

How COVID-19 affected food systems, health service delivery and maternal and infant nutrition practices: Implications for moving forward in Kenya

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Abstract

This implementation research study sought to examine the impact of the COVID-19 pandemic on maternal and infant nutrition practices, and related aspects of health and food systems in Nairobi and Uasin Gishu Counties, Kenya. The study triangulated in-depth interviews with 16 pregnant women, 31 lactating women (including COVID-19 positive), 10 facility health workers, 10 community health volunteers, 6 focus group discussions (FGDs) with food vendors, 4 FGDs and 15 stakeholder interviews with government and implementing partners. Trends from Kenyan Health Information System indicators (i.e., exclusive breastfeeding and initiation of breastfeeding, antenatal care) were also examined. During the COVID-19 pandemic, a decline in attendance of antenatal care, and maternity facilities was observed, and corroborated by Kenyan Health Information System data. Lack of clarity among health workers on COVID-19 breastfeeding guidance and fear of COVID-19 infection early in the pandemic were key drivers of early infant formula use, mother–child separation following delivery and delayed initiation of breastfeeding. Most women exclusively breastfed due to Government of Kenya restrictions in movement. Unemployment and job loss was linked to food insecurity and worsened by increased food prices and limited social protection measures. In response, pregnant and lactating women resorted to skipping meals and reducing quantity and variety of foods consumed. Efforts to build forward from COVID-19 in Kenya should include facility and community health education to prevent disruptions in breastfeeding and to support maternal dietary intake, and in the provision of targeted social protection measures alongside other multisectoral interventions (i.e., psychosocial support) for Kenyan pregnant and lactating women.

KEYWORDS

breastfeeding, COVID-19, food system, health services, health system, infant nutrition, maternal nutrition

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1 | INTRODUCTION

Globally, the novel coronavirus disease-2019 (SARS-CoV-2), commonly known as COVID-19, has disrupted the delivery of nutrition interventions in health facilities, overburdened the health workforce, and worsened food insecurity (Robertson et al., 2020). Further, COVID-19 is thought to have long-term negative effects on aspects of country food systems such as food markets and food prices in low- and middle-income countries (LMICs) (Ali et al., 2020). The combined effects of COVID-19 on health and food systems can ultimately affect the well-being and nutritional status of women and their children (Akseer et al., 2020; Osendarp et al., 2021). Importantly, women are vulnerable to micronutrient deficiencies and intrauterine growth restriction due to the dire effects of COVID-19 with projections of 2.1 million pregnant women affected by anaemia and up to 3 million infants born to undernourished women (i.e., low-body mass index) (Akseer et al., 2020; Osendarp et al., 2021). Sub-Saharan African countries have largely seen a decline in the use of essential maternal and child health (MCH) and nutrition services (i.e., antenatal care [ANC] and postnatal care [PNC]) (Buonsenso et al., 2020; Burt et al., 2021; Gichuna et al., 2020; Jensen & McKerrow, 2020). Further, some countries have notably shifted away from 'non-essential' health service provision, to prioritize COVID-19-related services by community health providers, which may place women and infants at risk for adverse health and nutrition outcomes (Abdelbadee & Abbas, 2020; Agbozo & Jahn, 2021). The response of country health systems to COVID-19 has been marked by low health facility readiness, health workforce shortage, varied health provider preparedness and provider confusion on COVID-19 guidance, in several African nations, including Tanzania and Ethiopia (Tessema et al., 2021).

In Kenya, the first COVID-19 case was detected on 13 March 2020, shortly after the World Health Organization (WHO) declared COVID-19 a global pandemic (MoH Kenya, 2020). The Government of Kenya (GoK) mandated public health measures to contain the spread of COVID-19 virus in the country, which included initial suspension of all public gatherings, school closures, lockdown (i.e., cessation of movement in and out of specific counties) and a nationwide curfew from 7 PM to 5 AM (MoH Kenya, 2020), alongside COVID-19 precautions (e.g., mask-wearing, hand washing, social distancing) (see Figure 1). Kenya has ~324,724 people infected with COVID-19 and 5651 deaths as of 23 May 2022 (MoH Kenya, 2022). Evidence in Kenya reveals that some health services (i.e., ANC, skilled births, immunization and family planning) were not affected during the early stages of the COVID-19 pandemic (Oluoch-Arudi et al., 2020). Yet, health system challenges persisted throughout the pandemic and included: difficulty in management of COVID-19 cases and limited access to key routine services, such as reproductive health and HIV, due to shifts towards COVID-19-related care (Barasa et al., 2020; Gichuna et al., 2020; Shikuku et al., 2020). While the Food and Agriculture Organization (FAO) recommends 'double-duty actions' in the response to reduce negative COVID-19 impacts of both food security and nutrition practices, which includes exclusive

Key messages

- Fear of COVID-19 infection and government lockdowns contributed to declined attendance to maternal and child health services.
- Initial lack of clarity around COVID-19 disrupted early and exclusive breastfeeding for some COVID-19-positive lactating women. Most women confined at home due to COVID lockdowns reported exclusive breastfeeding.
- During the pandemic, pregnant and lactating women ate fewer meals, reduced quantities with limited variety due to rising food insecurity, job loss and food prices.
- Improving maternal and infant nutrition practices requires continued facility and community health education, alongside multisectoral efforts, inclusive of psychosocial support and social protection measures.

breastfeeding (EBF) promotion, maternal nutrition, ANC, and food and agriculture policies to prevent rising costs of nutritious foods. Yet, little is known about the extent of the effects of COVID-19 on country health and food systems in relation to maternal and infant nutrition practices in sub-Saharan Africa and specifically Kenya (FAO, 2020).

Further, the effect of the COVID-19 pandemic on maternal and infant nutrition practices has not been characterized in-depth to inform programming to build forward from COVID-19 from a health and food systems. The objective of this implementation research study was to better understand how the COVID-19 pandemic affected: (1) delivery of maternal and infant health services, (2) aspects of the food systems (i.e., food access and availability, food prices) and (3) maternal dietary intake and breastfeeding practices of Kenyan pregnant and lactating women.

2 | MATERIALS AND METHODS

2.1 | Study design and site

This implementation research study used a mix of qualitative methodologies (i.e., in-depth interviews [IDIs], focus group discussions, key informant stakeholder interviews) triangulated with quantitative data from the Kenya Health Information System (KHIS). In the process of selection of study sites, first, the research team identified the counties with the highest burden of COVID-19 cases, with the Ministry of Health Kenya (MoH Kenya, 2021). Nairobi and Uasin Gishu Counties were selected to better understand the variation in the impact of COVID-19 on health services, food systems and maternal and infant nutrition practices in both rural and urban areas in relation to GoK COVID-19 restrictions (i.e., lockdowns). Nairobi County is primarily urban (i.e., Nairobi City), with at least one GoK lockdown during the COVID-19 pandemic.

