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Smaller disease outbreaks around the world during covid 19 pandemic: A review article

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Abstract
The on-going COVID-19 pandemic demonstrates how small outbreak can escalate rapidly to large scale. Due to the impact of the disease, COVID-19 has steadily been under focus. However, there were outbreaks of other zoonoses occurring simultaneously throughout the year. Since, zoonoses accounts for majority of the disease outbreaks occurring time and again, it necessitates documentation of the neglected local outbreaks to prevent further spread. To summarize the disease outbreaks other than COVID-19 that occurred in the year 2020 and collate them in a useful manner. The various disease outbreak occuring across the world from 1st January to 30th November 2020 was reviewed and compiled. The disease outbreak news from the world health organisation was the source for the extraction of information. The disease outbreak information categorized into various headings like agent of the outbreak, probable time period, place, no. of cases, etc. Disease outbreak news of 18 diseases were reported in 11 months around the world. Out of those, 16 diseases were caused by viruses, one disease (plague) by bacteria and one disease (Dracunculiasis) by the parasite. Sixteen outbreaks were zoonoses. Twelve disease outbreaks occured in the African continent, five were in South America, two in Asia and North America each and one in Europe. Timely notification of outbreak and coordination between the various organizations under the One Health approach required.

Keywords: Disease outbreak, Zoonoses, outbreak

Introduction
According to the World Health Organization, a disease outbreak is the occurrence of disease cases above normal expectancy [1]. The number of cases varies according to the disease-causing agent, and the size and type of previous and existing exposure to the agent. New outbreak occurring around the world can be caused by known or unknown agents. The outbreaks may occur in a particular geographic location at frequent intervals like the Ebola virus disease in the Democratic Republic of Congo. At some instances the disease of concern in an outbreak could be new, like the mink associated SARS CoV-2 in Denmark. There are certain zoonoses that are appearing very often in the various parts of the world. Zoonoses are the "diseases and infections that are naturally transmitted between vertebrate animals and man," as defined in 1951 by the World Health Organization (WHO) Expert Committee on Zoonoses [2].

The dreadful pandemic being witnessed currently is that of the SARS Cov-2 virus which is probably transmitted from animal to human. Virus is the common agent for most disease outbreaks. Why it is so? A Virus (RNA) replicates at a fast rate. There are rapid mutations that keep occurring and because of no proofreading mechanism by the polymerase enzyme, the mutation may be harmful or beneficial for the virus. But because of the high rate, there is also a greater chance to survive and cause virulence from one species to another [3].

The highly contagious Ebola virus disease has been responsible for many deaths since its first outbreak in 1970's in the African continent [4]. But, recently the virus has extended beyond Africa to reach the United States of America in 2017 and subsequently, other nations. The first recognized Ebola outbreak occurred in 1976, near the Ebola River in Zaire (now Democratic Republic of Congo, DRC). These viruses also known as haemorrhagic fever viruses because of their clinical manifestations, leading to coagulation defects, capillary leak and shock. However, the disease is caused by the *Ebolavirus* genus virus which is now referred to as EVD. Five distinct types of Ebola viruses including Bundibugyo (BDBV), Zaire (EBOV), Reston (RESTV), Sudan (SUDV) and Tai forest Ebola viruses (TAFV) have been reported till date. The main routes of Ebola virus transmission are direct contact with a symptomatic Ebola patient's blood and body fluids (including but not limited to urine, faeces, vomitus, saliva and

sweat) through breaks in the skin or through inoculation into the mouth, nose or eyes. Human infection can also occur through contact with wild animals, such as by hunting, butchering or preparing meat from infected animals with an incubation period is typically 8–10 days (range, 2–21 days. The initial symptoms are nonspecific and can easily be mistaken for other infectious diseases. Several days after the initial presentation the haemorrhagic manifestations become the predominant clinical feature [5]. Disease outbreak is occurring more frequently due to an amalgamation of various factors like changes in the environment, deforestation, increase the contact of human and animals, etc [6]. The World Health Organization advocates One Health approach considering the need for coordination across various sectors and organisations like World Health Organisation, World Organisation for Animal Health (OIE), Food and Agriculture Organisation (FAO), etc for better health outcomes [7].

