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Seasonal and Periodic Changes in the Mode of Child Delivery: A Time Series Study at Federal Medical Centre, Jalingo

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Abstract
This study examines seasonal and periodic fluctuations in the modes of child birth especially spontaneous vaginal delivery (SVD), planned cesarean section (CS), and emergency CS—at the Federal Medical Centre (FMC), Jalingo, Nigeria, using a ten-year monthly dataset (2015–2024). Employing a time series analytical framework in STATA 15, the study utilized Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to confirm stationarity and applied Vector Autoregression (VAR) to assess interdependencies among delivery modes. Descriptive analysis revealed marked seasonal variations: SVD peaked in February (mean = 9.89) and November (mean = 10.00), planned CS recorded its highest average in July (mean = 11.68), and emergency CS exhibited a major spike in March (mean = 11.26; maximum = 50 cases). ADF and PP results indicated all series were stationary ($p < 0.001$). The optimal model (Lag 1) was selected based on AIC and FPE criteria. VAR estimates demonstrated strong autoregressive and cross-sectional effects: prior SVD significantly predicted current SVD ($\beta = 0.3739$, $p < 0.001$), while prior emergency CS strongly predicted planned CS ($\beta = 0.2349$, $p < 0.001$). Additionally, emergency CS was influenced by prior SVD ($\beta = 0.1988$, $p = 0.004$) and planned labor stimulation ($\beta = 0.2151$, $p = 0.006$). Model diagnostics confirmed robustness, with no residual autocorrelation ($p = 0.379$). These findings highlight the influence of cultural, climatic, and institutional factors on delivery trends, offering actionable insights for maternal healthcare planning, resource allocation, and emergency preparedness. Strategic scheduling and preventive interventions during high-demand months are recommended to optimize obstetric care.

Keywords: Seasonal Variation, Cesarean Section, Vaginal Delivery, Time Series Analysis, Maternal Health

Introduction

Giving birth is still one of the most important life events, and the way it is delivered—by cesarean surgery (CS) or spontaneous vaginal delivery (SVD)—has a big impact on the health of the mother and the baby. The temporal patterns of childbirth, particularly the impact of seasonal and periodic fluctuations on delivery trends, have received increased attention in recent years. These differences have been linked to variables like maternal health, infectious illnesses, climate, and access to healthcare (Chauhan et al., 2015; Zhang et al., 2020). Understanding the temporal trends in birthing becomes essential in developing nations like Nigeria, where healthcare facilities are not fairly dispersed and are frequently impacted by seasonal issues like flooding or dry-season sickness. Studies have shown that variations in temperature, humidity, and rainfall can significantly affect pregnancy outcomes and the decision for cesarean delivery (Bruckner et al., 2007; Adedokun et al., 2018). For instance, higher incidences of cesarean sections have been reported during rainy seasons in some regions due to an increase in pregnancy-related complications and limited access to health facilities (Okonofua et al., 2009). Complete maternity and newborn care services are offered at the Federal Medical Centre (FMC) Jalingo, which is situated in northeastern Nigeria. However, seasonal change presents special issues for it, as it does for many other healthcare facilities in tropical environments. Taraba State experiences a range of climate variations, from intense rains during the wet season to intense heat and dryness during the dry season, which might have an effect on birth decisions and mother health. Planning for healthcare, allocating resources, and being ready for emergencies can all benefit from an analysis of the seasonal and periodic trends in the manner of delivery. According to Box et al. (2015), time series analysis provides a statistical method for comprehending these

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patterns throughout time, assisting in the identification of cycles, trends, and possible forecasting models. By evaluating delivery data from FMC Jalingo, this study seeks to uncover any existing cyclical or seasonal behaviors in childbirth modes, contributing to a data-driven approach to maternal health service delivery in the region.

According to anecdotal evidence, the number and kind of deliveries at the Federal Medical Centre (FMC), Jalingo, a significant referral hospital in Taraba State, fluctuate with the months and seasons. However, there isn't enough scientific data or research to determine if these variances are merely fortuitous or statistically significant. This lack of knowledge makes it more difficult for healthcare planners to schedule employees effectively, distribute resources effectively, or carry out programs meant to improve mother and child health outcomes all year long. Additionally, knowing whether delivery options are influenced by seasonal variations, agricultural cycles, or climatic conditions (such as wet or dry seasons) may offer important insights into patient behavior and the reactions of the healthcare system. For instance, seasonal changes may impact transportation, access to care, or even prompt elective CS to avoid delivery during less favorable times (Goldenberg et al., 2008; Oladapo et al., 2010). Failure to recognize and plan for these variations could strain the hospital's maternity services during peak periods or lead to underutilization during low periods.