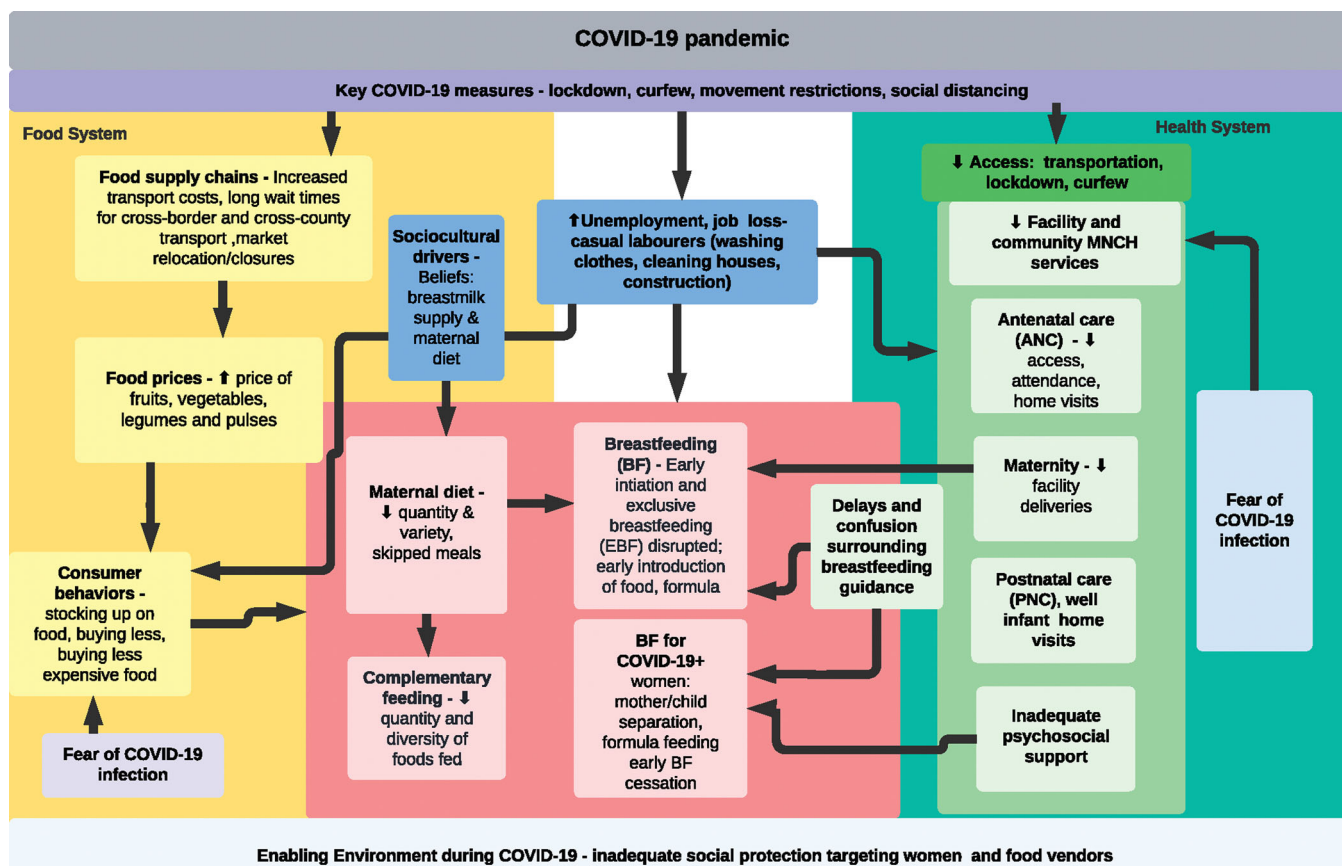


FIGURE 1 Conceptual framework on the impact of COVID-19 pandemic on food systems, health systems and nutrition practices.

Uasin Gishu County is comprised of rural, agricultural communities who cultivate maize and wheat, beans, Irish potatoes and horticultural crops such as passion fruits, coffee, macadamia nuts and avocados (County Government of Uasin Gishu, 2018) and did not experience a COVID-19 lockdown during the pandemic. In Nairobi County, Embakasi East and Kibra subcounties were identified as study sites, to ensure inclusion of informal settlements and middle-class settlements, which were hardest hit by the COVID-19 pandemic. Specifically, Kibra subcounty had the third highest cases of COVID-19 in the county and houses the largest informal settlement in the country. In Uasin Gishu County, Ainabkoi and Turbo subcounties accounted for almost half of the COVID-19 infections within the county.

2.2 | Data collection

Fieldwork occurred between August and September 2021 and comprised a mix of in-person and virtual data collection. Pregnant women in their second or third trimester, and lactating women 18–49 years of age with at least one child 0–23 months of age, were residents of study communities, and identified with the support of community health volunteers (CHVs) in study sites. COVID-19-positive lactating women 18–49 years of age who had at least one child 0–23 months of

age were identified through a Nairobi County list of clients with a confirmed polymerase chain reaction COVID-19-positive test and were approached via phone for possible study participation (see Table 1).

In-person IDIs were conducted with pregnant and lactating women on topics, such as the impact of COVID-19 on health-seeking behaviours, receipt and quality of health services and dietary practices, perceptions, beliefs and related behaviours related to breastfeeding, maternal nutrition and complementary feeding. Food frequency questionnaires (FFQ) were also administered to pregnant women, 15–49 years of age and lactating mother-child pairs with children 0–23 months of age and lactating COVID-19-positive women with children 0–23 months of age. During FFQ, women were probed on all foods consumed in the last 24 h before the interview, as well as foods consumed on a weekly basis. IDIs were carried out with CHVs, who offer maternal, child health and nutrition counselling/promotional information or referral services and facility health workers, providing MCH services. The IDIs explored the perspectives of health workers at facility and community level on the content, type and quality of breastfeeding counselling, extent of use and promotion of breastmilk substitutes, psychosocial support to breastfeeding women, adherence to Ministry of Health (MoH) COVID-19 breastfeeding guidance. In-person focus group discussions (FGDs) were also conducted with food vendors who sell cereals, legumes, fruits, vegetables and pulses in open-air markets examining the effect of COVID-19 on food systems.

TABLE 1 Overview of study sites, participants and methods, by county in Kenya, $n = 92$

Study participant/methodology								
County	Pregnant women IDIs	Lactating (BF) women IDIs	COVID-19+ BF women IDIs	HW IDIs	CHV IDIs	Food vendors FGDs	Stakeholders FGDs and KIIs ^a	Total
Nairobi	8	8	15	5	5	3	14	58
Uasin Gishu	8	8	–	5	5	3	5	34
	16	16	15	10	10	6	19	92

Abbreviations: BF, breastfeeding; CHV, community health volunteer; FGD, focus group discussion; HW, facility health workers; IDI, in-depth interview; KII, key informant interview.

^aNairobi County included: national and county stakeholders: National level KII stakeholder interviews ($n = 7$), Nairobi County stakeholder interviews (FGDs, $n = 2$; KIIs, $n = 5$).

Both virtual and in-person FGDs were conducted with county/subcounty stakeholders on MIYCN, which ranged from 3 to 4 persons. At the national level, virtual key informant interviews (KIIs) were conducted with national level nutrition-specific stakeholders, nutrition-sensitive stakeholders at national and county level ($n = 8$), and county implementing partners. All women, CHVs and facility health providers, and food vendors were selected by purposive sampling in study site communities.

Secondary data was extracted from the KHIS MoH database for Nairobi and Uasin Gishu Counties and trends were described for initiation of breastfeeding, EBF indicators, ANC attendance, prepandemic (from March 2019 to February 2020) and post declaration of the COVID-19 pandemic (March 2020–February 2021). The two-time frames, that is, prepandemic and pandemic, were selected to allow for comparison in access to services. At the health facility, data are documented daily in the registers of the various service delivery points, that is, ANC, maternity and MCH. This is consolidated monthly and subsequently submitted to either the health facility or subcounty records officer for entry into the KHIS database, which received further checks through monthly and quarterly data review meetings. Initiation of breastfeeding is documented in the maternity register and is calculated as a percentage of infants who are put to the breast within 1 h/total live births in the health facility. EBF is documented in the child welfare clinic (i.e., routine child health services), as a proportion of children 0–5 months who were exclusively breastfed in the last 24 h/children 0–5 months of age who visited the health facility. ANC attendance is documented as a percentage of all pregnant women who visited the health facility as the numerator and/the projected pregnant women as the denominator.

Study personnel were trained on research ethics, informed consent, privacy/confidentiality and techniques related to qualitative data collection and all data collection tools were pretested for cultural appropriateness and comprehension. Written informed consent was obtained for participants interviewed in-person, while verbal informed consent was obtained from participants in online interviews and FGDs before audio-recording interviews and FGDs in Swahili or English. Study procedures were approved in Kenya by the Institutional Ethics Review Committee of Masinde Muliro University of Science and Technology. Subsequently, a research license was granted by National Commission for Science Technology

and Innovation per Kenyan guidance for conducting research in-country. Written approvals to conduct the study were provided by the county governments in Nairobi and Uasin Gishu Counties and subcounty and health facility management teams.

2.3 | Analyses

Interviews with national and county stakeholders, implementing partners, health workers and COVID-19-positive lactating women were conducted and audio recorded in English. Interviews with CHVs, pregnant and lactating women, including food vendors were conducted and audio recorded in Swahili. Subsequently, transcribers conversant with both English and Swahili then transcribed all the interviews verbatim into English. The quality of transcriptions was checked for accuracy and completeness against the audio recording while demographic information and food frequency data were also verified against the data collection forms by B. A., C. G., and J. A. K. The researchers (B. A., J. A. K., L. R., C. G.) conducted a preliminary review of the data by reading a subset of the transcripts to create an initial codebook, which included major themes and subthemes that emerged from the data. The researchers (B. A., J. A. K., L. R., C. G.) then coded a subset of the transcripts and discussed and came to consensus about any discrepancies in coding. Based on this discussion, the codebook was refined and finalized. All transcripts were coded using Dedoose online software. Each subtheme was then summarized, and illustrative quotes were selected (see Table 3). Food frequency data were analysed daily and weekly (<3 times, ≥ 3 times per week) for pregnant and lactating women, and by study site. Food price data on local foods was compiled by county and provided in Supporting Information File: S1. Quantitative data were downloaded from the KHIS and trends were examined by indicator and study site.