In this review, we try to highlight such outbreaks so that they are not neglected due to an ongoing pandemic. Consolidation of information regarding small outbreaks will help the local authorities to adequately plan and execute mitigating steps and corrective measures to prevent further spread causing timely containment of outbreak within its bounds by the concerned authorities.

2. Materials and Methods

The information regarding various disease outbreak occuring around the world from 1st January 2020 to 30th November 2020 excluding the COVID-19 was compiled. The database of World Health Organisation under Disease Outbreak News (DONs) was selected as the source of information for the purpose of this review. Despite availability of other sources of information regarding the outbreaks, they were not considered to minimise the repetition and authenticity of the information.

The disease outbreak information was categorized into various headings like the agent of the outbreak, probable time period, place - districts, provinces, health zone wise, country, continent, the number of probable and confirmed cases and the common symptoms of the disease. Some diseases are continuous proceeds from the previous year like the Ebola virus disease in the Democratic Republic of Congo, yellow fever in Uganda and some were novel like the SAR CoV-2 mink associated in the Denmark, Mayaro virus disease in French Guiana, France and others.

3. Results

During the period from 1st January 2020 to 30th November 2020 outbreak news regarding 18 diseases were reported around the world. Out of these 18 diseases, 16 diseases caused by a virus and one disease caused by bacteria and another one caused by a parasite. Most of the disease outbreaks were zoonotic diseases. cVDPV-2 and acute hepatitis E were the non-zoonotic diseases [8-38]. (Table.1)

3.1 Disease outbreaks according to the mode of transmission [8-38]:

Respiratory secretions: There were outbreaks of seven diseases which are transmitted by person to person by close contact or respiratory secretions i.e. EVD, MERS, Measles, H5N1, H1N2, Monkeypox virus, and mink associated SARS Cov-2. *Vector-borne:* Outbreaks of five diseases namely Yellow fever, Dengue, Chikungunya, Mayaro virus and Rift valley fever which were transmitted by mosquitoes and three diseases transmitted by flea Dracunculosis, Oropouche virus disease and rift valley fever occurred. *Faeco-oral route*: Acute hepatitis E, cVDPV-2 and 1 disease by rat urine and faeces (Plague). (Table.1)

Table 1: Collation of disease outbreaks across the World according to disease outbreak news of World Health Organization (01-01-2020 to 30-11-2020)

S.no.	Disease	Agent[£]	Mode of transmission	Time period [8-38]	No. of cases [8-38]	Area affected [8-38]	Country [8-38]	Continent [8-38]
1.	Ebola Haemorrhagic fever	Ebola virus family, Filoviridae family.	Close contact with the blood, secretions, organs or other bodily fluids of infected animals and affected person ill or dead.	01-07/1/2020	12	North Kivu, Ituri	Democratic Republic of Congo	Africa
				08/1/2020-18/2/2020	48	North Kivu		
				10/04/2020-28/04/2020	7	North Kivu		
				18-02/05/2020	3	Equateur		
				12/08/2020-01/09/2020	24	Equateur		
2.	Yellow fever	Yellow fever virus, Flavivirus genus	Aedes and Haemagogus species mosquito	04/11/2019-01/02/2020	08	Bulisa, Maracha, Moyo,	Uganda	Africa
				03-28/03/2020	02	Central Equatoria State	Republic Of South Sudan	
				03/03/2020-06/04/2020	06	Enor Ener Woreda	Ethiopia	
				14-20/04/2020	01	Oti District	Togo	
				15/04/2020	01	Nyanga Province	Gabon	
				17/07/2020	01	French Guiana	French Guiana France	South America
				01-15/11/2020	21	Delta, Enugu, Bauchi, Benue, Ebonyi	Nigeria	Africa
3.	Middle East respiratory syndrome	MERS CoV (novel coronavirus), Coronavirus family	From animals (dromedary camels) to humans not fully understand (Nasal secretions most probably). Close contact from affected	09-13/01/2020	02	Abu Dhabi	United Arab Emirates	Asia
				04/12/2019-29-01/2020	19	Assir, Riyadh, Al-Qassim, Aljouf	Saudi Arabia	

