



Global Disease Outbreaks and Effects on Maternal, Newborn & Child Health in Global South, a Systematic Review

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Authors' contributions

This work was carried out in collaboration among all authors. Author OO conceived the idea and wrote the first draft. Authors TO, AKC, NLA and MG made inputs and reviewed the final draft for intellectual content. All authors read and approved the final manuscript.

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ABSTRACT

Background/Aim: The world has witnessed several disease outbreaks both in the past and in recent times. Apart from loss of lives as a result of such outbreaks, there are also disruptions in health care provision and utilization due to certain measures aimed at curtailing the spread of such outbreaks. This study aimed to seek evidence from existing literature on the effects of disease outbreaks on maternal, newborn and child health care in Global South.

Methods: A Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was used and 14 literatures met the inclusion criteria.

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Results: HIV/AIDS pandemic affected the Maternal Newborn and Child Health since increased cases of anaemia, hospital admissions, still births in HIV positive pregnant and cases of foetal anaemia reported in infants born from HIV positive pregnant women were reported. No COVID-19 pandemic related-effects on MNCH observed since no maternal deaths and transmission from infected pregnant women to their newborns reported. Indirect effects of pandemics on MNCH include reduced service delivery and demand/utilization as well as inaccessibility due to diverse reasons.

Discussion: The Government should put in place palliative measures for low-income citizens; engage and sensitize women, pregnant women and their children on available health care services and mitigation measures in place to access with minimal or no risk of being infected in a secure environment.

Keywords: Disease outbreaks; maternal; newborn and child health.

1. BACKGROUND

Disease outbreaks cause disruptions in social-economic activities, health care service delivery and utilization, life style of communities. As some of these diseases outbreaks affect several countries in the world, they declared them as pandemics by the World Health Organization (WHO): e.g. Severe Acute Respiratory Syndrome (SARS), HIV/AIDS and Coronavirus disease (COVID-19). During these pandemics, government of various countries implements preventive measures (diversion of both human and financial resources, movement restrictions) to curtail the spread of the disease and reduce the morbidity and mortality related. The implementation of these measures affects other health care provision and utilization.

According to WHO, out of the total number of deaths resulting from COVID-19 globally, only few are children and Women of Child Bearing Age (WCBA). These groups are more affected due to disruptions of health services delivery both in facility and outreach levels. The routine Maternal, Newborn & Child Health (MNCH) interventions such as immunization, vitamin A supplementation, deworming, and focused Ante-Natal Care (ANC) provided during campaigns and outreach sessions are suspended or reduced. (WHO report). Findings of studies conducted during previous outbreaks showed that the utilization of health services in facilities declined as well. Results of a study conducted during the 2014 epidemic of Ebola Virus Disease (EVD) revealed a decline in antenatal care coverage by 22 percent, coverage of family planning by 6 percent, facility delivery by 8 percent, and postnatal care (PNC) by 13 percent [1]. Qualitative studies suggest that these reductions were due to fear of contracting EVD at

health facilities, distrust of the health system, and rumors about the source of the disease [2]. In Taiwan, during the 2003 SARS epidemic, ambulatory care decreased by 23.9% and inpatient care decreased by 35.2% [3]. Simulated models of influenza pandemics also predict reductions in utilization of health services [4]. A similar situation related to disruption of health services is being observed during the current COVID-19 pandemic affecting both the provision and utilization of reproductive, maternal, newborn, and child health (RMNCH) services. It is against this background, we determine the effects of disease outbreaks on MNCH in some Global South countries.

1.1 Objective

The objective of this study is to carry out a systematic review of literature on the effects of some global disease outbreaks on maternal, newborn and child health in selected Global South countries.

1.2 PICO Framework and Question

Therefore, the formulated PICO question is as follows

How has disease outbreaks affected maternal, newborn and child health services provision and utilization in Global South countries?