Although the number of caesarean deliveries in Nigeria is rising (Fapohunda & Orobaton, 2014), little is known about the underlying seasonal dynamics and temporal trends. This gap can be filled by using a time series method to investigate seasonal and periodic changes in births, providing evidence-based insights to guide the development of policies and the provision of services at FMC Jalingo and other comparable settings. In the end, recognizing seasonal differences in delivery trends will help policymakers and healthcare professionals create adaptable plans to lower risks to mothers and newborns, guarantee effective staffing at busy times, and enhance the standard of obstetric care throughout the year. This research work is limited to the data obtained on the number of deliveries for the period of ten years (2015-2024) at the Federal Medical Centre Jalingo and the data was analyzed with the STATA version 15 software in order to investigate the rate of CS incidence in Federal Medical Centre (FMC), Jalingo, Taraba State, Nigeria. The mode of child delivery, primarily classified into vaginal delivery and cesarean section (C-section), can be influenced by several factors including medical, socio-economic, environmental, and seasonal determinants. Researchers have increasingly turned attention toward how seasonal and periodic patterns affect childbirth practices, revealing nuanced relationships between time of year and delivery modes.

Significant seasonal differences in the frequencies of vaginal and cesarean deliveries have been documented in a number of studies. These seasonal patterns are frequently associated with holidays, weather patterns, and cultural customs. For example, a study by Katz et al. (2011) found that the rates of cesarean sections were greater in the winter, and they attributed this pattern to higher rates of pregnancy problems like infections and gestational hypertension during the colder months. In a similar vein, Liu et al. (2019) looked at birth records from a number of years in China and found that the number of cesarean deliveries peaked in the summer, possibly as a result of hospital resource management and the scheduling habits of medical staff. This finding supports the theory that institutional procedures and physician convenience, among other non-medical considerations, could influence the time and approach. Beyond seasonal variations, periodic and day-of-week patterns also influence delivery modes. A notable pattern identified in the literature is the "weekend effect", where planned cesarean deliveries are significantly less likely to occur on weekends compared to weekdays (Abenhaim et al., 2008). This periodic variation suggests that scheduled (elective) cesarean sections are often aligned with the working days of healthcare professionals. Macfarlane et al. (2015) also reported monthly fluctuations in birth patterns, with a higher frequency of births observed towards the end of the month. They associated this trend with obstetricians' attempts to schedule deliveries conveniently, particularly elective C-sections and inductions.

The mode of delivery is also influenced by seasonal changes in disease frequency and environmental exposures. For instance, respiratory illnesses that are widespread in the winter months can raise the likelihood of problems that require a cesarean delivery, according to research by Parazzini et al. (2003). Additionally, severe temperatures both hot and cold have been linked to poor maternal health outcomes, which may have an impact on the choice to have a cesarean delivery (Basu et al., 2010).Cultural preferences and socioeconomic conditions also interact with seasonal trends. In some regions, specific times of the year are considered auspicious for childbirth, prompting an increase in scheduled cesareans to align with religious or cultural festivals (Chung et al., 2011). In lower-income settings, accessibility to healthcare facilities due to weather-related disruptions (e.g., flooding during rainy seasons) may limit the availability of elective procedures, influencing a higher rate of unplanned vaginal deliveries (Onwuhafua et al., 2012).