			persons.	01-31/03/2020	15	Riyadh, Makkah, Narjran, Al-Qassim		
				01/04/2020-31-05/2020	09	Riyadh, Northern, Assir		
4.	Measles	Measles virus, Paramyxovirus	Direct contact and through the air.	01/01/2020-16/02/2020	180	15 health districts	Central African Republic	Africa
				01/01/2020-02/04/2020	124	Mexico City, Mexico state, Campeche state	Mexico	North America
				27/04/2020	857	Cibitoke, Butezi, Cankuzo, South Bujumbura district	Burundi	Africa
5.	Dengue	dengue virus, flavivirus genus	Aedes aegypti (MC), Others-Albopictus, Polynesiensis, Scutellaris Mosquito	24/01/2020-07/02/2020	03	Easter Island	Chile	South America
				01/01/2020-17/02/2020	4965 (suspected)	French Guiana Guadeloupe Martinique Saint Martin Saint-Barthelemy	French Territories of The Americas	North America
				01/01/2020-07/04/2020	3533	Mayotte	Mayotte, France	Africa
6.	H5N1	Avian influenza virus subtype A(H5N1)	Close contact with infected live or dead birds, or H5N1-contaminated environments.	28/10/2020	1	Lao people's democratic republic (PDR)	Lao people's democratic republic (PDR)	Asia
7.	Chikungunya	Chikungunya ssRNA virus, Togaviridae family	Mosquito bite- most common Aedes aegypti and Aedes albopictus	01/07/2020-20/09/2020	27540 (suspected)	Abeche Biltine Abidi	Chad	Africa
8.	cVDPV-2	Type 2 component of Oral Polio vaccine	Contact with stool or contact with an infected person	09-26/08/2020	13	Red Sea West Darfur East Darfur White Nile River Nile Gezira South Darfur Gedarif	Sudan	Africa
9.	Dracunculiasis	Dracunculus Medanensis Nematode	Drinking of contaminated water with parasite-infected water fleas.	02-27/04/2020	07	Gog district	Ethiopia	Africa
10.	H1N2	Seasonal Influenza virus Influenza A(H1N2)v	Close contact with infected live or dead swine, or H1N2-contaminated environments.	22/06/2020	01	Parana	Brazil	South America
11.	Lassa fever	ssRNA Lassa virus, Arenaviridae family.	Exposure to urine or faeces of infected rats	01/01/2020-09/02/2020	472	26/36 states	Nigeria	Africa
12.	Mayaro virus disease	Mayaro virus (MAYV), Alphavirus genus, Togavirus family.	Haemagogus Mosquitoes	18/07/2020-29/09/2020	13	Cayenne	French Guiana, France	South America
13.	Monkeypox	Monkeypox virus, Orthopoxvirus genus, Poxviridae family.	Close contact with wild animals Person to person by contact	01/01/2020-13/09/2020	4594(suspected)	17/26 provinces	Democratic Republic of Congo	Africa
14.	Oropouche fever	Oropouche virus, Peribunyaviridae family.	Culicoides Paraensis Midge	30/09/2020	01	French Guiana	French Guiana, France	South America
15.	Plague	Yersinia pestis bacteria	Bite of infected vector fleas, Unprotected contact with infectious bodily fluids or fomites. Inhalation of respiratory droplets of pneumonic plague patient.	11/06/2020-05/07/2020	45	Ituri	Democratic Republic of Congo	Africa
16.	Rift Valley fever	Rift Valley fever virus, Phlebovirus genus	Bite of mosquitoes (Culex and Aedes) and fly (hematophagous), Direct or indirect contact with the blood or organs of infected animals, Ingestion of uncooked or unpasteurized milk	04/09/2020-07/11/2020	75	11/15 regions	Mauritania	Africa
17.	SARS Cov2	SARS Cov-2 mink associated Coronavirus family	Close contact with mink Human to human	01/06/2020-05/11/2020	214	North Jutland[&]	Denmark	Europe
18.	Acute Hepatitis E	Hepatitis E Virus Hepeviridae family	Faeco-oral route	08/09/2020-24/11/2020	442 (suspected)	Barsalogho	Burkina Faso	Africa

