A comparative trend analysis of maternal and child health service utilization before and during Covid-19 at Dire Dawa administration public health facilities, Ethiopia, 2021

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Research Article

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Abstract

Maternal health refers to the health of women during pregnancy, childbirth and the postnatal period. While child health encompasses health care services ranging from neonatal to under five years old. Evidences has shown that, the presence of Covid-19 has resulted significant disruption in the health service utilization. This study aims to describe maternal and child health service utilization before and during Covid-19 announcement in Ethiopia and forecast 12 months client flow, at Dire Dawa Public Health Facilities. We used Interrupted time series analysis to examine two years trend of maternal and child health service utilization. The interruption point was set be Covid-19 announced to Ethiopia. Data was extracted from client registers. Kobo toolbox was used to collect the data. Microsoft Excel and statistical package for social sciences version 26 were used for data management and analysis. Traditional Expert Modeler and one way ANOVA were used for data analysis. Findings are presented in tables, means, point percentages, time line plots and sequence charting. A total of 34,576 client registers were reviewed, where 17,100 (49.5%) and 17,476 (50.5%) had visited the MCH service before and during Covid-19 announcement in Ethiopia respectively. Total services utilization has shown a steady fall during the interruption point. Family planning, Institutional delivery, and child immunization has shown sharp fall during Covid-19 announcement to Ethiopia. Though the total client visit has shown an increase in percentage point of 2%, postnatal care and child immunization has shown 30% and 16% percentage point drop respectively. The total client visit has shown a difference in client visit before and during the time of covid-19 ($f=4.6$, $p<0.4$). It is evidenced that maternal and child health services are highly impacted by the presence of covid-19, where family planning, institutional delivery, and child immunization has shown sharp fall. Forecasting to the next 12 months has also shown no promising improvement in service visits. Hence the health system should mobilize the work force and resources to the lower service delivery inlet, health post, and directs its approach to community-based service to access missed mothers and children who had not come to facility.

Introduction

Maternal health refers to the health of women during pregnancy, childbirth and the postnatal period. Each stage should be a positive experience, ensuring women and their babies reach their full potential for health and well-being (1) . Maternal health components include family planning, antenatal care, delivery, and postnatal care services. And, key child health indicators include vaccinations of young children, nutritional status as assessed by anthropometry, and infant feeding practices (2) . Furthermore, protecting and improving the health of children is of fundamental importance and crucial component of maternal and child health (3) . A large proportion of maternal and neonatal deaths occur during the first 48 hours after birth. Thus, prompt postnatal care (PNC) for both the mother and the child is important to treat any complications arising from the delivery, as well as to provide the mother with important information on how to care for herself and her child (2) .

With the current pandemic, Covid-19, the health service utilization has dropped highly as evidenced by a number of studies across the globe, where clients have canceled their appointment and showed decreased health care seeking behavior (4–6). Timothy Roberton and his colleagues has modeled the effect of Covid-19 on 118 low and middle countries and present shocking new evidence on the potential rise in maternal and child mortality if essential health services are disrupted as a result of Covid-19. Building on lessons learned from previous outbreaks of Ebola virus disease and severe acute respiratory syndrome (SARS), the authors estimate a devastating increase in the numbers of maternal and child deaths resulting from reductions in routine health service coverage (4) . *With the current pandemic, Covid-19, majority of services provided at health facilities were impeded.* The results of recent key informant pulse survey showed that disruptions of essential health services have happened in nearly all responding countries, and more so in lower-income than higher-income countries. A wide range of services are affected, including essential services for communicable diseases, non-communicable diseases, mental health, reproductive, maternal, newborn, child and adolescent health, and nutrition services (5,6) . *The Covid-19 pandemic has jeopardized hard-won gains in women's, children's and adolescent health. Though women and children are at less risk from the virus itself, the knock-off effects—such as limited access to vaccines and sexual and reproductive health resources—are projected to do immense harm* (7,8) *.*

The Covid-19 pandemic, which requires a shift in resources (budget, health workforce, facilities, logistics and supplies, etc.), threatens to overburden the health system and reverse gains in MNCH outcomes. Covid-19 has also affected health-seeking behaviors. Families and communities who fear becoming infected at health care facilities and may have limited transport options are less likely to use essential health services (10–12). Ethiopia has one of the world's highest rates of maternal deaths in the world. Women have a one-in-52 chance of dying from childbirth-related causes each year. Every year, more than 257,000 children under the age of five and 120,000 neonates die in Ethiopia. More than 60 percent of infant and 40 percent of under-five deaths in Ethiopia are neonatal deaths (9) .