2. LITERATURE REVIEW

2.1 Disease Outbreaks

A disease is an abnormal condition that has negative effects the structure or function of all or part of an organism, and that is not due to any immediate external injury. In humans, *disease* is

often used more broadly to refer to any condition that causes pain, dysfunction, distress, social problems, or death to the person afflicted, or similar problems for those in contact with the person [5]. Disease outbreak is a sudden increase in occurrences of a disease in a particular time and place. It may affect a small and localized group or impact upon thousands or millions of people across an entire continent or even globally. Outbreaks include epidemics, which is normally only used for infectious diseases, as well as diseases with an environmental origin, such as a water or foodborne disease. They may affect a region in a country or a group of countries. Pandemics on the other hand are near-global disease outbreaks when multiple countries across the world are infected [6].

2.2 Some Disease Outbreaks in Recent Past

2.2.1 Corona virus disease

The COVID-19 is an infectious disease caused by a coronavirus. WHO case definitions:

- a. A suspected case of COVID-19 is a person presenting with
 - (i) severe acute respiratory infection (history of fever and cough that requires being admitted to hospital) *and* without any aetiology that fully explains the clinical presentation *and* a travel history to or residence in areas where prevalence of COVID-19 is high during the 14 days before manifestation of symptom; or
 - (ii) any acute respiratory illness *and* at least one of the following during the 14 days before symptoms start: Contact with a confirmed or probable case of COVID-19 *or* worked in or attended a health care facility where confirmed or probable COVID-19 patients were being treated.

- b. A probable case is a person for whom testing for COVID-19 is inconclusive or who test positive using a pan-coronavirus assay and without laboratory evidence of other respiratory pathogens.
- c. A confirmed case is a person who has a laboratory confirmed COVID-19 test, irrespective of clinical signs and symptoms.

Adult male patients aged between 34 and 59 years and people with underlying conditions such as cardiovascular and cerebrovascular diseases and diabetes are at greater risk of contracting COVID-19 [7,8,9,10]. Adults aged 60 years and above and people with underlying conditions such as cardiovascular and cerebrovascular diseases and diabetes constitute the highest proportion of severe cases as well as patients with bacteria and fungi infections [8]. Few cases of COVID-19 have been reported in children under 15-year-old [7,8,9,10].

COVID-19 transmits from Person-to-person during close contact mainly through respiratory droplets produced when an infected person coughs or sneezes. A large source of transmission may also be fomites, as COVID-19 has been found to stay and survive on surfaces up to 96 hours [11] and other coronaviruses for up to 9 days [12].

2.2.2 Ebola virus disease

Ebola virus disease (EVD), one of the deadliest viral diseases, was discovered in 1976 when two consecutive outbreaks of fatal hemorrhagic fever occurred in different parts of Central Africa. The first outbreak occurred in the Democratic Republic of Congo (formerly Zaïre) in a village near the Ebola River, which gave the virus its name. The second outbreak occurred in current South Sudan, approximately 500 miles (850 km) away [1]. Since then, the

Table 1. PICO framework

PICO	Key components
Population	Women of reproductive age, newborns and children under five years of age.
Intervention	Disease outbreaks, measures to curtail and contain their spread as well as their management.
Comparison	Effects of each disease outbreak on maternal, newborn and child health compared
Outcome	Effects of disease outbreaks on maternal, newborn and child health

majority of cases and outbreaks of EVD have occurred in Africa. The 2014- 2016 Ebola outbreak in West Africa began in a rural setting of southeastern Guinea, spread to urban areas and across borders within weeks, and became a global epidemic within months.

2.2.3 Human Immuno Virus/ Acquired Immuno Deficiency Syndrome (HIV/AIDS)

AIDS is the result after several years of infection with HIV. The disease was first detected in 1981 and the name AIDS was coined in the next year. It is transmitted through unprotected sexual intercourse with an infected person, mother to child during delivery and breastfeeding, sharing of sharp objects that have been contaminated with the virus. New HIV infections have been reduced by 17% over the past eight years. Since 2001, when the United Nations Declaration of Commitment on HIV/AIDS was signed, the number of new infections in sub-Saharan Africa is about 400,000 (15%) lower than 2008. The HIV incidence has declined by 25% in East Asia, and 10% in South and South East Asia during the same time period [7].