3.2 Disease outbreaks according to geographical area[8-38]:

Twelve disease outbreaks occured in the African continent, five were in South America, two in Asia and North America and one in Europe. Disease outbreaks that occured in French Guiana, France were the Yellow fever, Dengue, Mayaro virus disease and Oropouche virus disease. In the Democratic Republic of Congo outbreaks of Ebola, Monkeypox and plague were reported. In Ethiopia there were outbreaks of Yellow fever and Dracunculosis and in Nigeria outbreaks of Yellow fever and Lassa fever were reported. In various other countries outbreak of one disease was reported. (Fig.1)

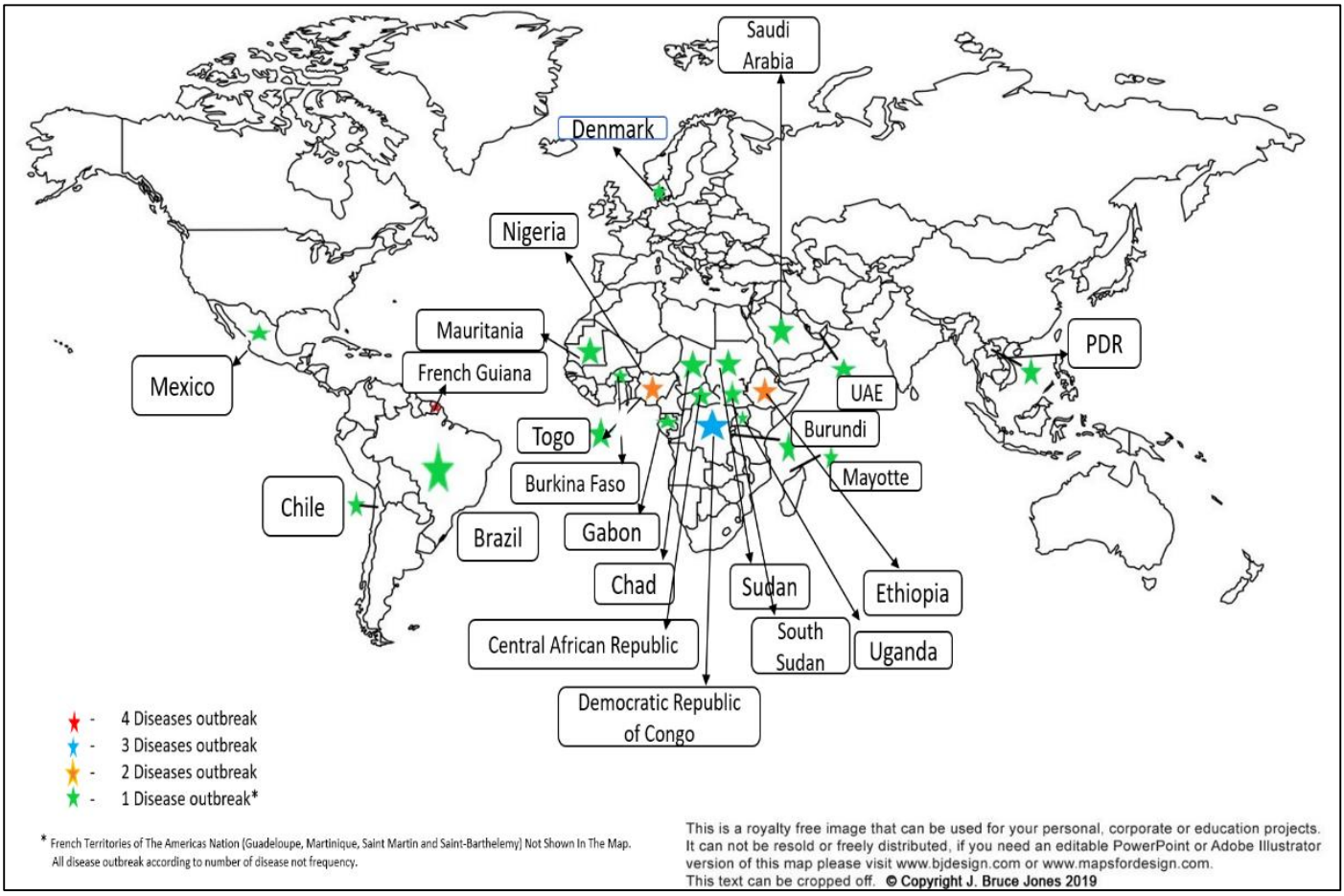

Fig 1: Map showing all disease outbreaks occurred from 01-01-2020 to 30-11-2020 according to disease outbreak news of the World Health Organization.

4. Discussion

Outbreak news regarding 18 diseases were reported worldwide during the year 2020. In most of those diseases the agent was virus and the rest two diseases were caused by bacteria and parasite. Except cVDPV-2 and acute hepatitis E, all the disease outbreaks were zoonotic diseases. Virus was the primary agent of these disease outbreaks. Most of the outbreaks were seen to be occurring in the African continent.

Zoonotic diseases comprise most of the emerging disease outbreaks seen over the years. Among the new pathogens discovered in the past few decades, the origin of the pathogen was found to be from animals in about three-fourth of them and virus is the commonly seen agent of those diseases [39]. It is known that the viruses specifically the RNA virus are notorious because of their fast replication and continuous mutation. Most of these mutations are harmless but some may help the virus circulating in the animal pool to enter and survive in humans [3]. This is a matter of concern as such agent would be novel to the health fraternity. Limited knowledge regarding the behaviour of such agent among humans and lack of preparedness to reduce transmission would militate against the control of spread of disease.