3 | RESULTS

3.1 | Characteristics of study participants

In Nairobi and Uasin Gishu Counties, greater than half of the pregnant and lactating women, 15–49 years, completed secondary

education, while most COVID-19-positive women had college or university level of education. Half of all women participating in the study were married. Nearly 25% of pregnant and lactating women were primarily employed in the informal sector as casual labourers (i.e., washing clothes, cleaning houses, working in farms, construction or selling vegetables) while the majority of COVID-19-positive women were employed in the formal sector (i.e., teacher, accountant). Among lactating women, 39% ($n = 12$) had children 0–6 months of age, 42% ($n = 13$) children 6–11 months of age and 19% ($n = 6$) children 12–23 months of age. Food vendors who participated in the FGDs sold cereals, vegetables and/or fruits in open-air markets. KIs and FGDs were held with stakeholders at national, county and subcounty level and included nutrition-specific (i.e., nutritionists, community strategy coordinators, reproductive health coordinators), nutrition sensitive (i.e., agriculture, social protection, markets) and implementing partners working in nutrition programming in study sites (Tables 1 and 2). The dominant themes that emerged from the qualitative analyses are discussed in Table 3.

The dominant themes that emerged from the qualitative analyses are presented in Table 3. Our findings also aided in development of a conceptual framework (see Figure 2), which delineates key themes explored in this paper, across food systems (in green), health systems (in yellow), maternal and infant nutrition practices (in red), while also noting the underlying enabling environment, including governance, capacity and social safety nets. Figure 2 characterized how COVID-19 affected aspects of the health and food systems as well as maternal and infant nutrition practices in Kenya, as well as key factors that affected dietary practices (i.e., psychosocial support, social protection measures, COVID-19 guidance), based on key

findings. The conceptual framework further illustrates how the COVID-19 pandemic affected food and health systems, taking into account job loss and sociocultural drivers, and fear of COVID-19 infection and rising food insecurity, which negatively affected maternal and infant nutrition practices (maternal diet patterns, breastfeeding).

3.2 | Effects of COVID-19 on access and disruptions to health service delivery

3.2.1 | Reduced access to facility-based MCH services during COVID-19

Due to COVID-19 GoK restrictions, facility and community-based health workers (i.e., CHVs) reported that attendance to ANC, maternity and child health facility services declined from April to December 2020 during the COVID-19 pandemic. This was echoed in trend data from the KHIS, which showed reductions in ANC attendance in both counties, with larger decreases noted in Nairobi County versus Uasin Gishu County, and facility deliveries (i.e., Nairobi County only) from March 2019 to February 2020 in comparison to March 2020 to February 2021 (see Supporting Information File, Table 3). Women and health providers described common barriers to access of MCH services such as: lack of affordability of health services, increased costs and/or lack of ground transportation due to GoK curfews, conversion of health facilities into COVID-19 isolation units and long wait times for clinic services. There was a refocusing of responsibilities of health workers to COVID-19 response while at the community level most COVID-19 responsibilities were described as an addition to regular work rather. Several health providers and stakeholders discussed restrictions to community health services at the onset of the COVID-19 pandemic mandated by MoH. Home visits and group activities by CHVs were cancelled as provision of COVID-19 supplies (i.e., masks, sanitizers, soap) and health education on infection prevention was prioritized early in the pandemic.

During this period, most health workers expressed uncertainty on how to advise pregnant and breastfeeding women on nutrition-related practices, with a focus on breastfeeding, especially early during the COVID-19 pandemic. Health workers discussed their initial lack of clarity on how to advise mothers on whether or not to breastfeed, especially if a woman was either COVID-19 positive or of unknown COVID-19 status. A stakeholder elaborated on uncertainty regarding recommendations around breastfeeding during COVID-19:

I think when COVID-19 started there was a lot of questions, like can a baby breastfeed when the mother is COVID-19 positive? And I could read a lot of tension and there are those that felt that they couldn't breastfeed because of the fear to infect their infants.Am sure there are those babies who were not breastfed exclusively just because the mother contracted the virusthere is an instance that I read in

TABLE 2 Socio-economic characteristics of pregnant and lactating women, Nairobi and Uasin Gishu Counties, Kenya.

	Pregnant women ($n = 16$)		Lactating women ($n = 16$)		Lactating COVID+ ($n = 15$)
	NC	UG	NC	UG	NC
Level of education ^a					
Primary	4	2	3	1	0
Secondary	4	6	4	5	1
Postsecondary	0	0	1	2	14
Occupation types					
Student	0	1	0	1	0
Housewife	4	4	4	3	0
Self-employed/ business	1	1	2	1	2
Casual labour	3	2	1	2	0
Formal employment	0	0	1	1	13

Abbreviations: NC, Nairobi County; UG, Uasin Gishu County.

^aPrimary: Completed class eight; secondary: completed form four/high school; postsecondary has a certificate, diploma or a degree.

TABLE 3 Summary of dominant themes, by study participant group, Nairobi (NC) and Uasin Gishu (UGC) Counties

Themes	Health workers and community health volunteers (CHVs) in-depth interviews- (IDs) (n = 20)	Pregnant women IDs (n = 16)	Lactating Women with children, 0-23 months of age, IDs (n = 16)	COVID-19+ lactating women IDs (n = 15)	Stakeholders KI and FGDs (n = 19)
Reduced access to facility-based health services	<p>For the pregnant mothers, we recorded less visits to the hospital. And for those in labor, access to the health facility especially at night was a bit difficult because of the curfew, and it led to an increase to home deliveries'. (Health worker, NC)</p>	<p>'I have visited Turbo hospital. They explained to me the problems of Corona and how I will deliver. They told me I don't have to stay at home and if I feel the signs, I just rush to the hospital'. (Pregnant woman, UGC)</p>	<p>'I can't go to the hospital every time because I fear the person next to me, as I don't know whether she has COVID-19'. (Lactating woman, NC)</p>	<p>'The services are a little bit slow because they are trying to accommodate the social distancing protocols. There is a lot of waiting'. (COVID-19+ lactating woman, NC)</p>	<p>'Mothers were scared to seek services because they don't know whether they are going to contract that virus at the hospital level or not. So, this affected the services that are being provided. The ANC visits reduced and the mothers come when they are almost due for delivery'. (Stakeholder, national level, NC)</p>
Adaptations to health services due to COVID-19	<p>'When the COVID-19 pandemic began, last year from April, we weren't doing the household visits. We were asked to use phones for follow-ups. Later, we were allowed to visit the households. We, however, don't enter the houses. We would call the mother outside and then we would talk to her'. (CHV, NC)</p>	<p>'There are changes. It's not like before when the doctors looked so concerned. It's like COVID-19 has changed a lot of things because when you go to the hospital, you are given the service you need and then you leave immediately. They don't want people to crowd. There is no good relationship or enough time for the doctor and the patient'. (Pregnant woman, NC)</p>	<p>'The doctor said I monitor how he (the child) is growing from home due to COVID-19 because they don't want crowds at the hospital. Those of us who were there were all told to stay at home until the children are six months old to get their vaccine. So, I am only monitoring from home'. (Lactating woman, UGC)</p>	<p>'Sometimes, you might find the services are a little bit slow. Because they are trying to accommodate the protocols—the distancing, the waiting'. (COVID-19+ lactating woman, NC)</p>	<p>'When COVID was first reported, Nairobi was put on lockdown. In Nairobi, it was advised that the normal growth monitoring should not continue because of the kind of touch that would be involved between the children and the health workers'. (Stakeholder, NC)</p>
Food systems impacts: reduced food access and availability	<p>'Most women here depend on going to the market to buy food. But now with COVID-19, the markets are closed and they were told not to go to crowded areas because they are pregnant. So, most of the time, they end up eating foods that are not nutritious or eat porridge and maize. So, [COVID-19] really affected</p>	<p>'Before, we used to prefer to buy flour and fruits in plenty. But now, we couldn't get to town to buy those things. Going to get them at the market was hard as we feared COVID-19 and going to crowded places. The things that we get within our reach now are ugali, milk, and vegetables'. (Pregnant woman, UGC)</p>	<p>'The period when the curfew was high during that time, there was lockdown and also curfew. Suppliers could not move to supply goods. During that time, I skipped meals because I would find the shop has been closed'. (Lactating woman, UGC)</p>	<p>N/A</p>	<p>'For the produce that was coming from the neighbouring countries, the procedure of clearance was so long, leading to spoilage of commodities like tomatoes, bananas, and avocados. So, the lockdown affected them as there were delays during the distribution'. (Stakeholder, UGC)</p>