2.3 Maternal, Newborn and Child Health

Maternal health refers to the health of women during pregnancy, childbirth, and the postpartum period. It covers the health care dimensions of family planning, preconception, prenatal, antenatal and postnatal care in order to ensure a positive and fulfilling experience, in most cases, and reduce maternal morbidity and mortality, in other cases (WHO). Maternal health revolves around the health and wellness of women, particularly when they are pregnant, at the time they give birth, and during child-raising. Newborn and child health on the other hand refers to medical care such as cord care immediately after delivery, administration of antigens and vaccines, growth monitoring, nutritional screening, vitamin A supplementation, deworming and treatment of childhood illnesses given to newborn babies and children under the ages of five in order to keep them healthy and alive.

3. METHODOLOGY

3.1 Keyword Generation

Keywords are words or phrases that describe in a very good way the study topic. Databases relevant to the study topic were allocated by

using the following search terms: COVID-19 and its effect on maternal, newborn and child health in Global South, how has these outbreaks affected maternal, newborn and child health in global south The keywords used in the search were extracted from the study topic words.

3.2 Search Strategy

The keywords were used to search for relevant literature on web of science, Medline and NCBI (PubMed). The journal articles and other grey literatures like government newspaper reports were retrieved. A total of 38 literatures were retrieved. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was conducted on the retrieved literatures and only 14 (7 journal articles and 7 reports) were considered for the study.

3.3 Inclusion Criteria

Literatures were considered for review if they were; written in English, specific on how disease outbreaks has already affected directly or indirectly maternal, newborn or child health in any of the countries in Global South.

3.4 Exclusion Criteria

Excluded literatures were those that only discussed how disease outbreaks will affect maternal, newborn or child health but not how it has already affected it. Excluded literatures were also those whose context was not in Global South.

4. FINDINGS

Prior to the lockdown measure due to COVID-19 in South Africa, 6,194 visits to child health services in all 11 clinics of rural Kwa-Zulu Natal were recorded. Immediately after the lockdown, child health visits for immunization and growth monitoring decreased by over 50% [13]. The decrease in health seeking behavior could be attributed to the movement restrictions and fear of contacting the virus at health facilities.

Before the COVID-19 pandemic, Child.org's Pregnant Women's Groups (a Non-Governmental Organization initiative) has been helping expectant mothers in rural Kenya by equipping them with all necessary information and resources they need to keep themselves and their babies safe and healthy. These activities have stopped in the COVID-19 context as it was

not sensible to gather people in groups. As the results, the organization-Child.org lost between 50-80% of their income as the main sources were from UK and Europe festivals which ceased. Results of a survey conducted amongst the expectant mothers revealed that most of them are not going to health facilities to access care due to fear of infection. It was also reported that in-hospital delivery rates have reduced by over 50%, while immunization clinics are down by over two-thirds [14].

According to Walton Beckley, UNICEF Nutrition Head in Sokoto, the COVID-19 pandemic has led to an increase in cases of malnourished children reported in Community Management of Acute Malnutrition (CMAM) sites in Sokoto and Zamfara States of Nigeria. This could be attributed to the loss of livelihoods by families leading to loss of income. The lockdown and restriction of movement has negatively affected many businesses. People have been made unemployed or without access to their normal livelihoods [15].

In Nigeria, the first confirmed case of COVID-19 was recorded on 27th February. Immediately,

several preventive measures were put in place to curtail the spread of the virus such as the lockdown of the country in late March when the virus had started spreading geometrically. This study presents selected maternal and childhood indicators for period before the pandemic (first and second quarters of 2019) and during the pandemic (first and second quarters of 2020) for comparison of service utilization.

Tables 2 and 3 summarizes service utilization for all selected maternal and child health indicators declined during the pandemic (Quarter 1 & Quarter 2, 2020) as compared to similar periods of previous year (Quarter 1 & Quarter 2, 2019). The monthly average service uptake for antenatal total attendance declined by 54,478 and 160,766 for quarters 1 & 2 respectively. For post-natal total visits, monthly average utilization declined by 23,054 and 26,269 for quarters 1 & 2 respectively. Monthly average institutional deliveries declined by 10,267 and 10,235 for first and second quarters respectively. Average number of children under the age one given penta vaccine monthly declined by 40,690 and 223,876 for first and second quarters respectively.