Impacts of Covid-19 on Maternal and Child Health Service Utilization:

WHO has assessed the effect of Covid-19 on 155 countries during a three-week period of May 2020. The findings revealed that health services have been partially or completely disrupted in many countries (6) . Similarly, a disruption in heath service has also seen from a global study conducted on 63,000 health facilities by the Global Financing Facility, where essential health, MCH services in low-income countries are disrupted by the presence of Covid-19. Substantial difference in services was observed on outpatient visits, vaccination for young children, pregnant women and new born care as well as skilled deliveries in several countries (8) .

A study conducted to assess the effect of MNCH service utilization at Bangladesh, Nigeria and south Africa revealed that a decline in formal ANC attendance during April and May 2020 in comparison the same months of 2019. Similarly, family planning and child immunization service has shown reduction in attendance. Specifically, a reduction in vaginal delivery and cesarean section has observed at Bangladesh, where it was mixed at South Africa and Nigeria. Lockdown enforcements and related measures as well as in availability of protective measures for the health work force were attributable factors (10) .

A retrospective study conducted at Nepal has shown a reduction in antenatal care and normal delivery service utilization at the beginning of Covid-19 lockdown, while an increase was observed through time. The patterns of cesarean section and permanent family planning methods has shown a mixed trend. While the use of temporary family planning methods and immunization service has shown increments through time (11) . A prospective observational study conducted at India has shown a reduction in institutional deliveries associated with a 7.2 percentage point increase of high-risk pregnancies. Similarly one third of pregnant women had inadequate antenatal care follow-up (12) . Another comparative study conducted in India shown an overall decrease across all maternal and child health services with a 2.26%, where antenatal care service was highly affected with 22.9% reduction, followed by immunization service with a 20% service reduction (13) .

A multi-nation multi-site study done in eight sub-Saharan countries revealed a disruption in health service utilization in all countries during the time of covid-19 for at least one month, where the magnitude and duration varies across the nations. There, child vaccination service was the most affected service point. Whereas, there was a fall in maternal health service utilization, it could not be generalized to all. However, there observed a significant decline in institutional deliveries, antenatal and postnatal care service in some countries (14) . A four-month comparative study done in Kenya revealed, no difference in RMNCAH attendance in the first two months of covid-19, at the service points of antenatal care, hospital births, family planning attendance, post abortion care and pentavalent 1 immunization. However there observed an increasing trend in adolescent pregnancy, family planning utilization among young people, injectable family planning methods uptake, and cesarean section rate (15) . A study in Rwanda extracted 30 districts MCH data from March -April 2019 to compare with the same months of 2020 to account seasonal variation, if there exist any change in service utilization due to covid19. Results has shown, a significant decrease in antenatal care, institutional deliveries, postnatal care and child vaccination (16) . In a comparative study done in the district of KwaZulu-Natal South Africa, to assess the impact of covid-19 in routine child health services, a fall in immunization service was observed earlier where there observed a rapid recovery. While Vitamin A supplementation remained low in the covid-19 era. Likewise, the study concluded, there was observable disruption in multiple service indicators to service access, service delivery and child well-being (17) . A mixed method comparative study done in Mozambique has also verified a fall in family planning visits, c-section, hospital deliveries, and children vaccination (18) .

