

ORIGINAL RESEARCH ARTICLE

Early indirect impact of COVID-19 pandemic on utilisation and outcomes of reproductive, maternal, newborn, child and adolescent health services in Kenya: A cross-sectional study

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Abstract

The paper determined the initial impact of COVID-19 pandemic on reproductive, maternal, newborn, child and adolescent health (RMNCAH) services in Kenya. Hospital data for the first four months (March-June 2020) of the pandemic and the equivalent period in 2019 were compared using two-sample test of proportions. Despite the global projections for worse indicators, there were no differences in monthly mean (\pm SD) attendance between March-June 2019 vs 2020 for antenatal care (400,191.2 \pm 12,700.0 vs 384,697.3 \pm 20,838.6), hospital births (98,713.0 \pm 4,117.0 vs 99,634.5 \pm 3,215.5), family planning attendance (431,930.5 \pm 19,059.9 vs 448,168.3 \pm 31,559.8), post-abortion care (3,206.5 \pm 111.7 vs 448,168.3 \pm 31,559.8) and pentavalent 1 immunisation (114,701.0 \pm 3,701.1 vs 110,915.8 \pm 7,209.4), $p > 0.05$. However, there were significant increases in FP utilisation among young people (25.7% to 27.0%), injectable (short-term) FP method uptake (58.2% to 62.3%), caesarean section rate (14.6% to 15.8%), adolescent maternal deaths (6.2% to 10.9%) and fresh stillbirths (0.9% to 1.0%) with a reduction in implants (long-term) uptake (16.5% to 13.0%) ($p < 0.05$). With uncertainty around the duration of the pandemic, strategies to mitigate against catastrophic indirect maternal health outcomes are urgently needed. (*Afr J Reprod Health* 2021; 25[6]: xx-xx).

Keywords: COVID-19, maternal and newborn health, family planning, adolescent pregnancy, maternal and perinatal mortality, Kenya

Résumé

Le document a déterminé l'impact initial de la pandémie de COVID-19 sur les services de santé reproductive, maternelle, néonatale, infantile et adolescente (RMNCAH) au Kenya. Les données hospitalières pour les quatre premiers mois (mars-juin 2020) de la pandémie et la période équivalente en 2019 ont été comparées à l'aide d'un test de proportions à deux échantillons. Malgré les projections mondiales pour les pires indicateurs, il n'y avait aucune différence dans la fréquentation mensuelle moyenne (\pm écart-type) entre mars-juin 2019 et 2020 pour les soins prénatals (400 191,2 \pm 12 700,0 contre 384 697,3 \pm 20 838,6), les accouchements à l'hôpital (98 713,0 \pm 4 117,0 contre 99 634,5 \pm 3 215,5), participation à la planification familiale (431 930,5 \pm 19 059,9 vs 448 168,3 \pm 31 559,8), soins post-avortement (3 206,5 \pm 111,7 vs 448 168,3 \pm 31 559,8) et vaccination pentavalente 1 (114 701,0 \pm 3 701,1 vs 110 915,8 \pm 7 209,4), $p > 0,05$. Cependant, il y a eu des augmentations significatives de l'utilisation de la PF chez les jeunes (25,7% à 27,0%), l'adoption de la méthode de PF injectable (à court terme) (58,2% à 62,3%), le taux de césarienne (14,6% à 15,8%), les adolescentes maternelles décès (6,2 % à 10,9 %) et mortinaissances fraîches (0,9 % à 1,0 %) avec une réduction du recours aux implants (à long terme) (16,5 % à 13,0 %) ($p < 0,05$). Avec l'incertitude entourant la durée de la pandémie, des stratégies pour atténuer les effets catastrophiques indirects sur la santé maternelle sont nécessaires de toute urgence. (*Afr J Reprod Health* 2021; 25[6]: xx-xx).

Mots-clés: COVID-19, santé maternelle et néonatale, planification familiale, grossesse chez les adolescentes, mortalité maternelle et périnatale, Kenya

Introduction

On March 11, 2020, the World Health Organization (WHO) declared COVID-19 disease caused by the novel coronavirus (SARS-CoV-2) a global pandemic¹. Globally, 10,185,374 cases of COVID-

19 were confirmed and 503,862 deaths translating to a 4.95 percent case fatality rate were reported as at June 30, 2020². As at the stated time, Africa regions had reported the lowest number of confirmed cases, case fatality and deaths – 297 290 cases, 2.02% and 6 010 deaths respectively². Cases

continue to increase and in Asia and Europe, a second wave is beginning to emerge³⁻⁵. Health systems are expected to adapt to maintain the routine essential health services in addition to managing an increasing COVID-19 case-load.