The continuous interaction and interference of human beings with the eco-system has made humanity highly vulnerable to zoonoses [6]. The effortless transport across boundaries has allowed greater interaction of humans with the eco-system and it also facilitates transmission of a disease to a wider population.Climatic changes causes a shift in environmental conditions in certain geographical locations which may lead to changing patterns of distribution of the disease [6]. With growing population the need for expansion of urbanisation and large scale food production has grown. The practice of addition of anitmicrobials during food processing, reduction of the forest cover, the trade of exotic animals further adds to the problem [6]. Stringent regulations on illegal trade of animals, continuous monitoring of the animal market and coordination between the various organisations like the World Health Organization, World Organisation of Animal Health and others is under the one Health approach. It advocates functioning of various sectors like public health, animal health, plant health and the environment in synergy to effectively detect and prevent zoonotic outbreaks [7]. Disease outbreaks have been commonly seen in African countries. The lack of infrastructure and other socio-economic inequities related to health poses a challenge to public health in the region [40]. A robust reporting system of disease is pre-requisite to take timely action to contain an outbreak. Various health organisations (WHO, Red Cross, doctors without

borders, etc.) are working in these risk-prone areas to address them. Depending on the nature of the agent and its behaviour amongs human hosts every outbreak is a potential threat to the world. So we need an organized plan to contain each and every, small or large, local or national and all outbreaks with appropriate responsibility.

Limitation: This review is based on a single source of information to avoid duplication because of which some local outbreaks might have been missed due to non-inclusion of other news sources. Also, the response measures adopted by the authorities to tackle these outbreaks has not been recorded in our study.

5. Conclusions

The disease outbreaks are frequently observed to be zoonotic in nature. Since a common eco-system is shared by both humans and animals, multiple sectors need to work as a unified force under the One Health approach to prevent outbreaks. Also, it is necessary to develop robust reporting systems to manage and respond efficiently to local outbreaks.

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