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Material and methods

This study adopts a time series research design aimed at examining seasonal and periodic variations in the mode of child delivery (vaginal vs. cesarean section) at the Federal Medical Centre, Jalingo. The design facilitates the analysis of temporal patterns, fluctuations, and trends in child delivery modes over a specified time frame, providing insight into recurring cycles and systematic variations. The study is conducted at the Federal Medical Centre (FMC), Jalingo, located in Taraba State, Nigeria. The hospital serves as a tertiary healthcare institution providing maternal and child healthcare services across the state and its environs. The target population comprises all recorded deliveries (vaginal and cesarean) at FMC Jalingo over the study period. These records are maintained in the hospital's Obstetrics and Gynaecology Department. The study employs a census sampling technique, utilizing secondary data covering all deliveries recorded from January 2015 to December 2024 (a 10-year period). This full enumeration is essential to maintain the time series structure of the data and allow for robust seasonal and trend analysis. The study relies exclusively on secondary data collected from: Monthly delivery registers. Medical records and hospital information system databases at FMC Jalingo. Departmental annual reports. Data extracted includes:

- Monthly counts of vaginal deliveries
- Monthly counts of cesarean deliveries
- Total deliveries per month

A data extraction form is designed to collect relevant information from the medical records. Prior to data collection, ethical approval is obtained from the hospital's research ethics committee. Data clerks and researchers are trained on accurate extraction procedures to minimize errors. The data will be analyzed using time series analytical techniques to identify trends, seasonal patterns, and cyclic behavior in the mode of delivery. The following statistical methods will be applied: Descriptive Statistics (mean, standard deviation, frequencies). Time Series Decomposition (into trend, seasonal, and irregular components). Autocorrelation and Partial Autocorrelation Functions (ACF & PACF) to examine periodicity. ARIMA Modeling (for forecasting and model fitting).

Results

Descriptive Analysis

Table 4.1: Descriptive Analysis of spontaneous vaginal delivery (SVD), planned cesarean and emergency cesarean cases

Cases	Observations	Mean	Standard deviation	Minimum	Maximum
Spontaneous Vaginal Delivery (SVD)	228	8.2982	5.8383	0	40
Plan Caesarean Section (CS)	228	9.9517	5.2465	0	36
Emergency cesarean	228	8.6096	6.2228	0	50

Each delivery type (SVD, Planned CS, Emergency CS) has data from 228 cases. Variation (standard deviation) is 5.84, indicating a moderate spread of cases around the mean. Standard deviation is 5.25, slightly lower than that of SVD, suggesting a bit less variability. Highest standard deviation at 6.22, indicating more variability in emergency cesarean occurrences. Planned cesarean sections are the most frequent on average, while emergency cesarean cases show the highest variability and widest range.

Table 4.2: Monthly descriptive statistics of spontaneous vaginal delivery

Month	Mean	Standard deviation	Minimum	Maximum
January	5.6842	3.84495	0.00	14.00
February	9.8947	9.05474	1.00	40.00
March	9.5263	6.10436	2.00	27.00
April	8.3158	5.62783	0.00	18.00
May	7.3158	5.41657	1.00	19.00
June	9.3684	5.37701	1.00	19.00
July	8.5789	7.32056	1.00	31.00
August	8.7368	4.71218	3.00	17.00
September	7.0000	4.06885	1.00	13.00
October	7.7895	6.17863	0.00	17.00
November	10.0000	5.13160	0.00	21.00

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December	7.3684	5.38734	1.00	20.00

The data shows seasonal fluctuations in spontaneous vaginal deliveries. Some months like November, February, and March have higher average deliveries, possibly indicating seasonal trends or healthcare service utilization patterns. In contrast, January and April recorded lower averages and even zero occurrences at times, which might be due to external factors such as holidays, staffing issues, or cultural practices. The variations also imply that health facilities may need to plan for more resources and staff in months with higher delivery rates.

Table 4.3: Monthly descriptive statistics of planned cesarean

Month	Mean	Standard deviation	Minimum	Maximum
January	11.0000	4.33333	3.00	19.00
February	8.6316	5.05756	1.00	19.00
March	10.2105	4.55313	.00	17.00
April	9.2632	6.91891	.00	26.00
May	10.4211	4.86844	1.00	20.00
June	9.3158	6.02820	.00	21.00
July	11.6842	7.40910	2.00	36.00
August	11.0000	3.97213	3.00	17.00
September	8.7895	5.00643	1.00	18.00
October	10.8947	4.20178	3.00	18.00
November	8.6842	4.76157	1.00	17.00
December	9.5263	5.02625	2.00	21.00