Public health emergencies have shown that the impact of an epidemic on reproductive, maternal and newborn health, domestic and gender-based violence and mental health often goes unrecognized, because the effects are often not the direct result of the infection, but instead the indirect consequences of strained health care systems, disruptions in care and redirected resources⁶⁻⁸. As noted by the World Health Organization (WHO), “People, efforts, and medical supplies all shift to respond to the emergency. This often leads to the neglect of basic and regular essential health services. People with health problems unrelated to the epidemic find it harder to get access to health care services⁹.” To avert indirect morbidity and mortality when services are disrupted, WHO developed and updated guidelines to support country preparedness and response plan¹⁰. These included prioritization and continuation of context-relevant essential health services during the acute phase of the COVID-19 pandemic and community-based health care, including outreach and campaigns, in the context of the COVID-19 pandemic at the end of June 2020^{11,12}. Among the high-priority categories of essential health services by WHO included - essential prevention and treatment services for communicable diseases, including immunizations; services related to reproductive health, including during pregnancy and childbirth; and provision of medications, supplies and support from health care workers for the ongoing management of chronic diseases, including mental health conditions⁶.

Governments around the world have had to quickly adapt and respond to curb transmission of the virus and to provide care for the many who have been infected. National mandates to contain the pandemic, such as complete or total lockdowns, curfews, and temporal closure of non-essential services (elective surgery, cancer treatment etc), the resultant economic slowdowns have adverse effects on accessing, utilising and provision of RMNCAH services especially for low and middle income countries⁶. Evidence from the 2014 outbreak of Ebola virus in west Africa showed that the indirect effects of the outbreak were more severe than the

outbreak itself¹³. In Sierra Leone, maternal and newborn care service utilisation decreased due to disrupted health services and fear of seeking treatment during the outbreak related to fear of contracting Ebola virus at health facilities, distrust of the health system, and rumours about the source of the disease¹⁴. There were reductions in antenatal care coverage by 22 percent, family planning (6 percent), facility births (8 percent), and postnatal care (13 percent)¹⁵ contributing to an estimated 3,600 maternal deaths, neonatal deaths and stillbirths—almost similar to the deaths (about 4,000) directly caused by the Ebola virus in the country¹⁵. Elsewhere, there were sharp reduction in contraceptive use and family planning visits in Guinea, Liberia and Sierra Leone due to the Ebola outbreak^{16,17}. As a result, policy makers must consider not only the immediate health effects of the pandemic but also the indirect effects of the pandemic and rapidly develop strategies to mitigate these.

Statistical models in the early phases of the COVID-19 pandemic predicted a reduction in the overall utilisation of reproductive, maternal and newborn health services with related adverse mortality outcomes across the globe^{18,19}. For instance, a reduction in coverage of essential maternal health interventions by 9.8 – 51.9% would result in 8.3 – 38.6% increase in maternal deaths per month¹⁸. Consequently, a 10% decline in use of short- and long-acting reversible contraceptives would result in 48,558,000 additional women with an unmet need for modern contraceptives and 15,401,000 additional unintended pregnancies¹⁹. The objective of this study was to determine the initial impact of COVID-19 pandemic on RMNCAH services in Kenya in the first four months of the pandemic by comparing RMNCAH Kenya Health Information System (KHIS) utilisation data for 2019 and 2020.

Methods

Study design

This was a cross – sectional design comparing RMNCAH utilisation data for Kenya extracted from the national KHIS, formerly known as the district health information system version 2 (DHIS2), an open-access publicly available reporting platform managed by the Ministry of

Health (MOH). This design was used as it helps to describe the status, any changes or relationships in a phenomena over a fixed point in time²⁰. Four-month period from March to June 2020 was assessed for any trends in the utilisation of pregnancy and antenatal care, facility/skilled childbirths, family planning, post-abortion care and immunization services. This data was compared to the equivalent period in 2019, a year before the COVID-19 pandemic, to demonstrate any significant changes in the utilisation and outcomes of these services during the COVID-19 outbreak.

Study setting

Kenya is a low- and middle- income country in the sub-Saharan Africa located in the East Africa region. It is geographically divided into 47 counties/county governments. Overall, the national government is mandated with policy and guidelines development while the county governments are mandated to support the implementation of the national policies and guidelines.

Kenya reported its first COVID-19 case on March 13, 2020. The government advanced preparedness, readiness and preventive measures for COVID-19 pandemic as well as to address the emerging effects of COVID-19 on the health and economy. Key measures are summarized below and the periods of enforcement against number of cases and deaths are presented in Figure 1.