A qualitative study conducted in Ethiopia has revealed covid-19 has impacted antenatal care service utilization (19) . Another, four-month comparative study done at governmental health facilities in Ethiopia, shown a reduction mean utilization of antenatal care, family planning, and new born immunization. While an increase in teenage pregnancy and abortion, institutional still birth, and neonatal death was observed in similar period of

comparison (20) . Similar study conducted at Dessie town, indicated a fall in service utilization of antenatal care, delivery and postnatal care attendants (21) . A mixed method comparative study was done to evaluate essential health and nutrition services in four selected regions of Ethiopia; Amhara, Oromia, SNNPR and Tigray. Key informants from health care facilities indicate a reduction in service delivery and utilization. An evaluation in the trends of maternal nutrition and health service utilization in the months of March to July 2019 and 2020 has shown a moderate drop in facility delivery, Antenatal care. While a significant fall was observed in Vitamin A supplementation, and, infant and young child feeding services. Whereas, minimal difference was observed in other child health services (22) . According to the study conducted by JSI L10K project on 96 health facilities in Ethiopia, showed that first antenatal attendance and under-five pneumonia treatment decreased by 12% and 35%, respectively in April 2020 compared to the previous eight months' average performance (23) .

Studying the effect of Covid-19 on MCH services utilization trend can help us understand to what extent Covid-19 has affected the health service utilization in the study area. Low service utilization further jeopardizes the fragile health system to cope with maternal and child health services, which leads to covert maternal and child mortality as a result of poor family planning service access, home deliveries, increased burden of vaccine preventable diseases and nutritional deficiency disorders. Furthermore, the study specifies which service unit has impacted highly and forecasted next twelve months of service utilization. Hence it will potentially inform program managers the effect of covid-19, help to strategically direct the work force and resources to improve client flow, and service coverage, as well as intensify targeted health communication and amend potential pressing factors to revive MCH service utilization.

Therefore, the main aim of this study is to describe maternal and child health service utilization before and during covid-19 announcement to Ethiopia, in Dire Dawa administration public health facilities in 2020.

Methods And Materials

The study was conducted in Dire Dawa Administration, where it is found at Eastern Ethiopia, 505 KM from the capital, Addis Ababa. As of 2012, Dire Dawa has 506,936 total populations, where 49% are males and 51% are females, of which 26.1% were reproductive age, and 14.25 were under five years of age. Dire Dawa has 15 Public Health Centers and 2 Public Hospitals, where each facility provides Maternal and Child Health Services. **Data was collected from Feb 01 to March 13, 2021.** Interrupted Time Series Analysis was employed. The interruption point considered was March 12, 2020, we took twelve months before and after from the mid-point for comparison. Randomly selected five public health centers and one public referral hospital was included in the study. Register logs were used to extracted mothers and children records who came to family planning, antenatal care, delivery, postnatal care and child immunization services. All records with in the two years period were included in the study. Structured check list was developed by consulting national register logs. The tool has two sections, the first section captures the facility, service entry point, and period selection. While the second section captures information

related to client demographics, and service utilization characteristics. Data Collection instrument was developed using Kobo toolbox. The tool was deployed to data collectors after testing instrument completeness and validity. Trained midwives working at the selected facilities were used for data collection. All the necessary precautionary measures were considered while supervision and communication with the study team. Collected data was then exported to MS Excel for data clearance and exported to SPSS V26 for analysis. Descriptive findings are reported in frequencies, means and percentages. While the data was examined for its trend, effect of interruption, and forecasted through Time Series Traditional Expert Modeler Method. Total client visit to the facilities and specific service utilization trends were observed through sequential charting, service utilizations were forecasted, and plotted against fit and forecast lines at 95% confidence interval, where stationary R Squared was considered to describe level of prediction. Percentage point was used to compare the effect of Covid-19 on maternal and child health service utilizations. One way ANOVA was computed to see if there is a difference in client's attendance trend in the two categories of periods. The proposal had provided ethical clearance from Dire Dawa university research ethics review committee to be communicated for the administration health bureau and facility heads.

Results

Maternal and Child Health Service records were extracted since March 10/ 2019 to March 09/ 2021, where March 12/ 2020 was considered as the interruption point. A total of 34,576 data were extracted from six facilities, where 49.5% (17,100) visits were made before Covid-19 occurrence to Ethiopia (March 10/2019- March 09/ 2020), while 50.5% (17,476) visits were made during the time of Covid-19 (March 10/2020 – March 09/2021) (Table 1).