Table 2. Selected maternal and child health service utilization data before and during COVID-19 pandemic in Nigeria

ng Federal Government								
dataname	Q1 2019	Q1 2020	Q1 2019 Average	Q1 2020 Average	Q2 2019	Q2 2020	Q2 2019 Average	Q2 2020 Average
Antenatal total attendance	3772805	3609372	1257602	1203124	3322491	2840194	1107497	946731
Post Natal Visit Total	640656	571495	213552	190498	567108	488301	189036	162767
Facility deliveries	661067	630265	220356	210088	626923	596219	208974	198740
Pentavalent Vaccine 1 given	1836857	1777020	612286	592340	1843024	1614235	614341	538078
Pentavalent Vaccine 2 given	1580571	1545993	526857	515331	1578690	1360180	526230	453393
Pentavalent Vaccine 3 given	1710665	1683011	570222	561004	1698073	1473744	566024	491248
Source: dhis2nigeria								

Table 3. Number of decline in monthly average service utilization of selected maternal and child health indicators during COVID-19 pandemic in Nigeria (2020 quarters 1&2) as compared to same period of previous year

Selected Maternal & Child health indicators	Quarter 1	Quarter 2
Antenatal total attendance	54478	160766
Post Natal Visit Total	23054	26269
Facility deliveries	10267	10235
Pentavalent Vaccine 1 given	19946	76263
Pentavalent Vaccine 2 given	11526	72837
Pentavalent Vaccine 3 given	9218	74776

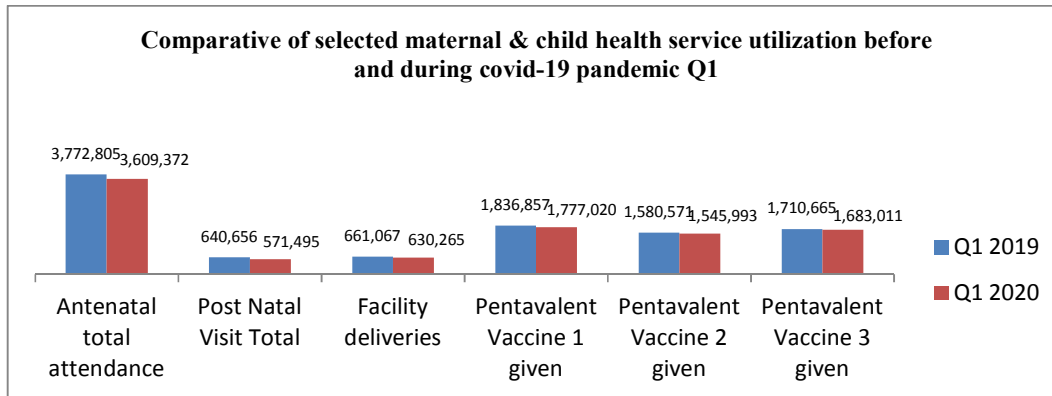


Fig. 1. Comparative of selected maternal & child health service utilization before and during COVID-19 pandemic Q1

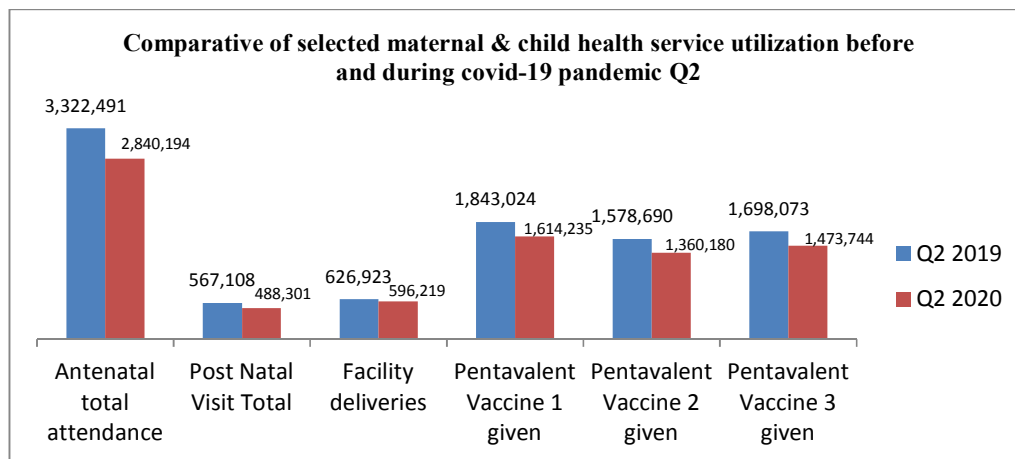


Fig. 2. Comparative of selected maternal & child-health service utilization before and during COVID-19 pandemic Q2