- March 2020: start of mandatory quarantine; testing of persons in quarantine; contact tracing, quarantine and testing of exposed cases; daily briefings by the MOH on the state and progress of COVID-19 since the first case; public awareness on COVID-19 through television, radio and print media (briefings and awareness communication ongoing at the time of writing).
- April 2020: start of countrywide dawn-to-dusk curfews; partial lockdowns/restrictions of movement in and out of priority high-risk counties of Nairobi, Mombasa, Kilifi, Kwale and Mandera; restrictions to social gatherings; closure of all schools and institutions of higher learning. Other measures initiated in April were handwashing facilities in all public places; use of face masks for personal protection for all citizens; restrictions to social gatherings; enforcement of social distancing at social

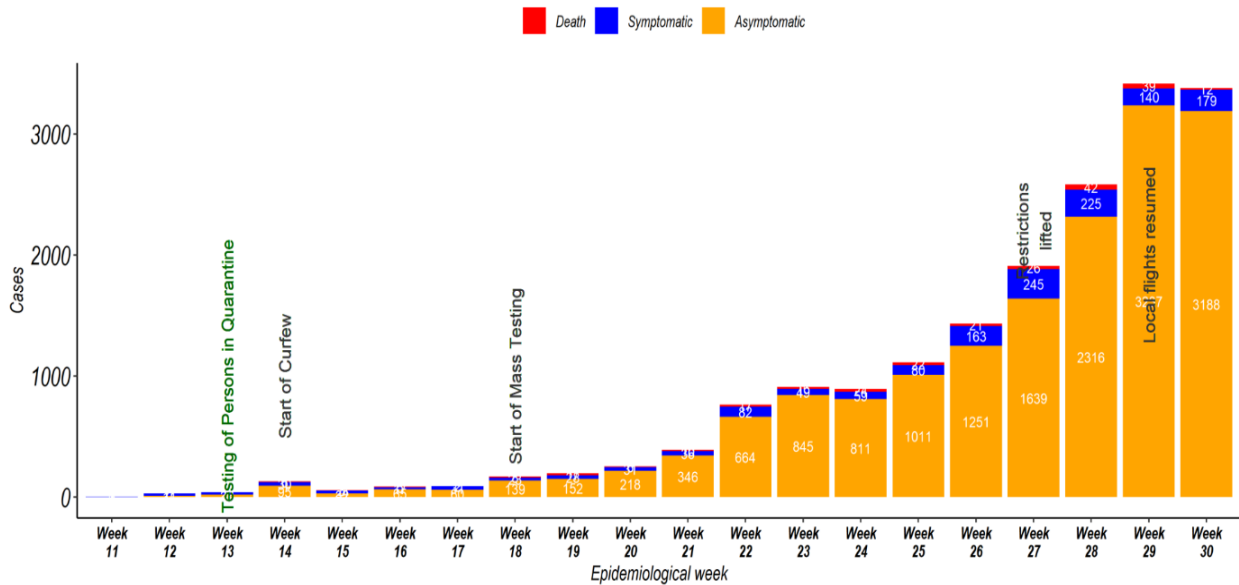
places including health care facilities; development and dissemination of COVID-19 guidelines – interim guidance on continuity of essential health services during the COVID-19 pandemic.

- May 2020: start of mass testing; development and dissemination of guidelines - Practical Guide for Continuity of Reproductive, Maternal, Newborn and Family Planning Care and Services in the Background of COVID-19 Pandemic; establishment of the Presidential 8-point Economic Stimulus Package for COVID-19 response that included recruitment of additional 5000 frontline healthcare workers for one year, expansion of bed capacity in public hospitals and development of a welfare package to cushion frontline healthcare workers; live weekly #AskTheDG (Ask the Director General for Health) open twitter chat from early May 2020 – a platform to hear views and opinions from the public by the Director General for Health as well as to respond to medical/technical questions relating to COVID-19 in Kenya were conducted.
- June 2020: launch of the Home-Based Care Isolation and Care protocol and training of health care workers and community health volunteers to educate the caregivers/households about the program aimed at building capacity at household level to take care of COVID-19 patients at home.
- Early July 2020: Restrictions to movement/lockdowns lifted

As at June 30, 2020, 41 out of the 47 (87 percent) counties of Kenya had reported COVID-19 cases with exponential increases reported for the positive cases from May from the onset of mass testing²¹. In addition, a total of 6,190 confirmed cases with 144 deaths (a 2.3% case fatality rate) were reported².

Data analysis

Data on RMNCAH service utilisation variables of interest were extracted from the KHIS to Microsoft Excel 2016 for processing and cleaning. The variables of interest were antenatal care attendance (new and revisits; adolescent pregnancies), skilled births – total births and caesarean section rates, family planning services uptake by age and method, immunization and post-abortion care services accessed. Relevant rates/proportions were



(Adopted from the Ministry of Health (Kenya) COVID-19 Outbreak in Kenya: Daily Situation Report – 131)

Figure 1: Trends of COVID-19 outbreak in Kenya and the containment measures

computed. Cleaned data was exported to STATA v12 (StataCorp. 2011. *Stata Statistical Software: Release 12*. College Station, TX: StataCorp LP) for analysis. Pairwise comparison for means using paired t-tests were performed to compare the mean difference in monthly and period attendance counts between the two years (2019 considered pre- and 2020 peri-COVID-19 pandemic period). Two-sample test of proportions were computed to compare the hospital RMNCAH services utilisation and maternal and perinatal outcomes before and during the COVID-19 pandemic. P – values ≤ 0.05 were considered statistically significant. The null hypothesis was that there was no difference in the outcome measures in March to June 2019 compared to March to June 2020. When a statistically significant difference was identified, the null hypothesis was rejected.