Table 4.3: Monthly Descriptive Statistics of Planned Cesarean presents summary statistics on the number of planned cesarean sections (C-sections) conducted each month. The descriptive statistics include mean, standard deviation, minimum, and maximum values across multiple years or observations. The highest average planned C-sections occurred in July (11.68), while February (8.63) and November (8.68) had the lowest. April and July showed the highest variability, indicating some months can be unpredictable or have unusual spikes in planned procedures. Zero planned C-sections occurred in March, April, and June, which could suggest either low demand or availability issues. July's maximum value (36) is a clear outlier and may indicate a special circumstance, such as an influx of patients or a shift in hospital policy

Table 4.4: Monthly descriptive statistics of emergency cesarean

Month	Mean	Standard deviation	Minimum	Maximum
January	10.6842	5.22869	2.00	20.00
February	8.8947	6.23516	1.00	26.00
March	11.2632	10.61886	.00	50.00
April	8.7895	9.29503	.00	40.00
May	7.5263	5.14639	1.00	19.00
June	8.4737	4.82319	1.00	20.00
July	8.7895	4.99532	1.00	18.00
August	6.4211	4.15419	.00	14.00
September	10.1053	5.31136	1.00	19.00
October	7.2105	5.19165	.00	19.00
November	6.5263	4.99298	.00	17.00
December	8.6316	4.84436	.00	17.00

Table 4.4: Monthly Descriptive Statistics of Emergency Cesarean provides a summary of emergency cesarean section (CS) cases on a monthly basis, using four statistical measures: Mean, Standard Deviation, Minimum, and Maximum. March recorded the highest variability and peak (50 cases), suggesting an unusual spike in emergency cesareans. August and November had low average cases with some months recording zero cases, indicating either a quiet period or underreporting. The highest average monthly cases occurred in March (11.26), followed by January (10.68) and September (10.11). Standard deviation is quite high in March and April, showing a wide variation in monthly cases, possibly due to unexpected events or seasonal factors. Generally, there is no consistent seasonal trend, but fluctuations suggest possible external influences like staffing, equipment, holidays, or climate. Emergency cesarean cases vary significantly across the year, with months like

March showing high spikes, while others like August and November are relatively quiet. High standard deviations in certain months indicate unpredictable increases that may require deeper investigation into healthcare delivery, patient inflow, or external triggers.

Table 4.5: ADF test for Stationary

Cases	Test statistics	P – Value
Spontaneous Vaginal Delivery	-13.709	0.000
Planned cesarean	-15.786	0.000
Emergency cesarean	-15.841	0.000

The ADF test checks whether a time series is stationary, which means its statistical properties (like mean and variance) do not change over time. The null hypothesis of the ADF test is that the data has a unit root (i.e., it is non-stationary). The alternative hypothesis is that the data is stationary. A large negative number suggests stronger evidence against the null hypothesis. A small p-value (typically less than 0.05) indicates rejection of the null hypothesis

Table 4.6: PP test for Stationarity

Cases	Test statistics	P – Value
Spontaneous Vaginal Delivery	-13.758	0.000
Planned cesarean	-15.794	0.000
Emergency cesarean	-15.857	0.000

All test statistics are highly negative and the p-values are 0.000, which are less than any conventional significance level (1%, 5%, or 10%). Since the p-values are less than 0.05, we reject the null hypothesis for all three cases. Therefore, all three variables (Spontaneous Vaginal Delivery, Planned Cesarean, and Emergency Cesarean) are stationary. This implies that the trends in these types of delivery do not change over time in a systematic way their statistical properties are stable, making them suitable for further time series analysis like regression or forecasting

Table 4.7: Selection of Model

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-2050.77				36415.8	19.0164	19.0353	19.0633
1	-2013.54	74.450	9	0.000	28041.1*	18.7550*	18.8308*	18.9426*
2	-2005.16	16.767	9	0.052	28203.3	18.7608	18.8933	19.0889
3	-1996.43	17.454	9	0.042	28278.3	18.7633	18.9527	19.2321
4	-1992.42	8.0293	9	0.531	29621.4	18.8094	19.0557	19.4189
5	-1987.24	10.360	9	0.322	30699.4	18.8448	19.1478	19.5949
6	-1983.12	8.2463	9	0.510	30699.4	18.8900	19.2498	19.7807
7	-1980.26	5.7134	9	0.768	32135.2	18.9469	19.3635	19.9782
8	-1975.19	10.137	9	0.339	35339.2	18.9833	19.4567	20.1552
9	-1971.76	6.8606	9	0.652	37257.0	19.0348	19.5651	20.3474
10	-1966.52	10.482	9	0.313	38637.8	19.0696	19.6567	20.5229
11	-1960.48	12.074	9	0.209	39789.3	19.0971	19.741	20.6909
12	-1950.25	20.466*	9	0.015	39428.7	19.0856	19.7864	20.8202