In Chad, Ethiopia, Nigeria and South Sudan, some child health interventions are already disrupted because of the COVID-19 pandemic. The disruptions in measles vaccination programmes in the aforementioned countries have left over 20 million children unprotected. Gavi, the vaccine alliance, has postponed 14 vaccination programmes against polio, measles, cholera, human papillomavirus, yellow fever and meningitis, which would have covered over 13 million children. The WHO has also made the decision to redirect resources meant for the vaccination of 12 million children in sub-Saharan Africa against polio to COVID-19. The WHO further warned that deaths caused by malaria could increase to more than 700,000 in sub-Saharan Africa in 2020 if prevention and treatment programmes are disrupted by COVID-19. As the Bill & Melinda Gates Foundation has pledged to shift almost its entire organization to

focus on COVID-19, their programmes on HIV, malaria and polio eradication, will suffer great setback [16].

In Ghana, the Tamale Teaching Hospital (TTH) weekly specialist outpatient clinic where an average of 40 high risk neonates including babies born preterm, hypoxic ischemic encephalopathy, severe jaundice and congenital anomalies are reviewed has been suspended. This is in the wake of the COVID-19 pandemic to ensure physical distancing. This measure has also restricted entry to only a limited number of mothers at a time to breastfeed or send expressed breast milk thereby limiting the number of children breastfed during the period [17].

In the Gambia, low immunization coverage is being witnessed as a result of information

dissemination on coronavirus vaccine that is being developed in the west and will be tested on Africans. This influenced mothers to stay at home with their infants [18]. *“Personally, my husband decided that I should not go to the facility to receive any vaccinations when he heard this information. We were scared to get our 2 year-old-child vaccinated because we took the information seriously,”* Mariama Bah, a mother of five tells The Chronicle [18]. Amie Sanneh has also skipped her appointment at the health facility. *“For me, it is not just about the vaccination fear. It’s also about practising social distancing. Ordinarily, there are many people who visit hospitals. It won’t be safe to be interacting with different people,”* she said [18].

In Uganda, the curfew imposed has limited the ability of women to travel and access maternal health services and/or child health care services for their children. White Ribbon Alliance Uganda has documented at least one instance of maternal and newborn death as a result of the lockdown. The government of Uganda has banned transportation, including private transport to health facilities, which is the primary means for women to reach health facilities for maternal health care services [19].

According to two UN agencies, the United Nations International Children's Emergency Fund (UNICEF) and the WHO, more than 250,000 Libyan children under one year of age are at risk from vaccine-preventable diseases as the country faces critical shortages in vaccine supplies in Libya, as the novel coronavirus pandemic has disrupted health care services and health care commodity supplies. According to the agencies, there are acute shortages of hexavalent vaccine, which protects against six diseases (diphtheria, tetanus, pertussis, poliomyelitis, Haemophilus influenzae type b and viral hepatitis B). Similarly, oral polio vaccine, which is administered at birth and at nine months of age, is in critically short supply [20].

In China, a study on the effect of COVID-19 on Pregnant Women, their Newborn Infants, and Maternal-Fetal transmission showed that COVID-19 did not lead to maternal deaths and there was no evidence of transmission from infected pregnant women to their fetuses [21,22].

In Mozambique, HIV infected women were more likely to have anaemia both at the first antenatal care visit and at delivery than HIV-uninfected women (71.5% versus 54.8% and 49.4% versus

40.6%, respectively, $p < 0.001$). Incidence of hospital admissions during pregnancy was increased among HIV-infected women. The risk of stillbirths was found to be twice in HIV-infected women (RR, 2.16 [95%CI 1.17; 3.96], $p = 0.013$). Foetal anaemia was also more among infants born to HIV-infected women (10.6% versus 7.3%, $p = 0.022$) [23].

In Haiti, a study showed that maternal HIV illness has negative effect on children’s well-being and health; this is because the mothers lack physical strength to take care of their children, there is also difficulty in providing food for the children thereby being prone to malnutrition. The children from HIV positive mothers though were reported to be HIV negative but were distressed by HIV-related stigma [24].