Results

The results presented in this section is data from all the 47 (100%) counties of Kenya.

Overall hospital attendance for RMNCAH services

There were no significant changes in the mean total hospital attendance per month for antenatal care, hospital skilled births, family planning, post-

abortion care and immunization services during a 4-month period (March – June 2019) pre-COVID-19 compared with during the equivalent 4-month period peri-COVID-19 pandemic ($P > 0.05$). Even though the changes were not statistically significant, there were reductions in the attendance for antenatal care and immunization services with increments in hospital births, family planning and post-abortion care services (Table 1).

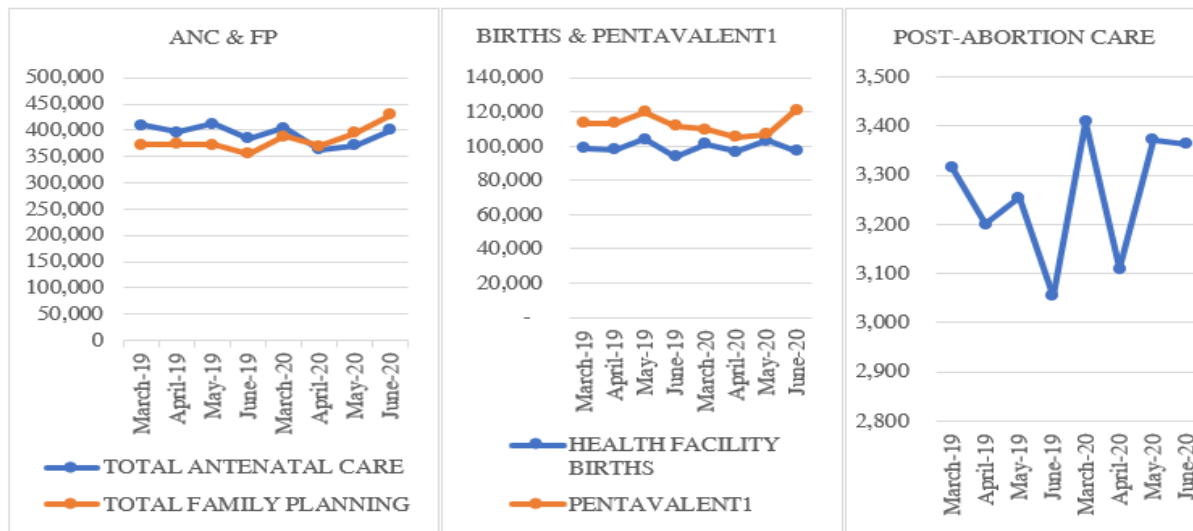
It is notable that the trends across the months showed a reduction in hospital attendance in April 2020 for all the hospital services followed by a sustained increase in May and June 2020 for antenatal care, family planning, pentavalent immunization and post-abortion care compared with the similar equivalent pre-COVID-19 period (Figure 2).

Pregnancy and antenatal care service utilisation

There was a significant reduction in the proportion of adolescents presenting with pregnancy among 10 – 14 years and 15 – 19 years from 0.4% to 0.3% ($p < 0.0001$) and 8.4% to 7.0% ($p < 0.0001$) respectively from the pre-COVID-19 to the peri-COVID-19 period. Similar reduction trends were observed for revisiting clients for antenatal care services (69.8% to 67.9%, $p < 0.0001$) and clients

Table 1: Monthly hospital attendances during the pre-COVID-19 and peri-COVID-19 periods in Kenya

Service	March - June 2019		March - June 2020		P-value
	Mean	SD	Mean	SD	
Antenatal care	400,191.3	12,700.0	384,697.3	20,838.6	0.251
Hospital births	98,713.0	4,117.0	99,634.5	3,215.5	0.736
Family planning	431,930.5	19,059.9	448,168.3	31,559.8	0.412
Post-abortion care	3,206.5	111.7	3,313.0	136.7	0.273
Pentavalent immunization	1 114,701.0	3,701.1	110,915.8	7,209.4	0.386

**Figure 2:** Trends for hospital attendances in equivalent 4-month periods (pre- and peri-COVID-19 pandemic)

completing four antenatal care visits at the health facilities (18.6% to 17.0%, $p < 0.0001$). Interestingly, there was a significant increase in the new clients seeking antenatal care services at the health facilities during similar periods (30.2% to 32.1%, $p < 0.0001$) but also a significant decrease in ANC revisits (69.8% to 67.9%, $p < 0.001$) although climbing up to March 2019 and March 2020 levels (Table 2 and Figure 1).