The table above is a model selection table used in Vector Autoregression (VAR) or similar time series models. It helps determine the optimal lag length to include in the model. Lag 1 has the lowest AIC (18.7550), HQIC (18.8308), and FPE (28041.1), which are marked with asterisks. The p-value = 0.000, meaning that Lag 1 significantly improves model fit over Lag 0. Lag 2 and Lag 3 have slightly higher AIC and FPE and p-values around 0.05, so they are marginally significant. Lag 12 has a statistically significant LR test (p = 0.015), but its AIC and FPE are higher than Lag 1, making it less optimal despite the significant test.

Table 4.8: Estimate for spontaneous vaginal delivery

Variable	Lag	Estimate	Standard Error	t-value	P-Value
Constant		4.1623	1.1290	3.69	0.0000
SVD	1	0.3739	0.0619	6.04	0.000
PLS	1	0.0226	0.0697	0.32	0.746
ECS	1	0.0949	0.0588	1.61	0.108

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The constant term is statistically significant ($p < 0.01$), indicating that when all lagged predictors are zero, the baseline estimate for SVD is about 4.1623. This coefficient is highly significant ($p < 0.01$). It means that a unit increase in SVD in the previous period is associated with a 0.3739 unit increase in current SVD. This suggests that SVD is positively autocorrelated past values significantly influence current values. For Planned Labor Stimulation (lag 1) the result is not statistically significant ($p > 0.05$). It implies that past Prolonged Labour Syndrome has no significant effect on current SVD. The effect of past Emergency Caesarean Section is marginally insignificant ($p = 0.108$). There is a positive association, but it's not strong enough to be considered statistically significant at the 5% level although it might be considered for further exploration at a 10% significance level.

Table 4.9: Estimate for planned cesarean

Variable	Lag	Estimate	Standard Error	t-value	P-Value
Constant		8.2641	1.0522	7.85	0.0000
SVD	1	-0.0137	0.0577	-0.24	0.812
PLS	1	-0.0235	0.0650	-0.36	0.718
ECS	1	0.2349	0.0548	4.28	0.000

When all predictors are zero (i.e., no prior SVD, PLS, or ECS), the baseline value for planned cesarean is 8.2641. Very significant ($p < 0.0001$), as shown by the high t-value (7.85). This means the constant is reliably different from zero. A one-unit increase in the lagged SVD is associated with a decrease of 0.0137 units in planned cesarean rates. Not significant ($p = 0.812$). This suggests that past spontaneous vaginal deliveries have no meaningful impact on current planned cesarean rates. A one-unit increase in the lagged planned labor stimulation is associated with a decrease of 0.0235 units in planned cesarean rates. Not significant ($p = 0.718$). Similar to SVD, Planned Labor Stimulation has no statistically meaningful effect on planned cesarean rates. A one-unit increase in the lagged emergency cesarean section is associated with an increase of 0.2349 units in planned cesarean rates. Highly significant ($p = 0.000$). This implies a strong and positive relationship between previous emergency cesareans and current planned cesareans—likely due to medical recommendations to avoid repeated emergency procedures. Only emergency cesarean (ECS) from the previous period significantly affects planned cesarean rates, and the effect is positive. Spontaneous vaginal deliveries (SVD) and planned labor stimulation (PLS) do not have a statistically significant impact. This suggests that prior emergency cesarean experiences may lead doctors and patients to opt for planned cesareans in subsequent deliveries, likely for safety and health reasons.