TABLE 3 (Continued)

Themes	Health workers and community health volunteers (CHVs) in-depth interviews- (IDIs) (n = 20)	Pregnant women IDIs (n = 16)	Lactating Women with children, 0-23 months of age, IDIs (n = 16)	COVID-19+ lactating women IDIs (n = 15)	Stakeholders KII and FGDs (n = 19)
Job loss fuelled food insecurity	how they were getting their food supplies'. (Health worker 002) 'I think many mothers are always businesspeople [informal/casual workers], so when COVID-19 came, people lost their jobs. So, they didn't have the money to buy food'. (Health worker, UGC)	'I lost my job when the homeowners of the homes I was caring for came back. Therefore, we had to eat less'. (Pregnant woman, UGC)	'Even in the past week, I struggled to get food because I didn't have money. I rarely eat at lunch time. I rarely get work because I style hair from door to door. So, you can either get or not get a customer. So, COVID-19 really affected me'. (Lactating woman, NC)	'When COVID hit last year, we closed our business. So we stayed home. And now you know with business, if you're not working, you are not getting any income. Yeah, so that was a huge challenge, but it did not affect my ability to buy food as my husband would buy it since he did not lose his job'. (COVID-19+ lactating woman, NC)	'The main thing is access to food has been disrupted, especially for most of the mothers who have lost employment due to COVID. So, accessing food is challenging. Then, the prices have also gone up for some of the foods. So, that makes it hard for the mothers to access their three meals [per day]'. (FGD-Stakeholders, NC)
Food systems impacts: high food prices of perishable foods due to reduced food availability and delayed transport	'Things like meat were not easily affordable especially for the pregnant mothers. So, they preferred to eat kale and cabbage. The price of cabbage reduced at some point, though right now it has increased again. But fleshy foods, they couldn't get in plenty. The cost of fish was too high for them'. (CHV, NC)	'I used to buy vegetables for ten shillings, and it would be enough for the two of us, but right now vegetables for ten shillings is only enough for one person'. (Pregnant woman, NC)	'Rice and green grams I get from the shop but at a higher price. I feel bad because the price we get for commodities at the shop is high and the income we get is little because it is hard to go and do work or do business like we used to before Corona came'. (Lactating woman, UGC)	'You know, COVID-19 brought about a lot of challenges. Because a lot of things changed. Even now, things have changed because they are very expensive. Though, I have adapted. We have to work with what we have. So, as much as it's difficult, we use what we have--as long as we don't go hungry the whole day. So whatever little I get, I purchase food'. (COVID-19+ lactating woman, NC)	'At the onset of COVID 19, when the government containment measures such as restrictions of movements were imposed, we had an increase in food commodity prices'. (Stakeholder, NC)
Disruptions in early initiation of breastfeeding	Interviewee 'When a mother comes to deliver, if mother has COVID-19, we will not allow her to be very close or she must mask. She must separate immediately after delivery, so we have to protect mother to mask and	N/A	'After I gave birth, I didn't have milk for almost two days. So, before my child started breastfeeding, I was told to just let her be until milk comes out. But after one day, she started crying and so I gave her water and glucose'. (Lactating women, NC)	'On delivery, I didn't receive any advice on giving my baby formula, but I just opted to sign a consent form so that he can be given the formula'. (COVID-19+ lactating woman, NC)	'During childbirth, it [early initiation of breastfeeding] was affected. Now that at the onset of COVID-19, essential services like skilled delivery and antenatal care visits had really gone down. So, since we were having more of home deliveries

(Continues)

TABLE 3 (Continued)

Themes	Health workers and community health volunteers (CHVs) in-depth interviews- (IDIs) (n = 20)	Pregnant women IDIs (n = 16)	Lactating Women with children, 0–23 months of age, IDIs (n = 16)	COVID-19+ lactating women IDIs (n = 15)	Stakeholders KII and FGDs (n = 19)
Disruptions in exclusive breastfeeding	<p>do what is needed because the child still needs her'. Interviewer: 'After how long you will give her the child?' Interviewee: 'I don't know'. (Health worker, UGC)</p> <p>'During COVID-19, what happened is that you would visit a household and find that a mother wasn't breastfeeding a child because they had a flu and they thought that it was a symptom of COVID-19. This was so widespread that everyone suspected themselves of having COVID-19, so they wouldn't breastfeed and would resort to feeding the child packed milk (animal milk from the shop) instead. So, we were called by a nutritionist and told that even if one has COVID-19, they could still breastfeed their child as usual and that there are no changes with regard to that'. (CHV, NC)</p>	N/A	<p>'Though I was told to breastfeed exclusively, my milk was inadequate and so I had to follow grandmother's advice [to give porridge alongside breastfeeding] because he was crying too much. But when we go to the hospital, we will just tell the doctor the child has been breastfeeding well'. (Lactating woman, NC)</p>	<p>'So initially, when I came out of the hospital, I breastfed her completely. She was on full breastfeeding, but when we got COVID-19 and we were in hospital, she was given formula. And there, my milk supply reduced. My [breast]milk came back after two weeks. And, then we started doing both breastmilk and formula'. (COVID-19+ lactating woman, NC)</p>	<p>then, of course, the initiation of breastfeeding was also affected because it goes hand in hand'. (Stakeholder, NC)</p> <p>'In this COVID-19 pandemic, the whole issue of staying together as a family is a positive thing. So, mothers have had to be with their children and bond with them. And of course, that has helped mothers to breastfeed their children adequately and exclusively up to six months'. (Stakeholder, national level, NC)</p>
Variety of foods consumed during pregnancy and lactation	N/A	<p>'Pregnant women consume foods rich in proteins and traditional vegetables because, for example, traditional vegetables helps improve the amount of breastmilk, while ugali also helps. Spinach and cabbage hydrates the body'.</p>	<p>'During COVID-19, we eat traditional vegetables mostly and then there is also porridge—a lot of porridge for the child. The other one will be a little bit of protein, not too much. And then there is this lemon mixture that we boil every</p>	<p>'The food I eat must have nutrients and has to be a balanced diet with a variety of vegetables and fruits. Vegetables include what is locally available—spinach, kale, cabbage, French beans and fruits are oranges, apples, pineapples, avocados. And for carbohydrates, like ugali, rice, porridge, chapatti,</p>	N/A

TABLE 3 (Continued)

Themes	Health workers and community health volunteers (CHVs) in-depth interviews- (IDs) (n = 20)	Pregnant women IDs (n = 16)	Lactating Women with children, 0-23 months of age, IDs (n = 16)	COVID-19+ lactating women IDs (n = 15)	Stakeholders KII and FGDs (n = 19)
	(Pregnant woman, NC)	week and drink. The child drinks it; too, even if we don't know if the doctor accepts that. It's a must for the child to drink, so that at least it makes someone strong, so that when COVID-19 strikes, at least it won't be easy'. (Lactating woman, NC)	sweet potatoes, arrow roots because I can access and afford them. And I can get them fresh. No need to store them'. (COVID-19+ lactating woman, NC)		
Skipping Meals, pregnant and breastfeeding women	'If one doesn't have food, they would skip [meals]-they would eat once a day or twice a day. One would wake up and drink porridge, then they would eat at four in the evening and have the next meal the following day'. (Health worker, UGC)	'For two days, we didn't have food. Yes, sometimes in a week, we would be lucky and someone would give us food. Otherwise, we would just boil water, drink it, and go to bed'. (Pregnant woman, NC)	'I saw that the food I had prepared was not enough. So, I had to reduce the amount so that everyone could get [something to eat]. And so, when it reaches the kids, you just say, 'As long as they have eaten, that's okay.' The only time that I didn't eat is when I skipped my lunch because there was no food'. (Lactating woman, NC)	N/A	'Even if you look at [coping strategies] in terms of adopting the different coping strategy measures, women had higher chances of skipping meals than men'. (Stakeholder, NC)
Reducing quantity and/or diversity of foods eaten, pregnant and breastfeeding women	'Because of financial issues, they [mothers] were eating a poor diet; if its <i>ugali</i> , it would just be <i>ugali and vegetables</i> every day because there was no money to buy good proteins such as beans'. (Health worker, UGC)	'Before COVID-19, we used to eat well, but after, we don't eat as much. For example, when you buy potatoes, you eat a little and ensure you remain with some for the next meal. You just limit yourself'. (Pregnant woman, UGC)	'Even now, it's a miracle if I can eat meat once in a week. Just those foods that have protein, I have reduced'. (Lactating woman, NC)	'Right now, we reduce the amount of food we buy. Before COVID-19, we used to have snacks maybe after breakfast and after lunch, but now we don't do that. Because we have less income, we have to budget with what we have until end month, which means that we have to reduce the quantity of foods we consume'. (COVID-19+ lactating woman, NC)	'I know [COVID-19] has affected [diet] because the mother had no choices. They will take what is available. So, the pregnant and lactating women, most of them are not able to eat from the seven food groups. It's because either the food groups are not there and also because of the cost, so they just take what is available for survival. And most of them actually were doing with porridge'. (Stakeholder, national level, NC)