Despite the reduction in proportions of adolescent pregnancy for both the 10 – 14 and 15 – 19 years groups, monthly trends showed a steady rise in numbers of pregnancy in the 15 – 19 years group during the COVID-19 period compared to the pre-COVID period with a flat curve observed in the 10 – 14 years group during similar periods (Table 2 and Table 3).

Hospital births service utilisation

The mean monthly skilled birth attendance rate increased significantly from 68.5% ($SD \pm 2.0$) to 79.7% ($SD \pm 1.2$) from the 4-month pre-COVID-19

to peri-COVID-19 period ($p < 0.0001$). Mean caesarean section births increased significantly from 14,385.3 ($SD \pm 689.9$) to 15,703.8 ($SD \pm 496.8$) ($p = 0.021$) with the overall caesarean section rate increasing significantly from 14.6% to 15.8% ($p < 0.0001$) during the same periods (Table 2). Comparing the trends for caesarean section rates, there was a steady increase across the peri-COVID-19 period beyond the 10-15% recommended by WHO compared with the pre-COVID rates that were within the WHO recommendations (Figure 3).

Family planning and post-abortion care utilisation

There was a significant increase in the proportion of clients revisiting the hospitals for FP services from 53.0% to 56.6% ($P < 0.0001$) from the pre-COVID-19 to the peri-COVID-19 period. In contrast, a significant reduction was reported in the new clients seeking FP services from 47.0% to 43.3% ($P < 0.0001$). The proportion of adolescents 10 – 19 years seeking post-abortion care services reduced

Table 2: Pre- and peri-COVID-19 pandemic two-sample test of proportions for RMNCAH services utilisation and outcomes in Kenya

Variable	2019 Total	Proportion	2020 Total	Proportion	P-value
Pregnancy (n=total ANC clients)	(n=1,600,765)		(n=1,538,789)		
Adolescents 10-14 years with pregnancy	6,872	0.4	4,971	0.3	<0.0001
Adolescents 15-19 years with pregnancy	133,708	8.4	107,667	7.0	<0.0001
New ANC clients	482,719	30.2	493,877	32.1	<0.0001
Re-Visit ANC clients	1,118,046	69.8	1,044,912	67.9	<0.0001
Pregnant women completing 4 ANC visits	298,211	18.6	261,444	17.0	<0.0001
FP by client/age (n=total FP clients)	n=1,727,722		n=1,792,673		
FP New clients	811,464	47.0	777,119	43.3	<0.0001
FP Revisits	916,258	53.0	1,015,544	56.6	<0.0001
Proportion of adolescent FP uptake 10-14 years	9,017	0.5	11,592	0.6	<0.0001
Proportion of adolescent FP uptake 15-19 years	118,667	6.9	121,581	6.8	0.0007
Proportion of youth FP uptake (20 – 24 years)	315,666	18.3	350,497	19.6	<0.0001
FP method (n=total women of reproductive age who received a modern contraceptive method)	n=1,474,053		n=1,585,597		
Proportion of E-pills	25,265	1.7	25,989	1.6	<0.0001
Proportion of Injectable FP	858,317	58.2	988,283	62.3	<0.0001
Proportion of IUCD utilisation	87,461	5.9	66,794	4.2	<0.0001
Proportion of Implants utilisation	242,706	16.5	206,299	13.0	<0.0001
Proportion of COC pills	199,863	13.6	222,531	14.0	<0.0001
Post-abortion care services	n=12,826		n=13,252		
Adolescents 10-19yrs accessing PAC services	2,793	21.8	2,464	18.6	<0.0001
Women accessing PAC services	10,033	78.2	10,788	81.4	<0.0001
Maternal & Perinatal outcomes (n=total births)	n=394,852		n=398,538		
Caesarean Sections (CS)	57,541	14.6	62,815	15.8	<0.0001
Fresh stillbirths (FSB)	3,634	0.9	3,883	1.0	0.0066
Macerated stillbirths (MSB)	3,805	1.0	3,959	1.0	0.0893
Neonatal deaths (NND) ^a	4,082	1.1	3,712	1.0	<0.0001
n=Total maternal deaths	n=373		n=412		
Adolescent (10-19 years) maternal deaths	23	6.2	45	10.9	0.009
Maternal deaths 20+yrs	350	93.8	367	89.1	0.009
Maternal mortality ratio ^a	96.6 ^b		105.8 ^b		0.1023

ANC – antenatal care; FP – family planning; COC – combined oral contraceptives; IUCD – intra-uterine contraceptive device; PAC – post-abortion care

significantly from 21.8% to 18.6% while the women seeking the same services increased from 72.8% to 81.4% from the pre- to peri-COVID-19 period ($p<0.0001$).