Accordingly, about half of the visits were made to Child Immunization 25.1% (8,663) and Family Planning Services 24.7% (8552), while the least visit was made to Postnatal Care Services 8.1% (2,817) (Table 2).

Trend Analysis and Forecasting:

Date and time were initially defined to time series data for Year and Month, with 12 Months periodicity. Then fit to traditional models, expert modeler to describe and forecast the next 12 months client visit.

There is an observable fall in the total maternal and child service utilization during the time of covid-19 announcement to Ethiopia. The service utilization has shown improvement after six months, around August to September 2020, though followed by a sharp fall in October 2020. The total service utilization forecast shows no exceptional improvement in client flow in the next 12 months (Figure 1). The model has explained 82.4% of the prediction (Table

3). Similar trend was observed in Family planning service utilization during covid-19 announcement in Ethiopia. However, a steady increase was observed immediately after a month and reaches to its peak in August 2020, and lower peak was observed on March 2021. The forecast in family planning service shows relative improvement since the previous 12 months (Fig. 1). The model predicted the service utilization to 87.3%. ANC service utilization has shown insignificant fall during covid-19 announcement, and the trend shows steady increment throughout the covid-19 period and in the 12 months of prediction. The model predicted 84.3% of ANC client utilization. Delivery service utilization has kept its lower trend since the month of September 2019, where a steady rise observed from June 2020 and reached to its peak in September 2020 followed by a sharp fall in December 2020. The forecast shows mixed presentation, however there is no promising improvement in the following 12 months service utilization. The model we used predicted delivery service trend to 82.4%. Trends in postnatal care service shows no observable change throughout the study and prediction period, keeps its momentum below 250 clients visit per month. The model we used predicted 78.3% of postnatal care service utilization. Following covid-19 announcement, child immunization service has shown a sharp fall to is lower peak in the month of April to May 2020. Then follows a mixed trend with 200 – 400 client visits per month, where the peak in the prediction period is 300 to 150 visits per month. The model has predicted 87.1% of child immunization service flow.

Interrupted Time Series Analysis:

The two-year trend was observed in sequence charting, and observed a general fall in service utilization around covid-19 announcement to Ethiopia. However, improvements were observed after five months, followed by a sharp fall after a month, and kept its previous momentum of the same comparing season (Fig. 2).

Then data were explored to examine the effect of Covid-19 on service utilization change in percentage point and percentage. Total client visit has 2% increment during the time of covid-19 announcement in Ethiopia. Similarly, a 6% percentage point increase in family planning service utilization, 26% percentage point increase in delivery service utilization, and 17% percentage point increase in antenatal care service utilization was observed. However, a 30% and 16% percentage point reduction was observed on postnatal care and child vaccination service utilization (Table 5).

One way ANOVA was then computed to examine whether there exists a significance difference in the mean visits of each service and the total service visit. Accordingly, antenatal care service utilization has shown a significant difference in service visits among the comparison periods ($f(1,22) = 4.60$, $p = 0.043$) (Table 6).

Discussion

It is observed that there is a disruption in the MCH service delivery at the study area during Covid-19 announcement to Ethiopia and around. This is supported by evidences from WHO study and global financing, where majority of health services were disrupted, where essential health services like MCH were highly affected due to covid-19 presence (6,8,13,14,17,18). This may be attributable to fear and anxiety to the new pandemic due to social and mainstream media predisposition, and nationwide impacted prevention protocols limiting movements and closure of some facilities and transport system disruption, as well as the health system resilience in low and resource limited countries like Ethiopia.

Postnatal service has shown a sharp fall since the declaration of Covid-19 to Ethiopia. Studies done at Rwanda, South Africa and Ethiopia, had similar finding that postnatal care service had shown significant decrease following the months of Covid-19 announcement. (14,17,21). The routine trend, where PNC is not considered as part of the routine Delivery care in addition to the existing anxiety to global pandemic and social predistortions may be considered as the pressing factors for the decreased service utilization.