Table 4.10: Estimate for emergency cesarean

Variable	Lag	Estimate	Standard Error	t-value	P-Value
Constant		4.0080	1.2555	3.19	0.002
SVD	1	0.1988	0.0688	2.89	0.004
PLS	1	0.2151	0.0775	2.77	0.006
ECS	1	0.0959	0.0654	1.46	0.144

The table presents the results of a regression analysis used to estimate the effect of certain variables on emergency cesarean section (ECS) at different lags. The constant term is significantly different from zero (P-value = 0.002), which suggests that the baseline level of emergency cesarean section (ECS) is significant. This implies that the model's intercept has a meaningful effect on the outcome. The coefficient for SVD (lag 1) is significant (P-value = 0.004), meaning that SVD has a positive and statistically significant impact on ECS. Specifically, a 1-unit increase in SVD is associated with an increase of 0.1988 in ECS, holding other factors constant. The coefficient for Planned Labor Stimulation (lag 1) is also significant (P-value = 0.006), meaning that Planned Labor Stimulation has a positive and statistically significant effect on ECS. A 1-unit increase in Planned Labor Stimulation leads to an increase of 0.2151 in ECS. The coefficient for ECS (lag 1) is not statistically significant (P-value = 0.144). This suggests that ECS from the previous period does not have a significant impact on the current ECS level in this model. The estimate of 0.0959 suggests a small positive relationship, but it's not statistically reliable.

Table 4.11: Test of residual autocorrelations

Lag	Chi-Squared	LM Test (P-Value)
1	9.6558	0.37906

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Chi-Squared: This is the statistic used to test the hypothesis of no autocorrelation in the residuals. The value of 9.6558 is the computed statistic. LM Test (P-Value): The LM (Lagrange Multiplier) test is a statistical test for autocorrelation. The p-value of 0.37906 tells us whether we can reject the null hypothesis of no residual autocorrelation. With a p-value of 0.37906, which is much greater than a common significance level of 0.05, we fail to reject the null hypothesis. This means that the residuals at lag 1 do not exhibit significant autocorrelation. In other words, there is no evidence of autocorrelation in the residuals at lag 1 based on this test. Thus, the model appears to have residuals that are not autocorrelated at this lag, suggesting a good fit with respect to autocorrelation at lag 1.

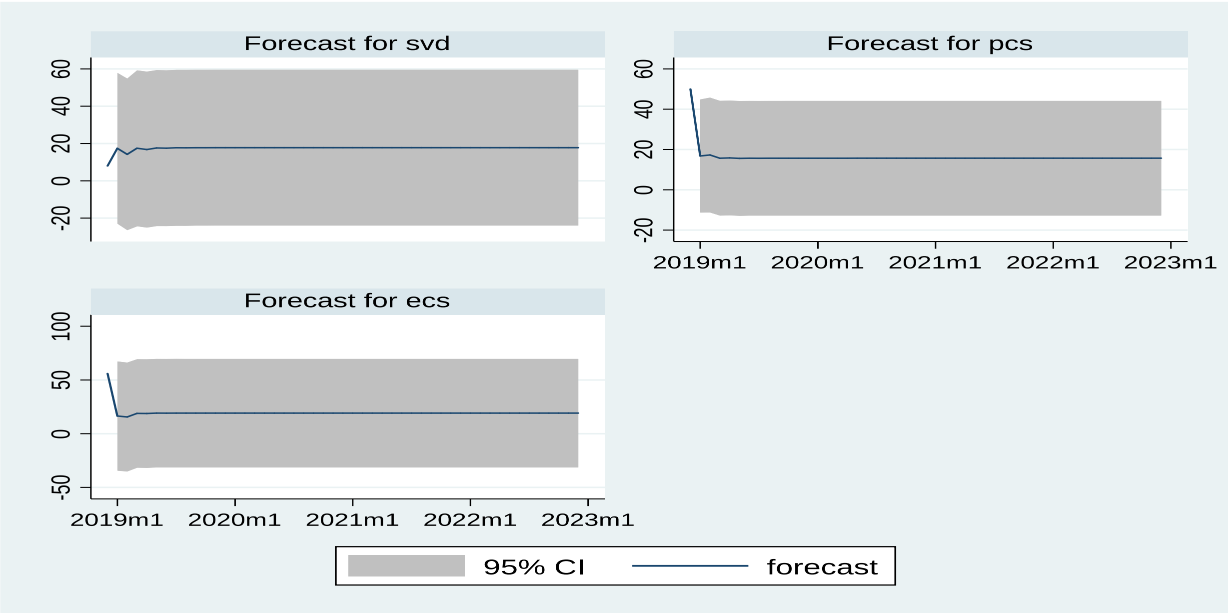

Figure 4.1 illustrates the forecast of the three main modes of child delivery – Spontaneous Vaginal Delivery (SVD), Planned Cesarean Section (CS), and Emergency CS – based on the historical monthly data (2015 – 2024) and the fitted VAR(1) model. Seasonal trends observed historically persist into the forecast horizon: Planned CS peaks around mid-year (especially July), Emergency CS shows a potential spike in March, SVD maintains relatively stable but higher rates in February and November. The forecast intervals (confidence bands) likely widen as the time horizon extends, indicating increasing uncertainty over long-term predictions.