Comparing FP services utilisation by age, there was a significant increase in proportion among adolescents 10 – 14 years (0.5% to 0.6%) and youths 20 – 24 years (18.3% to 19.6%) seeking

the FP services in the health facilities ($p<0.0001$). Comparing by method, injectable FP method was the most utilised both pre- and peri-COVID-19 periods. There were significant increases in the proportion of clients utilising injectable FP methods (58.2% to 62.3%) and combined oral contraceptive pills (13.6% to 14.0%) during similar periods ($p<0.0001$).

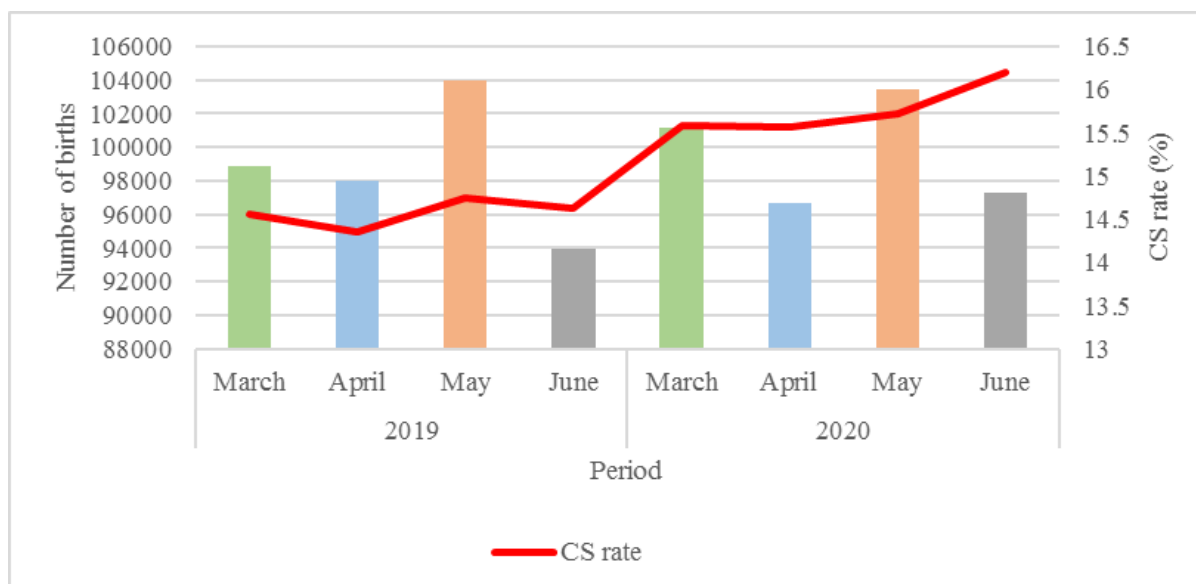


Figure 3: Pre- and peri-COVID-19 trends for total births and caesarean section rates in Kenya

Table 3: Pre – and peri-COVID-19 proportion trends in adolescent RMNCAH service utilisation and outcomes in Kenya

Category	2019				2020			
	MARCH	APR	MAY	JUNE	MARCH	APR	MAY	JUNE
Pregnancy (10-14 years)	0.4	0.4	0.5	0.4	0.3	0.4	0.3	0.3
Pregnancy (15-19 years)	8.4	8.3	8.3	8.4	6.7	6.8	7.2	7.3
Pregnancy (10-19 years)	8.8	8.6	8.8	8.9	7.0	7.2	7.6	7.6
Family Planning (10-14 years)	0.5	0.5	0.4	0.7	0.5	0.9	0.6	0.6
Family Planning (15-19 years)	7.5	6.2	6.0	7.8	6.5	6.5	7.0	7.1
Family Planning (10-19 years)	8.0	6.7	6.5	8.5	6.9	7.4	7.7	7.7
Maternal deaths (10-19 years)	2.3	4.8	11.5	6.0	3.6	5.9	11.9	23.0

In contrast, there were significant reductions in the proportions of clients utilising emergency contraceptive pills (1.7% to 1.6%), intrauterine devices (5.9% to 4.2%) and implants (16.5% to 13.0%) during the same periods ($p < 0.0001$) (Table 2). Comparing trends over different data points, there was a steady rise in adolescents 15 – 19 years and overall 10 – 19 years utilising FP services across all the 4-months peri-COVID-19 period (Table 3).