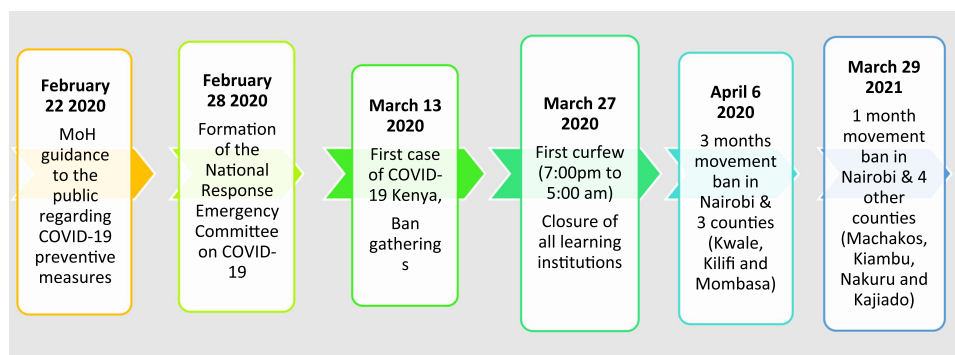


FIGURE 2 Timeline of COVID-19 lockdown and curfew in Kenya.

the social media and heard people sharing about it and sometimes we could even call a mother and they would ask the same. So, I believe that somehow it (COVID-19) affected exclusive breastfeeding in the initial stages. (Stakeholder, Nairobi County)

In April 2020, the national GoK MoH developed guidance during the COVID-19 pandemic to describe the essential nutrition services, key maternal nutrition and infant feeding messages, and guidance on nutrition management in treatment and isolation centers, to guide implementation and to clarify confusion on 'essential' nutrition services (see Table 4).

When the guideline came, it was able to guide that a mother should breastfeed whether they are COVID-19 positive or negative. I believe the developments of the guideline from the Division (of Nutrition and Dietetics) was able to demystify and they (health workers) were able now to support. I even heard a story of a mother who was able to breastfeed when she was in isolation, yeah. (Stakeholder, Nairobi County)

Yet, the majority of CHVs and health workers discussed their lack of awareness on specific COVID-19 guidelines for breastfeeding. Further, health workers felt that the guidance on nutrition largely targeted nutritionists and was not adequately integrated into other dissemination meetings on COVID-19 conducted with health workers. In the early days of the COVID-19 pandemic, some health workers mistakenly believed that infants could be infected with COVID-19 through breastfeeding, according to government stakeholders and health workers.

3.3 | Disruptions in early initiation and EBF during the COVID-19 pandemic

This belief contributed to early infant formula use, early introduction of liquids to newborns after delivery, separation of mothers and

TABLE 4 COVID-19 guidance documents, MoH, Kenya April 2020

- Guidance on the continuity of nutrition services delivery in the context of COVID-19 pandemic
 - Continuation of essential nutrition services: Management of acute malnutrition for children under 5, micronutrient supplementation (i.e., vitamin A) for children 6–59 months, IFA for Pregnant women and deworming for children under 5.
- Nutrition messages to contribute to the prevention of COVID-19
 - Pregnant and lactating women to consume 5 of 10 foods groups per day with one small extra meal for pregnant and two small extra meals for lactating, exclusive breastfeeding regardless of COVID-19 status continued breastfeeding with appropriate complementary feeding, prohibition of distribution of breastmilk substitutes, planning for food stocks by purchasing adequate stocks of nonperishable foods and unripened fruits and vegetables and avoid wastage
- Guidance for nutritional management for health worker in COVID-19 treatments and isolation centers:
 - Counselling on initiation of breastfeeding within an hour of birth, rooming in, exclusive breastfeeding, timely introduction of appropriate, safe and adequate complementary foods, continued breastfeeding for 2 years and beyond, all while applying necessary infection prevention protocols.
 - Counselling mothers to practice respiratory hygiene through use of masks, hand hygiene before and after contact with the child, and routinely clean and disinfect surfaces with which the symptomatic mother has been in contact
 - Provision of basic psychosocial support

newborns following childbirth, and delayed breastfeeding initiation, particularly by COVID-19-positive lactating women, women suspected to have COVID-19, and by health workers. For example, some COVID-19-positive breastfeeding women relayed their infants were given formula until 'breastmilk came in', following facility deliveries in private facilities, which delayed early initiation of breastfeeding (i.e., <1 h of childbirth). In addition to infant formula, several health workers also gave infants a mixture of sugar and water. Furthermore, rather than being counselled on whether or not to breastfeed, other women were 'just given a consent form' to

allow providers to feed infant formula to their newborn. A lactating mother who had COVID-19 narrates her experience on separation from her child in the quote:

After I gave birth, the baby was given formula on the first day and started breastfeeding on the second day... months later, when I had COVID-19, I was advised to separate from my child, but then I had also decided on my own that I needed to because—there was no information that was given to me that I could continue safely breastfeeding my baby while I had COVID-19. So, we were separated, and I didn't breastfeed her after I got COVID-19. (Lactating women with COVID-19, Nairobi County)

Despite health worker confusion earlier in the pandemic, GoK COVID-19's guidance gave health workers the confidence to continue provision of EBF counselling 'to build the child's immunity', especially to new mothers, regardless of COVID-19 status. COVID-19-positive women were encouraged to wear a mask, wash their hands or breasts before/after breastfeeding, according to some health workers, CHVs and stakeholders. Yet, COVID-19-positive lactating women also described being ignored, or neglected by health workers during labour and delivery, due to their COVID-19 status, as shown in the quote below:

Yeah, there is a bit change in the operational because you know you feel like you are stigmatized because when those nurses know that you have COVID-19, they fear attending to you. Yeah, there is that stigmatization because you are left—no one attends to you frequently. So, they come maybe after some

long hours. (Lactating woman with COVID-19, Nairobi County)

Furthermore, most stakeholders discussed women being able to practice EBF at home due to GoK- lockdowns and movement restrictions, which allowed women to be in close and frequent contact with their infants. This is corroborated by KHIS data, which revealed consistently higher rates of early initiation of breastfeeding and EBF, for the majority of 2020, for those who delivered in the health facility during the COVID-19 pandemic compared to the prepandemic during the same period (Figures 3 and 4).

People are still breastfeeding. No one stopped. In fact, during COVID-19, people breastfed more. Before people used to go to work. But right now during COVID-19, someone is at home, or working from home, and decide to just breastfeed their child. (CHV, Uasin Gishu County)

In addition, as the COVID-19 pandemic continued in these communities, CHVs were reported to encourage women to attend antenatal and PNC, which was believed to improve health facility attendance for both pregnant and lactating women, as described in the following quote:

People used to fear to come to the hospital. They used to say health workers are the people who are carriers of COVID-19. But when the messages came and we really sensitized the community through our community strategy people and the CHVs, they really took up the messages and now they started coming back to the facility. (Stakeholders' FGD, Uasin Gishu County)

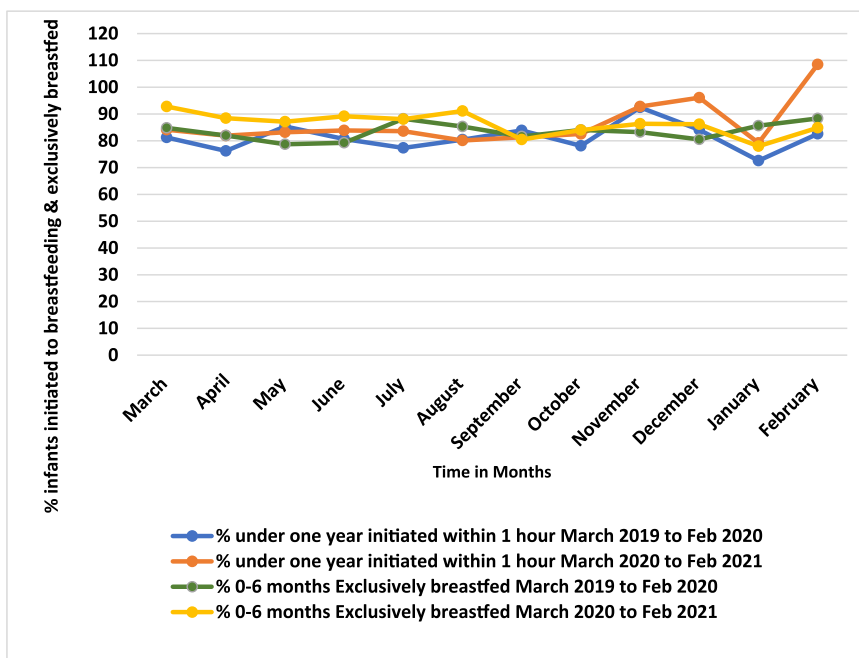


FIGURE 3 Proportion of infants initiated to breastfeeding within 1 h of delivery and proportion of infants 0–6 months exclusively breastfed in Nairobi County, pre-COVID-19 (March 2019 to February 2020) and during COVID-19 (March 2020 to February 2021).

