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Common diseases after wars

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ABSTRACT: Unsound hygiene, dietary deficiencies, and battle wounds set the stage for epidemic infection, while inadequate information about disease causation greatly hampered disease prevention, diagnosis, and treatment. War causes destruction of the infrastructure and related operational mechanisms. Public health gets compromised due to limited resources. As a consequence of which disease outbreak takes place and creates public health havoc. Many vector borne and water borne diseases may scale up in a population over a short period of time if ill managed.

Key words: Diseases, infections, war

Wartime diseases have historically decreased the combat capacity of armies, led to the suppression and suspension of military activities, and wreaked devastation on both civilian and non-civilian populations. The predominant cause of sickness and mortality among soldiers and impacted civilian populations up until World War I was infectious diseases rather than battle and non-battle injuries (Smallman-Raynor and Cliff, 2004). Since the Russio-Japanese war (1904-1905) and World War I, there has been a steady drop in the prevalence of infectious diseases among troops and civilian populations, in part due to breakthroughs in weapons and advancements in military hygiene and disease control methods (Hoeffler and Melton, 1981). However, the ability of belligerents to fight was threatened during World War II by vector-borne illness (Mc Coy, 1946). Vectors such as mosquitoes, flies, mites, ticks, fleas and lice play a very important role in diseases transmission and can act as a source of infection between migrated and endemic human/ animal population. The invasion of remote ecological niches by military forces, the destruction of human and animal habitats and population shifts may encourage local conditions favourable to disease emergence and re-emergence from wildlife reservoirs (Morse, 1995). The destruction of water purification and sewage system may lead to various water borne diseases such as typhoid, paratyphoid and cholera and diseases such as schistosomiasis and fascioliasis can easily parasitize human population if deworming of war affected population has not been practised.

Historical perspective

From the war of Granada (1482-1492) to World War I (WWI), many epidemic of typhus has been recorded. One such epidemic occurred in Eastern Europe between 1917 and 1923 during WWI. However, due to methods adapted to control lice such as heating clothes to kill lice and their eggs and mandatory bathing for troops there was no such report of typhus on the western front (Bertherat *et al.,* 2005; Utzinger and Weiss, 2007). Despite a major typhus outbreak with up to 10% mortality rates in the civilian population during WWII, there were only 104 cases recorded and no deaths in the US army due to advancements in diagnostics, treatments, louse control techniques, DDT and Cox's chick embryo vaccine (Gilliam, 1946; Atenstaedt, 2007). Trench fever is another such disease that contributed massive illnesses in the British army and the allied forces during WWI and caused large-scale epidemics in Ukraine and Yugoslavia during World War II (WWII) (Bertherat *et al.,* 2005). Now-a-days it is not a major concern for soldiers due to adoption of various effective control measures but could re-emerge as a result of war (Utzinger and Weiss, 2007). Louse-borne relapsing fever is caused by the spirochaete *Borrelia recurrentis*, a human-restricted

pathogen which is transmitted by the body louse *Pediculus humanus humanus*. During WWI, a major outbreak occurred in Greek army on the oriental front. The disease was brought to Guinea by soldiers and natives of West Africa returning from Middle East, sparking an epidemic that utterly destroyed the population of the Sudan belt of tropical Africa (Sezi *et al.,* 1972; Sanchez *et al.,* 2001).

Yellow fever is an arboviral disease caused by genus Flavivirus and transmitted by Aedes mosquitoes. It was seen as the primary cause of defeat and a significant cause of mortality for the forces engaged in South America, the West Indies, and Africa. It completely decimated Napoleon's strongest expeditionary force (50000 soldiers) during the Haitian-French war from 1801to1803 (Peterson, 1995). At present, it poses no threat to forces thanks to routine immunization of soldiers before deployment in endemic regions. Immunization can also be used to control tick borne encephalitis, a viral infection caused by virus of Flaviviridae family. An expedited immunization regimen against tick-borne encephalitis was put into place for US troops stationed in Bosnia (Sanchez *et al.,* 2001). Similarly, with the introduction of highly effective and well tolerated Japanese encephalitis vaccine, Japanese Encephalitis should not be a major concern for troops stationed in endemic areas anymore.

Francisella tularensis, a zoonotic pathogen that causes tularemia, is extremely contagious and can infect people through a variety of routes, including direct contact with infected carcasses, consumption of contaminated food and water, arthropod bites, and inhalation of infectious dusts or aerosols (Sjostedt, 2007). Tularaemia transmitted by ticks is not a concern for the military, but the use of tularemia as a biological weapon is still a risk (Boui and Errami, 2007). Q-fever is a zoonotic disease caused by *Coxiella burnetti* and can be isolated from about 40 species of ticks' worldwide (Craig *et al.,* 1999). Some outbreaks have already been reported in forces on duty; however, the main source of transmission is typically human inhalation of infectious aerosols, not the vectors (Splino *et al.,* 2003). The COVID-19 pandemic is a major concern under present scenario which can easily be transmitted via aerosols among human population under confined space.