Maternal and perinatal mortality

During the 4-month periods, the proportion of adolescent (10 – 19 years) maternal deaths significantly increased from 6.2% to 10.9% from the pre- to peri-COVID-19 period ($P < 0.009$). During the same period, there was a significant increase in the proportion of fresh stillbirths from 0.9% to 1.0% ($P = 0.0066$). However, there was a significant reduction in the proportion of neonatal deaths from 1.1% to 1.0% ($P < 0.0001$) with no

changes in the proportions for macerated stillbirths during the two periods (Table 2). Like for trends across the months for the other indicators, there was a steady rise in fresh stillbirths, macerated stillbirths and adolescent maternal deaths during the four peri-COVID-19 months.

Discussion

This study has demonstrated the overall impact of COVID-19 pandemic on essential RMNCAH services utilisation and maternal and perinatal outcomes during the first four months, when strict measures were in place to limit community spread in a low – and middle-income setting.

Overall hospital attendance for RMNCAH services

Overall, there was no significant change in the mean total hospital attendance for all the RMNCAH services – antenatal care, skilled birth, family

planning, post-abortion care and immunization services during the 4-month peri-COVID-19 period as per the earlier global predictions^{18,19}. However, the trends across the services showed a dip in April 2020 before eventually rising in May and June reaching and/or even surpassing the 4-month pre-COVID-19 period. This could be attributed to a well-coordinated and centralised risk communication strategy by the government first by decreeing that health services were critical essential services to be accessed by all. Secondly, the centralised communication campaigns through daily ministerial briefings (through radio and television) and other social media platforms helped to dispel any fears from the public in seeking hospital care for the critical essential services. Experts including the WHO, London School of Hygiene and Tropical Medicine and UNICEF recommend that risk communication is a critical component of the response to COVID-19 as is with other epidemics^{24,25}. Such communication helps the public make the right decisions about how to protect themselves, when to seek care, and to avoid contributing to panic about the disease and its effects. This approach manages the 'infodemic' (an excess of information that makes it hard to know what's trustworthy and what's not) and maintains trust in public health authorities that is critical to any ongoing management of the outbreak²⁴.

Family planning and post-abortion care utilisation

There was a general reduction in new ANC clients, the uptake of long-term family planning methods and an increase in the short-term contraceptive utilisation during the peri-COVID-19 period. It appears like current FP users were more motivated to continue using compared with never-users in the initial months of the pandemic. Evidence suggests that first discussion with a health care provider is a key determinant for uptake of long acting and permanent contraceptive methods among women of reproductive age²⁶⁻²⁸. The injectable contraception was the most prevalent FP method used during the peri-COVID-19 period. Besides, this method had the highest increase in uptake during the period. Injectable and other short acting family planning methods remain the most dominant among women of reproductive age in sub-Saharan Africa^{29,30}. Women prefer this method as it is considered

private: no one else can tell that a woman is using contraception³¹. Evidence from 33 sub-Saharan countries showed that young women (15–24 years) prefer short-term methods obtained from limited-capacity, private providers, compared with older women. Besides, the use of long-term methods among young women is low, but among those users, more than 85 percent receive the service from a public sector source³².

A decrease in the unmet need for FP and increase in utilisation of PAC service in the first 4 months of the pandemic compared to the same period a year earlier is encouraging. Maintaining adequate stock levels and supply chain throughout the year, is essential to maintaining this trend. Although, globally, there are anticipated shortages of contraception, we have not analysed the FP supply chain in Kenya during this period³³. It is unclear what the impact of the pandemic was on the supply chain for various FP commodities in Kenya. The global supply chain disruption lead to shortages in family planning commodities that may have contributed to the low uptake of implants in the first 4 months of the pandemic in Kenya³⁴.

An interesting situation was seen with adolescents accessing RH/MNH services: there were more adolescent pregnancies, increased uptake of FP services, reduced uptake of PAC services but increased adolescent maternal deaths. Closure of schools could have a part to play in this trend as majority of this age group is school going and therefore kept engaged with the rigorous education routines that have been suspended. A research conducted by Plan International in nine counties of Kenya in 2019 showed that 98 percent of pregnant girls were not in school, and 59 percent of the pregnancies among girls aged 15-19 years were unintended. Furthermore, 45 percent of severe abortion complications were also reported among adolescent girls³⁵. Evidence shows that pregnancy before the age of 18 years increases the health risks for the mother and her baby³⁶. Clearly the effect of increased FP uptake amongst adolescents in terms of health outcomes will not be visible in the short term but further investigation of adolescent maternal deaths recorded during this period is required to understand the underlying causes of deaths, associated and contributing factors related to these deaths. This is more so because there was a significant reduction of maternal deaths in women aged 20 and above compared to adolescents in the

same period. This is critical to ensuring that the predicted additional maternal deaths are avoided during this pandemic and during similar outbreaks in future.