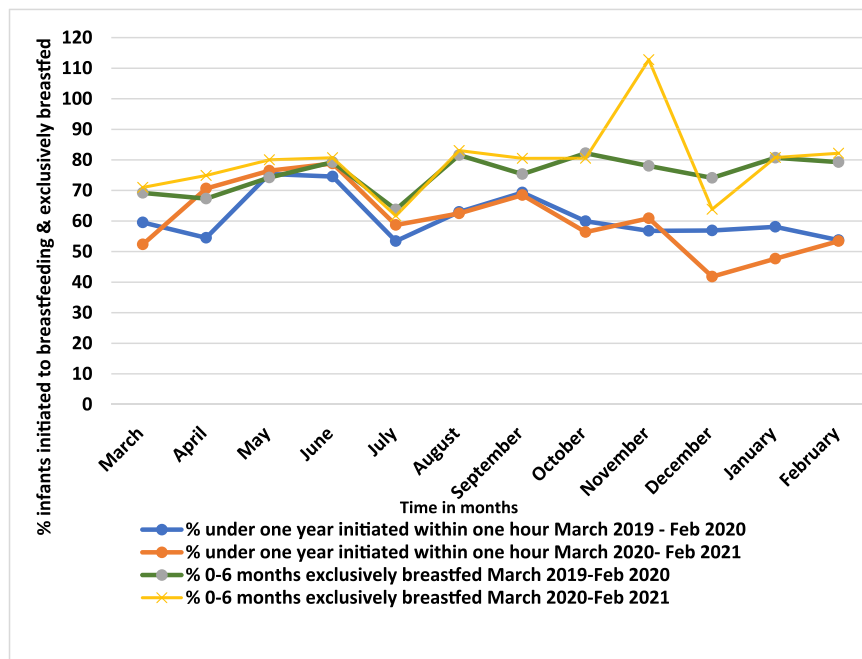


FIGURE 4 Proportion of infants initiated to breastfeeding within 1 h of delivery and proportion of infants 0–6 months exclusively breastfed in Uasin Gishu County, pre-COVID-19 (March 2019 to February 2020) and during COVID-19 (March 2020 to February 2021).

Yet, some lactating women, health workers and CHVs held additional misperceptions around breastfeeding. Women and health providers mentioned that ‘inadequate food’ for women, as a consequence of the pandemic, translated to ‘not enough’ breastmilk to nourish infants, which prompted women to introduce foods or liquids before 6 months of age.

Even the lactating mothers were affected because they were saying that they didn't have food andthe community members believe that when you don't eat then you wouldn't have enough milk to breastfeed your child. So they believed that whenever they didn't have food then their children would also be hungry because they wouldn't have enough milk for the child. (CHV, Nairobi County)

Some study participants indicated that women continued breastfeeding up to 2 years of age to ensure children ‘would not go hungry’, when they ‘lacked other foods’. During the COVID-19 pandemic, the reason for not breastfeeding up to 2 years was mothers testing COVID-19 positive according to health workers, stakeholders and lactating women.

3.4 | COVID-19 effects on health systems also mirrored food systems impacts: Reduced availability and access and high prices of perishable foods

Availability and access to perishable foods was limited due to GoK prohibitions on movement (i.e., curfew, lockdown) and closure of local food markets, in efforts to implement social distancing and reduce the spread of COVID-19. Food vendors discussed the substantial rise

(up to two-fold increase or higher in both counties) in food prices of fruits, vegetables, legumes and pulses (see Supporting Information File: S1, Tables S1 and S2) due to the high cost of fertilizer for crops (Uasin Gishu only), and cross-border and cross-county transport of foods from rural areas to markets (see Supporting Information). Food affordability affected families, as customers often acquired food ‘on credit’, and food vendors expressed their frustration in their failure to repay. Further, delays in receipt of perishable food items often led to food stockouts and spoilage of fruits and vegetables, as relayed by food vendors.

The transporters would spend the night on the road. So, by the time the products arrive, you get a sack of produce and they have hiked the price by 2000 (Kenyan Shillings -Kshs). And you know if I only had Kshs 3000, that would mean I had to come back with nothing to sell. (Food vendor FGD, Nairobi County)

3.5 | COVID-19-related job loss fuelled food insecurity and compromised maternal dietary practices

Food insecurity was further exacerbated by COVID-19-related job loss due to government-imposed lockdowns and curfews, according to study participants. Most pregnant and lactating women described ‘being unable to earn an income’ as casual labourers. In addition, some women and CHVs relayed that husbands often lost their jobs or source of income, which placed greater stress and childcare burden on women, with reports of greater frequency of gender-based violence. Yet, despite widespread food insecurity, most women who

expected to be considered for support reported not receiving either food or cash transfers through social protection programmes from the government to mitigate financial losses and enable them to obtain food during the COVID-19 pandemic. While a few pregnant and lactating women described receipt of food or cash donations via government social protection measures, the support was viewed as insufficient and short-term as it was provided for only a few months during the COVID-19 pandemic. Instead, pregnant and lactating women discussed strategies they used to cope with household food insecurity, including purchasing inexpensive food (i.e., sardines), borrowing food or money from friends and relatives, purchasing precooked food from street food vendors (which was perceived as 'cheaper' than buying food items), using family savings to buy food from the markets early on in the pandemic, reducing expenditure on food based on the budget and eating whatever was available.

For two days we didn't have food. Sometimes in a week we would be lucky, and someone would give us some food because there were no jobs, and we would just be at home. Other days we would just boil water, drink and go to bed. (Pregnant woman, Nairobi County)

...before COVID-19 we used to eat well but after we don't eat as much. For example, when you buy potatoes, you eat a little and ensure you remain with some for the next meal, you just limit yourself. (Pregnant woman, Uasin Gishu County)

3.6 | Pregnant and breastfeeding women ate few meals, less quantity and variety

Most pregnant and lactating women reported skipping meals during the COVID-19 pandemic, as corroborated by some health workers, CHVs and stakeholders. Women expressed the need to skip meals so as 'to have enough to eat in the evening' and even 'going to bed hungry'. Health workers and stakeholders also observed that women were eating one to two meals per day or limiting dietary intake to 'only ugali or porridge'. In Uasin Gishu County, fewer women skipped meals while in contrast, the proportion of women skipping meals was higher in Nairobi County.

I have to eat less food than the way I was used to because it's not easy to get these foods. As in lunch time now if I use to eat ugali, I prefer not to cook lunch so that I save for supper. The food I was supposed to cook for lunch I cook it for supper. (Mother child age, 8 months, Uasin Gishu County)

Several lactating women expressed that skipping meals allowed children to have 'something to eat... so everyone else could eat well', and that they were, 'making do with what we have'. Many pregnant

and lactating women discussed eating a less varied diet, primarily consisting of beans, porridge/ugali, kale, and at times, locally available fruits. Several pregnant and lactating women explained that drinking tea often replaced actual food as a means to curb hunger. This is illustrated by the following quote:

It was a difficult time. It wasn't easy. First, let's say you only have ugali and kalesyou just eat. Because you could want to eat meat, but that meat isn't available. You are supposed to drink soup, but that soup isn't available, tea also isn't available. So, what you get is what you eat so you don't die from hunger and at least the child gets what to breastfeed on. (Mother, child age, 22 months, Nairobi County)

Pregnant and lactating women consumed one to three meals per day in both counties during the COVID-19 pandemic. Consumption of snacks by pregnant and lactating women varied as some ate no snacks, while a few mentioned eating three snacks per day.