Disease outbreak in wartime: future perspective

Malaria

An estimated 125 million travellers per year and two billion residents of the 90 endemic countries are at risk of catching malaria, and about 1.5 to 2.7 million people die each year (Buck and Finnigan, 2022). Children under the age of five, expectant mothers, and disease-naive groups, such as refugees in Central and Eastern Africa, nonimmune civilian and military travellers, and immigrants going back to their country of origin, are those most at danger (Fletcher and Beeching, 2013). Cerebral malaria, severe malarial anaemia, and nephritic syndrome are the three main consequences of malaria (Buck and Finnigan, 2022). The avoidance of mosquito bites through the use of DEET skin applications, permethrin-treated clothes, and bed nets impregnated with insecticides can keep mosquitoes at bay (Lopez *et al.*, 2014).

Dengue fever

In tropical and subtropical regions of the world, Aedes mosquitoes are prevalent and spread the dengue virus. More than 100 million people are affected each year, making it the fastest spreading viral disease carried by mosquitoes worldwide (Schaefer *et al.*, 2022). Development of vaccines has been hampered by the presence of four dengue viruses that differ in their antigens (Halstead, 1988). However, at present dengue fever vaccine has been approved and is commercially available in a number of countries (East, 2016). Dengue is one of the 17 neglected tropical diseases, according to the World Health Organization. Ecological disruption is thought to have contributed to the marked spread of dengue during and after Second World War. The genesis of dengue hemorrhagic fever and the spread of various serotypes of the illness to new regions were both caused by the same dynamics (Gubler, 1998).

Yellow fever

Tropical and subtropical regions of South America and Africa are home to yellow fever which is spread

by mosquitoes. Aedes and haemagogus species of mosquitoes are the main vectors of transmission. Yellow fever epidemics have diminished due to vaccination, but the illness has reemerged in many regions of Africa and South America (Simon *et al.*, 2017). The diagnosis requires a thorough travel history and record of immunization. Persons at risk should wear appropriate protective clothes because even very brief periods of time spent outside can expose them to mosquito bites (Simon *et al.*, 2017).

Trench fever

The appearance of trench fever in Denver, Colorado, amid the COVID-19 pandemic in 2020 serves as a warning that we must continue to be prepared for both new and old threats. Trench fever historically resulted in considerable morbidity for more than 1 million soldiers during WWI and is frequently associated with people who are homeless and/or have inadequate hygiene (Okorji *et al.*, 2021). The hallmark of this disease process is fever which has somewhat comparable pattern to malaria (Okorji *et al.*, 2021).

Leishmaniasis

It is a protozoal disease spread by sandflies and observed most frequently in Europe, Africa, Asia and Latin America (Maxfield, 2018). The disease is increasingly getting brought into developed countries as travel pattern change (Maxfield, 2018). The disease may be either cutaneous or systemic. The disease is subsequently spread to the new host when the fly feeds on dogs, rodents, marsupials, or humans (Steverding, 2017).

Plague

The disease is prevalent in warmer climates especially in impoverished populations that live in shelters where they are often exposed to rats (Butler, 2009). It could result into potential bioterrorism, therefore to combat such circumstances as many as 17 vaccines are in production, but none of these are in extensive use due to their questionable efficacy (Sun and Singh, 2019).

Typhus

Global warming and excessive humidity during the rainy season produce favourable conditions for chiggers as they thrive well in hot and humid environment. Activities such as trekking or camping increase the risk of exposure of the vectors in its natural environment and thus predispose to increased risk of infection (Ranjan and Prakash, 2018).

Typhoid

Typhoid fever is directly associated with sanitation, sewage and water treatment system. It is more prevalent in temperate and tropical climates (Bhandari *et al.*, 2022). Exposure history and related activities like contact with animals, impure drinking water, insect bites, accommodations and undercooked food are of diagnostic importance. With the development of treatment methods and the production of antibiotics, the overall mortality rate today has decreased to less than 1% from 12.75% in the 1940s, when therapy was primarily symptomatic and supportive (Waddington *et al.*, 2014). However, the vaccines are only 50% to 80% effective in preventing the disease (Bhandari *et al.*, 2022). The persons at risk must continue to practice good hygiene and avoid unnecessary exposure to predisposing factors.

Cholera

Nearly 1.8 million people get their drinking water from places that may harbour cholera bacteria because they are tainted with human faeces. In the impoverished world, where requirements for water filtration and sanitation may not exist, outbreaks are known to happen (Barua, 1992). Epidemics have a history of spreading when a population is introduced to a new area at a time when hygiene and medical services has collapsed (Chatterjee *et al.*, 2018).

CONCLUSION

The lack of ample space and scarcity of food and water can have its obvious effect on our health. The same can be further compromised due to poor sewage disposal facilities which may lead to many water borne diseases, parasitic infections and vector borne diseases. Further, the respiratory secretions and excretions may aggravate the situation leading to disease outbreaks such as COVID-19. The

mosquitoes act as a vector for many viral diseases and can infect the human population during wartime. Therefore, diseases borne out of war can paralyse the health of human population as compared to the bullets and missiles. Though the intention of war is destruction but its long-term effect is not desirable as can be realised from the public health perspective.

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