Discussion

This study investigated seasonal and periodic patterns in childbirth modes at the Federal Medical Centre (FMC), Jalingo, over a ten-year period using time series analysis. The results revealed statistically significant variations across months, affirming the presence of seasonal peaks and cyclical behaviors in delivery modes.Planned cesarean sections exhibited their highest average occurrence in July, aligning with periods of relative climatic stability and possibly reflecting institutional scheduling preferences during mid-year when staffing may be more predictable. This trend suggests that non-medical factors, such as physician availability and hospital policies, influence elective procedures. Conversely, emergency cesarean sections demonstrated pronounced spikes in March, a period that coincides with transitional weather conditions between the dry and rainy seasons in Taraba State. Such climatic fluctuations can increase maternal complications like infections or hypertensive disorders, which often necessitate emergency interventions.

Spontaneous vaginal deliveries (SVD) peaked in February and November, potentially reflecting cultural and socio-economic patterns, including agricultural cycles and festive seasons, which may affect healthcare-seeking behavior. For instance, rural women may plan births before or after the peak farming season to reduce logistical barriers to hospital access. These findings underscore the interplay between environmental, cultural, and institutional factors in shaping obstetric practices.

The Vector Autoregression (VAR) analysis provided further insight into interdependencies among delivery modes. Prior emergency cesarean sections strongly predicted subsequent planned cesareans, suggesting a preventive approach by clinicians to reduce maternal and neonatal risks. Additionally, previous SVD and

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planned labor stimulation significantly influenced emergency cesarean rates, indicating that failed labor progression or complications in spontaneous deliveries can lead to emergency interventions.

Understanding these seasonal patterns offers critical opportunities for resource optimization and policy planning. Hospital administrators can align staffing schedules, surgical theater availability, and blood bank stockpiles with months of historically high demand. Similarly, preventive public health campaigns can target high-risk periods, particularly months with elevated emergency cesarean rates, to reduce delays in seeking care.Despite the robustness of the time series approach, several limitations warrant caution. First, the analysis relies on secondary hospital data, which may be subject to recording errors or underreporting. Second, the findings are specific to FMC Jalingo and may not be generalizable to other regions with different socio-cultural, infrastructural, or climatic conditions. Third, potential confounders such as maternal age, parity, and medical comorbidities were not included, which limits the explanatory power of the observed trends. Future research should incorporate these variables and consider multi-center data to improve generalizability.

Conclusion

The seasonal and periodic fluctuations in the ways of child delivery planned cesarean section (CS), emergency CS, and spontaneous vaginal delivery (SVD) at the Federal Medical Center, Jalingo throughout a ten-year period (2015–2024) were thoroughly examined in this study. The results highlight the presence of distinct seasonal patterns and statistically significant periodic trends in delivery modes, even though there are noticeable variations from month to month. While planned CS peaked in July and emergency CS surged significantly in March, February and November saw greater occurrences of SVD, suggesting a non-random distribution with potential cultural, institutional, and climatic influences. The time series analysis's robustness was validated by the confirmation that all three delivery kinds were stationary. Vector autoregression (VAR) results revealed that prior emergency cesarean deliveries significantly influenced the likelihood of future planned cesareans, suggesting a proactive shift in delivery planning to avoid repeat emergencies. Similarly, both previous SVDs and planned labor stimulation had significant predictive effects on emergency cesareans, reflecting complex interdependencies in obstetric decision-making. These results have substantial implications for maternal healthcare policy and practice. The seasonal predictability in delivery modes can inform more efficient workforce planning, targeted interventions, and improved resource allocation at FMC Jalingo and similar facilities. Emergency preparedness measures can be optimized for months with historically high emergency CS rates, while scheduled cesareans and vaginal deliveries can be better managed to reduce strain during peak periods.

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