Observable fall was observed in family planning service in the study facilities, since Covid-19 announcement in Ethiopia for consecutive three months. This finding is in congruent with other studies where a fall in Family planning service was observed at Bangladesh, South Africa and Nigeria (10), Mozambique (18), Ethiopia (20). Where the fall is attributable to similar reasons that people were suffer from fear and anxiety about the disease and multifaceted protective measures taken by local authorities, that had limited movements. However, another study has shown an increase in short term and injectable family planning utilization by adolescents during the time(15). Where adolescents were exposed to sexual practice, abuse and violence due to the lockdown and school closures.

In the study facilities, delivery was decreased before and after covid-19 announcement for a period of four months. This finding is highly supported by findings ranging from global studies to Asian, Sub-Saharan African nations and Ethiopian studies. Where the studies had observed significant fall in facility delivery during the time of covid-19 in their respective countries (8,10–12,14,16,18,21,22). The fall in facility delivery could be attributed to Covid-19 announcement and related social and family reinforcements, available strong social

values encouraging home deliveries might be pronounced by the poor health system resilience to maintain mothers in the service continuum.

The study has shown a very sharp fall in child immunization service, observed a month after Covid-19 announcement to Ethiopia. Similarly, the service utilization has shown a fall when compared to similar periods of the previous year. Fall in child immunization service since Covid-19 announcement had also reported from several studies including a global study conducted on 63,000 health facilities (8), Multi Nation study conducted at Bangladesh, Nigeria and South Africa (10), India (13), study conducted in Sub-Saharan African nations(14), Rwanda(16), Mozambique (18) and a multi-regional stud conducted in Ethiopia (22), has revealed similar findings. Like that of the previous, comparable reasons might contribute to the fall in child vaccination services.

In the current study, antenatal care service has fallen while covid-19 was announced in Ethiopia, whereas there is a moderate rise in the service use. This finding is in congruent with the Nepal and Kenya studies where a fall in ANC service was observed on the first two months (11,15). However, other studies has also proved that ANC was highly impacted by covid-19 presence (16,19–21).

Conclusion

It is evidenced that maternal and child health services are highly impacted by the presence of covid-19, where some services has shown a significant fall; Family planning, institutional delivery and child immunization. The Forecasting done to visualize the next 12 months of MCH service utilization does not indicate an improved trend, which shows there will be a continuation in service fall priorly to child immunization, delivery and family planning services. This implicates that, there were high proportion of missed mothers, who were supposed to follow ANC, and had facility delivery, children who did not started their vaccination at the right time, and possibility of unplanned or unwanted pregnancies due to decreased service utilization as related to covid-19.

Hence, the health system should strengthen and mobilize the workforce to the lower service delivery inlet, health post, and direct its approach to community outreach service to access children in the range of vaccination age, pregnant mothers and women in need of family planning services.

Declarations

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Tables

Table 1: Client facility visits for MCH services, before and during Covid-19 at Dire Dawa Administration, 2020.

Facility	Before Covid-19	During Covid-19	Totals
Addis Ketema HC	1,794 (49.4%)	1,836 (50.6%)	3,630 (10.5%)
Dechatu HC	2,065 (47.7%)	2,264 (52.3%)	4,329 (12.5%)
Gende Gerada HC	2,964 (49.6%)	3,013 (50.4%)	5,977 (17.3%)
Gende Kore HC	2,518 (48.9%)	2,628 (51.1%)	5,146 (14.9%)
Jelo Belina HC	1,665 (52.5%)	1,504 (47.5%)	3,169 (9.2%)
Dil Chora Hospital	6,094 (49.4%)	6,231 (50.6%)	12,325 (35.6%)
Mean Service Visit	**1425.0**	**1456.3**	
Totals	**17,100 (49.5%)**	**17,476 (50.5%)**	**34,576 (100%)**

Table 2: Client visits to MCH services, before and during Covid-19 at Dire Dawa Administration, 2020.