In Guinea, maternal health indicators declined during the Ebola pandemic compared to the months before the Ebola virus disease outbreak. Before the pandemic, a monthly average increase of 61 (95% CI 38–84) institutional deliveries to 119 (95% CI 79–158) women achieving at least three antenatal care visits were recorded. These increasing trends were reversed during the epidemic: fewer institutional deliveries occurred (–240, 95% CI –293 to –187), and fewer women achieved at least one antenatal care visit (–418, 95% CI –535 to –300) or at least three antenatal care visits (–363, 95% CI –485 to –242) per month ($p < 0.0001$ for all). Similarly, the increasing trend in child vaccination completion a time before the outbreak was followed by significant and immediate reductions across most vaccine types. Before the outbreak, the number of children younger than 12 months who had completed each vaccination ranged from 5752 (95% CI 2821–8682) for tuberculosis to 8043 (95% CI 7621–8464) for yellow fever. Immediately after the outbreak, significant reductions occurred in the level of all vaccinations except for yellow fever for which the reduction was marginal. The greatest reductions were noted for polio and tuberculosis at –3594 (95% CI –4811 to –2377; $p < 0.0001$) and –3048 (95% CI –5879 to –216; $p = 0.0362$) fewer vaccines administered, respectively. Compared with pre-Ebola virus disease outbreak trends, significant decreases occurred for all vaccines except polio, with the trend of monthly decreases in the number of children vaccinated ranging from –419 (95% CI –683 to –155; $p = 0.0034$) fewer for BCG to –313 (95% CI –446 to –179; $p < 0.0001$) fewer for pentavalent during the outbreak [25].

Table 4. Summary of literature included in the study

Author(s)/Year	Study/Report	Country	Results/Findings
Siedner, et al. 2020	Access to primary healthcare during lockdown measures for COVID19 in rural South Africa: a longitudinal cohort study	South Africa	Child health care visits declined by more than 50% immediately after the lockdown
Global citizen interview with an NGO-Child.org Head of programming-Martina Gant. Reported by Rodrigveu, L on 15 th April, 2020	Pregnant Women in Rural Kenya Are Struggling to Access Health Care Amid COVID-19	Kenya	Though there was no full lockdown, pregnant women were scared to visit facilities to access care for fear of being infected. This led to over 50% decline in rate of hospital delivery and over two-thirds of immunization clinics were down
Schwartz (2020)	An Analysis of 38 Pregnant Women with COVID-19, Their Newborn Infants, and Maternal-Fetal Transmission of SARS-CoV-2: Maternal Coronavirus Infections and Pregnancy Outcomes	China	COVID-19 did not lead to maternal deaths and there was no evidence of COVID-19 transmission from infected pregnant women to their foetuses.
Chen et al. (2020)	Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records.	China	COVID-19 did not lead to maternal deaths and there was no evidence of COVID-19 transmission from infected pregnant women to their foetuses.
Report in The Guardian newspaper of 19 th April 2020 written by Franka Osakwe	Malnutrition amidst COVID-19: Thousands of children severely affected in Sokoto and Zamfara States	Nigeria	Increase in the number of malnourished children
Health Action International (HAI) report on 8 th May 2020 by Gaby Ooms	COVID-19 And Its Far-Reaching Health Impacts in Sub-Saharan Africa	Chad, Ethiopia, Nigeria, & South Sudan	Disruption in measles vaccination programme leaving over 20 million children unprotected
Alhassan, et al. 2020	Maintaining quality newborn care in Ghana amid the COVID-19 pandemic	Ghana	Suspension of neonatal Intensive Care Unit (NICU) in Tamale Teaching Hospital (TTH), one of the largest facility in the country for NICU
Report by Kebba Jeffang in the Chronicle newspaper of 6 th May 2020	In Gambia, Mothers Keep Children from Immunization Due to COVID-19 Vaccine Fear	The Gambia	Low immunization turnout at health facilities due to fear of rumored COVID-19 vaccine
The White Ribon Alliance Report of June 8 th 2020 by Elena Ateva	COVID-19 curfew restrictions impact Reproductive, Maternal and Newborn Health and Rights worldwide	Uganda	Blocked access to maternal, newborn and child health care and at least one instance of maternal and newborn death was reported

