infrastructure such as housing, pipelines, wells etc., outbreaks of cholera hepatitis A, norovirus, Salmonella/Shigella/Campylobacter may have devastating effect to remaining civilians such as to occupational armies.

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