3.7 | Pregnant and lactating women commonly consumed carbohydrate-rich foods, vegetables and dairy during COVID-19

Cereals (i.e., porridge, ugali, maize, rice, chapati), dark green leafy vegetables (African spider plant, kale, African nightshade, jute mallow, spinach, vine spinach) dairy products and other fruits (i.e., bananas, oranges, avocado) were the prominent features of women's daily diets (Figures 5 and 6) in both counties, with a few exceptions. Key differences in daily intake of certain foods were noted in Nairobi and Uasin Gishu Counties. On a daily basis, animal source (i.e., beef, sardines) and sugary foods (i.e., biscuits, sweets, cakes) were consumed by pregnant and lactating women in Nairobi County only. On the other hand, legumes and pulses, nuts and seeds, and vitamin A rich fruits and vegetables were noted to be consumed by women in Uasin Gishu County on a daily basis due to the availability of these foods as they were farmers. When examining difference between pregnant and lactating women, the proportion of pregnant women consuming vitamin A rich fruits and vegetables on a daily basis (i.e., carrots, watermelon) was four times higher in comparison to lactating women. A greater percentage of lactating women (13%) compared to pregnant women (6%) consumed other vegetables (onions, tomatoes, cabbage). Legumes and pulses were consumed by one-quarter of lactating women and about one-tenth of pregnant women on a weekly basis (defined as three times or more in a week) (data not shown).

4 | DISCUSSION

This study found reduced attendance to maternal, newborn and child health services which largely stemmed from fears around COVID-19 infection in health facilities, as well as lack of affordability of health

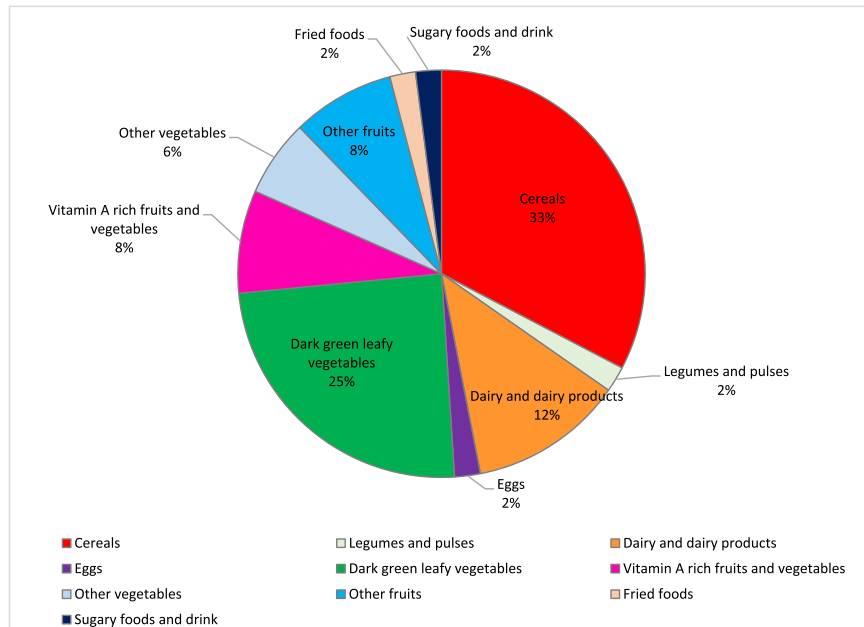


FIGURE 5 Daily food frequency, pregnant women, Nairobi and Uasin Gishu Counties, Kenya (n = 16).

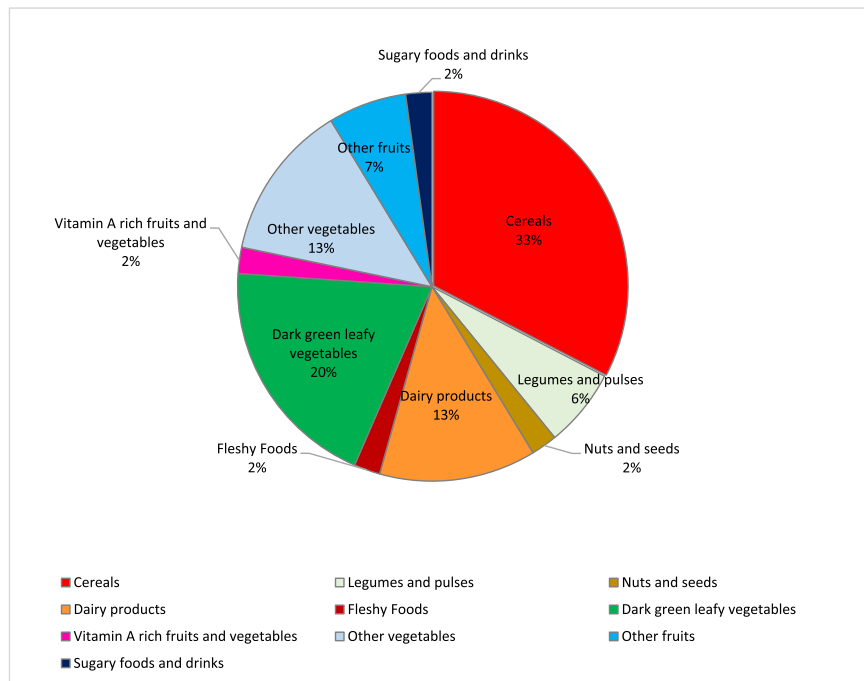


FIGURE 6 Daily food frequency, lactating women, Nairobi and Uasin Gishu Counties, Kenya (n = 16).

services, increased cost or lack of local transport, especially early in the COVID-19 pandemic. Notably, pregnant and lactating women skipped meals and reduced quantity and variety of foods consumed in response to food insecurity, which was fuelled by decreased household income and increased food prices during the pandemic. The food prices were based on the foods that were sold by vendors and were collected during designated period of time during the course of the COVID-19 pandemic, based on food availability, and therefore were not generalizable to the county to county, yet are reflective of the study sites. While most women exclusively breastfed their infants, early confusion among health workers regarding

breastfeeding during COVID-19 translated into separation of COVID-19 positive mothers and infants following childbirth, delayed breastfeeding initiation and early introduction of formula or other liquids before 6 months of age. In addition, our study showed that government-enforced COVID-19 measures alongside fear of COVID-19 infection were major drivers of reduced income for informal sector workers and restricted access to food markets, which was corroborated by other studies in Kenya and Morocco (Ahmed et al., 2021; Demeke et al., 2020; El Bilali et al., 2021; Lau et al., 2021; Oluoch-Aridi et al., 2020; Population Council, 2020b). Evidence from Kenya and Uganda revealed that female informal workers bore the

brunt of COVID-19 income loss, which echoed our findings (Demekle et al., 2020; Kansime et al., 2021; Logan, 2020; Population Council, 2020a; Shupler et al., 2020a). In West, East, and Southern Africa, the prices of perishable food items, such as fruits, vegetables and meat increased, alongside cereals, which most affected poor households, who were more vulnerable to food insecurity and lacked functioning social safety nets (Demekle et al., 2020; El Bilali et al., 2021; Haider et al., 2020; Heck et al., 2020; Jafri et al., 2021; Kansime et al., 2021; Kibe et al., 2020; Oluoch-Aridi et al., 2020; Oni et al., 2020; Shupler et al., 2020b; Workie et al., 2020).

The COVID-19 pandemic disrupted the provision and use of essential MCH services across several sub-Saharan African countries (Agbozo & Jahn, 2021; Ahmed et al., 2021; Nwosu & Oyenubi, 2021). In most African countries, 25% of service disruption persisted into 2021 (WHO, 2022). In Mali, Nigeria, Sierra Leone and South Africa, several studies revealed significant declines in uptake of key maternal health services, including ANC, institutional deliveries and/or PNC during the COVID-19 pandemic (Ahmed et al., 2021; Nwosu & Oyenubi, 2021; Shapira et al., 2021). Specifically, in this study, we observed declines in attendance to ANC reported by health providers, stakeholders and women themselves, which was corroborated by routine health system data (KHIS) that showed reductions in ANC attendance during COVID-19 versus before the pandemic. Similar findings of decreased ANC use during the COVID-19 pandemic were reported in Nigeria, Democratic Republic of Congo, and South Africa, which showed attendance to be consistently lower following government-imposed restrictions in movement versus prepandemic (Ahmed et al., 2021; Hategeka et al., 2021). Reductions in attendance to MCH services were also reported in other studies in Kenya, due to fear of infection and curfews, while data from Ethiopia, Burkina Faso, Uganda, Ghana, Kenya and Nigeria noted lack of transport, increased transport costs, and lockdown orders which disrupted transportation to health facilities and caused higher cost of health services during COVID-19, which rendered access to health facilities unaffordable (Agbozo & Jahn, 2021; Ahmed et al., 2020; Assefa et al., 2021; Burt et al., 2021; Oluoch-Aridi et al., 2020).