Author(s)/Year	Study/Report	Country	Results/Findings
Anadolu Agency Report of 19 th May 2020 by Erdogan Cagatay Zontur	Children less than 1 vulnerable as Libya faces critical shortages in vaccine supplies	Libya	access to routine immunization services has been disrupted as a result of shortages in vaccine supply
Gonza ́lez, et al. 2017	Effects of HIV infection on maternal and neonatal health in southern Mozambique	Mozambique	HIV positive pregnant women had more cases of; anaemia, hospital admissions and stillbirths. More cases of foetal anaemia was recorded among infants born to HIV-infected women
Donaldson, et al. 2015	Maternal HIV illness and its impact on children well-being and development in Haiti	Haiti	Lack of mothers' physical strength to take care of their children, and their difficulties in providing housing and food for their children. Although their children were HIV-negative, they were distressed by HIV-related stigma that they and their mothers experienced
Delamou, et al. 2017	Effect of Ebola virus disease on maternal and child health services in Guinea	Guinea	Decline in ANC visits, facility delivery and childhood immunization
Shannon, et al. 2017	Effects of the 2014 Ebola outbreak on antenatal care and delivery outcomes in Liberia	Liberia	Access to ANC declined by 50% and facility deliveries fell by one third during the outbreak

During the Ebola outbreak in Liberia, ANC attendance declined by 50% and reported facility deliveries fell by one third, also deliveries by skilled attendants and Caesarian section declined by 32% and 60% respectively [26]. The decline in skilled attendants and Caesarian section could probably be as a result of skilled personnel's involvement in the management of the pandemic [13].

5. DISCUSSION OF FINDINGS

Disease outbreaks causes decline in maternal and child health services utilization as revealed from the reviewed literatures. In Chad, the Gambia, Ethiopia, Libya and Nigeria, immunization programs were disrupted due to COVID-19 outbreak. EVD outbreak in Guinea also led to the decline of immunization coverage leaving millions of children prone to vaccine preventable deaths. This could lead to high mortality rate for children during outbreaks which may not be as a result of the disease outbreaks. Same can be said of maternal health as these outbreaks caused decline in ANC, health facility delivery and PNC service uptake. As a result, maternal deaths may increase during such outbreaks. For regions with high prevalence of HIV/AIDS, ratio of children in the population will decrease as many cases of stillbirths are recorded. Such regions will also have in the long-run a population with many anaemia patients.

6. CONCLUSION

Based on the literatures reviewed, it is concluded that disease outbreaks have either direct or indirect effects on maternal, newborn and child health. The only outbreak that was found to have direct effect on maternal, newborn and child health was the HIV/AIDS pandemic where HIV positive pregnant women had more cases of anaemia, hospital admissions and stillbirths and more cases of foetal anaemia was recorded among infants born to HIV-infected women. COVID-19 and Ebola virus disease (EVD) on the other hand had no direct effect on maternal, newborn and child health as they did not lead to maternal death and there were no evidence of transmission from infected pregnant women to their newborn infants. The occurrence of all outbreaks had indirect effects on pregnant women, newborn infants and children. These indirect effects include limited access to health care as a result of movement restrictions and diversion of resources and efforts to management of such pandemics, increase in the

number of malnourished children as a result of poor economies of low-income families, shortages in supply of health commodities and vaccines due to travel bans, low service utilization due to fear of being infected by the disease at service points and other false information about such pandemics especially in African countries.

7. RECOMMENDATIONS

- Government agencies should sensitize citizens through text messages and TV shows to encourage utilization of maternal, newborn and child health care services even in the face of the pandemic.
- Health facilities and service provision points should adopts measures to provide services with minimal or no risk of spreading infection.
- Rather than suspend maternal, newborn and child health interventions and focus only on management of disease outbreaks when they occur, Government, local and international agencies should make the two run concurrently.
- Palliatives should be given to low-income families to cushion the effect of economic crash as a result of lockdown and movement restriction measures during pandemics.
- During curfews and lockdowns, pregnant women and caregivers of newborns and children should be issued permits exempting them from such orders.
- Training and equipping families to carry out newborn care process.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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