Hospital births service utilisation

The caesarean section rates in the peri-COVID-19 period are steadily rising beyond the WHO recommendation of not more than 10-15 percent as rates higher than 10 percent are not associated with reductions in maternal and newborn mortality rates³⁷. The rising caesarean section rates are consistent with evidence from a systematic review among women who had COVID-19³⁸. According to WHO, Royal College of Obstetricians and Gynaecologists (RCOG) and Kenya MOH COVID-19 guidelines, COVID-19 infection is not an indication for caesarean section and therefore the rising rate of caesarean section needs to be monitored and investigated^{25,39,40}. It would be expected that this rise should translate to a reduction in the fresh stillbirths in the facilities. However, there is an unexpected rise in the fresh stillbirths which could reflect falling standards of quality of care during labor and childbirths in the health facilities during the pandemic. Dawn-to-dusk curfews, related fear to police enforcers of the curfews (leading to interrupted transport and support systems) and lockdowns presented a worrying period for pregnant women disrupting access to antenatal and skilled birth services⁴¹. This could easily lead to delays in accessing skilled health services further complicating pregnancies/labor which could have contributed to the rise in stillbirths in the country. Consequently, evidence from Kenya, Uganda and Tanzania showed that worries among midwives in provision of essential health care services due to poor infrastructure, lack of/inadequate personal protective equipment and fear of contracting the disease could have contributed to the worsened trend for stillbirths in the country⁴¹⁻⁴³. The exact nature of the delays experience by women when they reach health facilities needs further investigation, this could potentially include but not limited to delays in providing care due to reduced number of health workers, poor preparedness of facilities to operate during the pandemic, and increased frequency of disrespectful maternity care^{44,45}.

Maternal and perinatal mortality

For any reduction in preventable maternal and perinatal mortalities, WHO emphasizes that pregnant women must be able to access the right care at the right time⁴⁶. Therefore, resources (human capacity) and a supporting environment (drugs and supplies and a functional referral system) need to be guaranteed to ensure access to skilled health personnel for deliveries and emergency obstetric care in the face of increased COVID-19 threats. The rising macerated stillbirths indicate that women are likely not seeking hospital care early enough and/or they are seeking care from unskilled health personnel in the communities^{35,41}. Public health responses to COVID-19 should leverage intersectional, human rights centred frameworks and community-driven approaches to sufficiently prevent complex health adversities for women, adolescent girls, and vulnerable populations⁴⁷.

Strengths and limitations

Our study has strengths and limitations. The use of a comparison period enabled testing the hypothesis on whether the COVID-19 pandemic had any impact on the utilisation of RMNCAH services and maternal and perinatal outcomes. However, the use of DHIS2 data poses key data quality challenges including inaccurate and incomplete reporting that are prevalent in low and middle-income countries⁴⁸⁻⁵¹. The short period reviewed during the peri-COVID-19 pandemic represents the period when the burden of the pandemic was not at the peak in the country compared to the transmission trends as experienced in other European and American countries at similar periods and therefore the results should be interpreted in context. Further evaluations at 6 and 12 months may be required to validate the outcomes.

Based on the earlier models, the predictions in reduction of access and utilisation of essential RMNCAH services and worsening maternal and perinatal mortality did not hold at four months. The concerted efforts by the government in managing the communication and messaging during the pandemic played a key difference although further evaluations may be required to clearly assess the impact of the pandemic on RMNCAH services and maternal and perinatal outcomes.

Ethical considerations

No institutional research and ethics review was sought because KHIS data is deidentified open-source and publicly available. Also the use of aggregate data is not human subject research as defined by the World Medical Association's declaration of Helsinki^{22,23}.

Conclusion

Findings demonstrate that the earlier gains achieved in family planning, pregnancy and skilled child births and adolescent sexual and reproductive health are likely to be watered down by the COVID-19 pandemic if not mitigated. The rising caesarean sections with no improvement in maternal and perinatal outcomes require further monitoring and investigation. While the overall picture for maternal mortality ratio is reassuring, a significant increase in maternal deaths amongst adolescents is of concern. If unchecked, there is a likelihood of worsening of adolescent maternal deaths and stillbirths. Further research urgently needed to understand the reasons for increased adolescent maternal mortality, reduced uptake of long-term FP methods, and increased still birth rate. This will be critical to developing policies and interventions to prevent additional maternal deaths during this pandemic and in future infectious disease outbreaks.

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Competing interest

The authors declare that they have no competing interests.

Contribution of authors

DNS and CAA conceived the idea and designed the study. DNS performed data extraction, cleaning, analysis and interpretation of the results, drafted the manuscript, reviewed and prepared it for publication. CAA interpreted the results and substantively reviewed the manuscript for publication. IKN and LNN participated in the design of the study procedures and reviewed the final manuscript. All the authors have read and approved the final manuscript.

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