Disruptions of essential health services had a negative effect on breastfeeding practices, especially for COVID-19-positive women in this study. Our study findings revealed that at the onset of the COVID-19 pandemic, mother-infant separation was common for suspected or COVID-19-positive mothers. On 13 March 2020, WHO released interim guidance in support of skin-to-skin with their mothers after birth, initiate breastfeeding within 1 h of birth, and rooming-in day and night to encourage frequent breastfeeding, Kenya scored 80% out of 100% on measures recommended by WHO and fared better than other countries as the pandemic progressed (Gribble et al., 2020; World Health Organization, 2020). Our data revealed that initial misperceptions that the COVID-19 virus could be spread through breastfeeding contributed, in part, to the introduction and use of infant formula or sugar-water mixtures and in some cases, early cessation of breastfeeding amongst study participants. This is supported by data from 62 LMICs that showed that 10%–12% facility health workers separated COVID-19-positive mothers from their

infants and were then fed infant formula (Rao et al., 2021). Separation of COVID-19-positive mothers and asymptomatic infants was common among many countries, with rates as high as 56% in Europe and Central Asia, whereas separation occurred in 20% of cases in sub-Saharan Africa (Klingenberg et al., 2021).

Importantly, the absence of lactation support found in this study among COVID-19-positive mothers merits attention, given COVID-19-positive lactating women described being ignored or neglected. The lack of awareness of guidelines may have attributed to this finding, as well as fear of infection from health providers in Kenya. Though the MoH Kenya developed guidance, the majority of health workers reported not being aware of any guidelines on COVID-19 and breastfeeding. A study conducted in Ethiopia showed that slightly less than half of health workers were aware of COVID-19 breastfeeding guidelines that mothers should initiate and continue breastfeeding regardless of their COVID-19 status (Kebede et al., 2021). In this study, stakeholders felt that COVID-19 had a positive impact on the ability of mothers to EBF at home during GoK imposed restrictions in movement.

Beliefs around insufficient production of breastmilk were linked to limited food availability and inadequacies in maternal dietary intake. In a survey of South Africa women, those 'who went to bed hungry' were less likely to breastfeed (Sayed et al., 2021). This study is one of the first exploring the profound impact of the COVID-19 pandemic on dietary quality, meal frequency, and quantity of food consumed by pregnant and lactating women in sub-Saharan Africa. Our data indicate that diets of pregnant and lactating women were limited to carbohydrate-rich foods, such as ugali, or porridge, maize, rice, chapatti with green leafy vegetables. Pregnant and lactating women in Nairobi and Uasin Gishu Counties reported skipping meals, reducing quantity and quality of food consumed (i.e., animal source foods, purchasing ready-made food), and borrowing food or money.

While no data is available specific to reductions in maternal dietary intake in Nairobi's informal settlements, households/families responded to COVID-19 fuelled food insecurity and lower availability of foods by reducing consumption of bread/chapati, meat, fish, milk, milk with tea and cooking less frequently (Shupler et al., 2020b). Previous evidence from Kenya and East Africa shows that families coped with food insecurity by borrowing food or money from friends or relatives, reducing portion sizes, using savings, looking for alternative sources of income and resorting to farming (Jafri et al., 2021; Lau et al., 2021; Population Council, 2020a; Shupler et al., 2020b). Moreover, several studies showed reduced household food consumption and meal frequency which was attributed to economic constraints and increased food prices across other African countries in the region, including Ethiopia, Malawi, Nigeria, Uganda and South Africa (Dasgupta & Robinson, 2021; Quaife et al., 2020). It is also noteworthy that pregnant and lactating women participating in this study relayed they were unable to access mobile money loans, which were provided as part of relief measures during the COVID-19 pandemic as their unemployment and reduction in income, rendered these women ineligible for these loans.

During the COVID-19 pandemic, social protection and social safety nets (i.e., cash handouts) provided by some country governments aided in protecting populations against economic shocks (Ayanlade & Radeny, 2020; Demeke et al., 2020). Yet, our data indicate that social protection programmes largely did not target pregnant and lactating women in Kenya. Few countries have targeted social protection efforts, with the exception of Uganda which provided sugar and powdered milk rations, as well as maize flour, beans and salt (Nathan & Benon, 2020) as part of the COVID-19 response.

5 | STRENGTHS AND LIMITATIONS

The primary strength of this study was the robust data collection with rigorous quality assurance by the study team during the COVID-19 pandemic. In addition, the study collected in-depth qualitative data from 92 pregnant, lactating and COVID-19 women, health providers and stakeholders and attained saturation with regard to the range of beliefs, behaviours and perceptions on topics present in this paper. Collection of in-depth dietary intake information, with information on key nutrient intakes, during pregnancy and lactation would have strengthened and aided in supporting our findings. Importantly, any constraints in movement, during data collection during the COVID-19 pandemic, were lifted during data collection. While the competing priorities among the national, county, subcounty stakeholders and time constraints of COVID-19-positive lactating women, limited our ability to collect all data in-person, importantly this study had face-to-face IDIs with 32 pregnant and lactating women, 2 stakeholders, 6 health workers, 10 CHVs, 2 FGDs with county and subcounty stakeholders, and 6 FGDs with food vendors. Data quality issues were seen in KHIS indicators as initiation of breastfeeding (February 2021 in Nairobi County), and EBF rates in (November 2020 in Uasin Gishu County), exceeded 100%, which pointed to errors in data entry, collation and/or reporting during the COVID-19 pandemic. Food prices data were collected during specific timepoints during the COVID-19 pandemic, and were based on food availability (i.e., foods in stock, and ability of vendors to access these foods) and is not generalizable beyond the specific study sites.

6 | PROGRAMME RECOMMENDATIONS

To rebuild MCH programmes and services in Kenya post-COVID-19, the following actions will be critical in building forward from COVID-19, as part of future pandemic preparedness:

- Provide community-based education to continue provision of maternal newborn and child health services, early on in crises/pandemics, while engaging in essential task shifting, and mobilizing CHVs to address any misperceptions, taboos to prevent disruption of breastfeeding practices and encourage healthcare-seeking behaviours.

- Address awareness, knowledge and skills for pandemic preparedness, through integrated capacity building for health workers and CHVs to support continuation of early initiation, skin-to-skin, rooming-in and EBF, within the context of any misperceptions around breastfeeding that arise for future pandemics.
- Strengthen practical breastfeeding and psychosocial support to mothers with or without COVID-19.
- Support to address meal skipping/reduction in quantity of meals and dietary diversity while emphasizing healthy food choice during ANC and PNC counselling with CHVs through linkages with other nutrition-sensitive sectors.
- Support multisectoral efforts to improve food access and availability, such as through development of household 'backyard' or kitchen gardens through collaboration between the key relevant government ministries to reach pregnant and lactating women in order to increase greater variety of fruits and vegetables in their households and communities.
- Strengthen additional nutrition-sensitive initiatives—such as economic empowerment and gender-based violence initiatives targeting women and their partners/husbands and social protection measures which target pregnant and lactating women as recipients.

7 | CONCLUSION

This implementation study provided information on how the COVID-19 pandemic shaped maternal and infant nutrition practices, through the lens of health and food systems in Kenya. Building back better from COVID-19 requires addressing gaps in capacity building, especially counselling around breastfeeding and maternal diet, supporting community-based education around any misperceptions and taboos that persist due to the pandemic. Moving forward, it will be critical to strengthen nutrition-sensitive measures around economic empowerment for women, targeted social protection and agriculture initiatives to address food insecurity for women and their families.

AUTHOR CONTRIBUTIONS

Brenda Ahoya, Justine A. Kavle and Constance Gathi conceptualized and led the writing of the paper. Brenda Ahoya, Justine A. Kavle, Constance Gathi were involved in pre-testing, data collection, data analyses, data interpretation and writing of the paper. Laura Kiige, Betty Samburu, Lucy Maina, Rose Wambu, Patrick Codjia were involved in design of the study and provided significant input into drafts. Lacey Ramirez carried out data analyses, data interpretation, and contributed to writing of the paper. All authors were involved in the decision to submit the paper for publication. All authors have read and approved the final manuscript.

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CONFLICT OF INTEREST

Team members from Kavle Consulting, LLC were hired for a consultancy with UNICEF Kenya to carry out this study.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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