MCH Services	Before Covid-19	During Covid-19	Totals
Postnatal Care	1,657 (58.8%)	1,160 (41.2%)	2,817 (8.1%)
Family Planning	4,152 (48.6%)	4,400 (51.4%%)	8,552 (24.7%)
Delivery	3,053 (44.2%)	3,861 (55.8%)	6,914 (20%)
Child Immunization	4,716 (54.4%)	3,947 (45.6%)	8,663 (25.1%)
Antenatal Care	3,522 (46.2%)	4,108 (53.8%)	7,630 (22.1)
Totals	**17,100 (49.5%)**	**17,476 (50.5%)**	**34,576 (100%)**

Table 3. Time series model statistics for MCH service utilization trend before and during covid-19 at Dire Dawa Administration, Ethiopia 2020.

Services Models	Stationary R-Squared	df	Significance
Family Planning Service	.873	16	.257
Antenatal Care Service	.843	15	.020
Delivery Service	.824	16	.006
Postnatal Care Service	.783	16	.198
Child Immunization Service	.871	15	.015
Maternal and Child Health Service (Total Visit)	.824	16	.017

Table 4 is available in the supplementary files section.

Table 5: Impact of Covid-19 on MCH service utilization before and during Covid-19 at Dire Dawa Administration, Ethiopia, 2020.

Services	0 Client Visit Means $_0$	1 Client Visit Means$_1$	Percentage Point Mean $_1$ - Mean $_2$	% (PP/Means $_0$) x100%
Postnatal Care Service	138.1	96.7	-41.4	-30%
Family Planning Service	346	366.7	20.7	6%
Delivery Service	254.4	321.8	67.4	26%
Vaccination Service	393	328.9	-64.1	-16%
Antenatal Care Service	293.5	342.3	48.8	17%
MCH Service (Total Visit)	1425	1456.3	31.3	2%

Table 6. One way analysis of variance for antenatal care by service utilization periods, before and during covid-19, at selected health facilities of Dire Dawa Administration, Ethiopia, 2020.

Source	df	SS	MS	f	p
Between groups	1	14308.17	14308.17	4.601	0.043
Within groups	22	68421.67	3110.08		
total	23	82729.83			

Figures

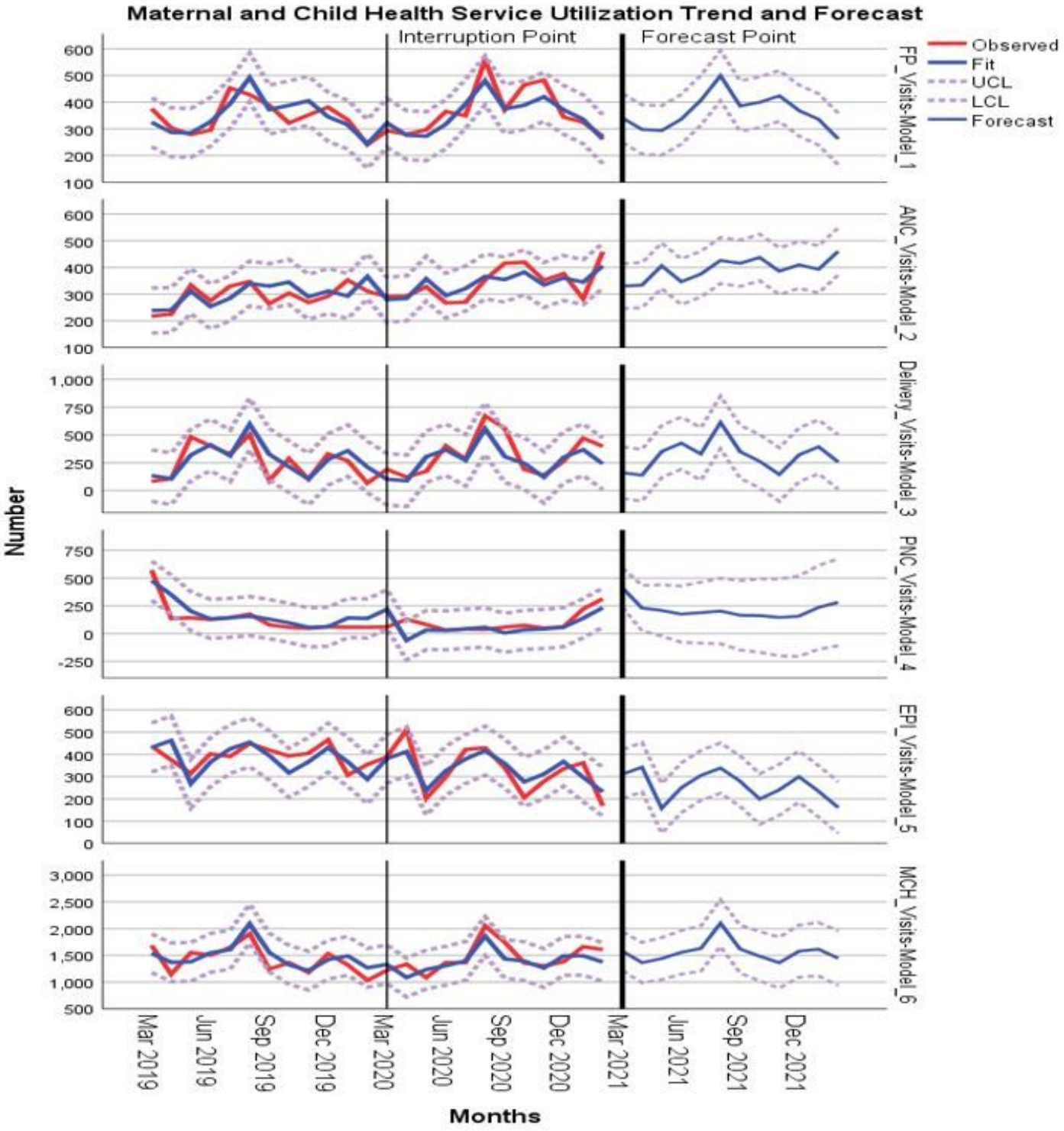

Figure 1

Maternal and child health service utilization trend and forecast, before and during the time of Covid-19 at selected health facilities of Dire Dawa Administration, Ethiopia 2020.

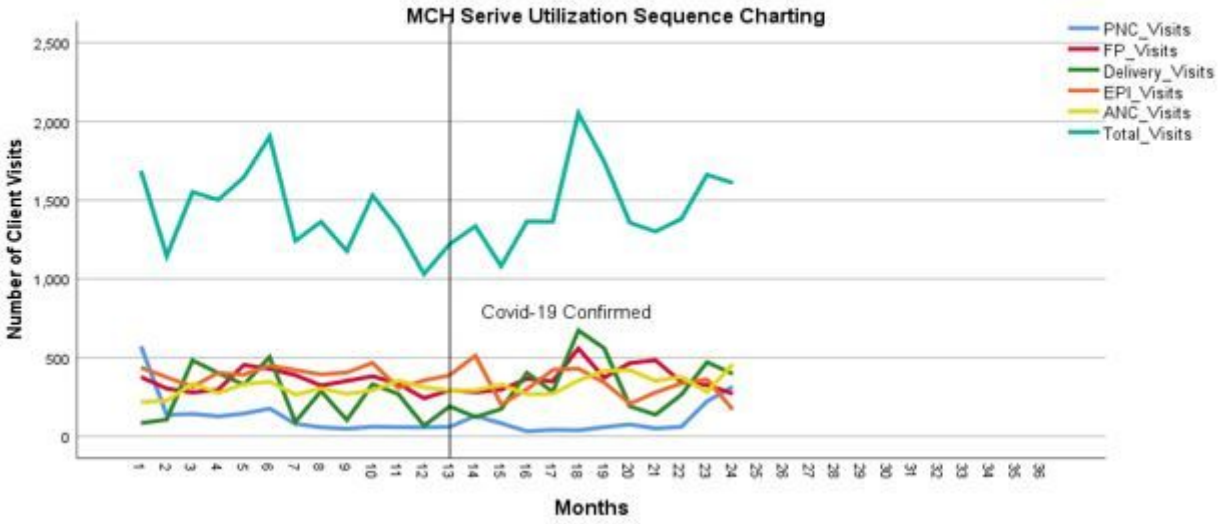

Figure 2

Sequential Chart Plotting of MCH service utilization before and during the time of Covid-19 at selected health facilities of Dire Dawa Administration, 2021.

Supplementary Files

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- Table4.docx