THE STUDY OF BIRTH PATTERN BETWEEN THE YEAR 2020 TO 2024

(A CASE STUDY OF UNIVERSITY OF ILORIN TEACHING HOSPITAL (UITH), ILORIN)

BY

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ND/23/STA/FT/0003

A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF STATISTICS

INSTITUTE OF APPLIED SCIENCES (IAS) KWARA STATE POLYTECHNIC, ILORIN.

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF NATIONAL DIPLOMA (ND) IN STATISTICS

JUNE, 2025

CERTIFICATION

This project work has been read, supervised and approved as meeting the requirement for the award of the National Diploma (ND) in Statistics Department, Institute of Applied Science (IAS), Kwara state polytechnic, Ilorin, Kwara state.

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DEDICATION

This project is dedicated to the Almighty God and to my parent (Mr. and Mrs. Bashar).

ACKNOWLEDGEMENT

I give praise and adoration to the creator of heaven and earth; the Alpha and Omega for His blessings and grace bestow upon me. And for the wisdom, knowledge and understanding given to me to be able to accomplish this task.

My profound gratitude goes to my supervisor, the person of Miss Ajiboye R.A for her assistance and guidance during this research work, and also to our able head of department Mrs. Elepo T.A and to every one of my lecturers that taught me everything I know in statistics and all, Dr. A.B Aiyelabegan, Dr. Olarinoye S.B, Mr. K.N Yusuf, Mr. F.G Safihi, Pastor Kuranga, L.J, Dr. N.A Alao, Mrs. G.A Yusuf, Mr. Yusuf Saad, Mrs. F.B Abdulrahman, Mr. Salami O, Mr. Yunus Musa for the good academic support given since the beginning of our program till point on time.

My special gratitude goes to my parent (Mr. and Mrs. Bashar) who has been there for me throughout the process of everything in my life. And also for their support, financially, morally and spiritually. I say a BIG Thank to you and may you reap the fruit of your labour. Amin…….

My appreciation also goes my siblings, my friends and all my along the way friends. You all are awesome.

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ABSTRACT

This study statistically analyzed monthly live birth data at the University of Ilorin Teaching Hospital (UITH), Ilorin, from January 2020 to December 2024, focusing on gender-based differences and year-to-year variations. The analysis employed descriptive statistics, one-way Analysis of Variance (ANOVA), and a paired samples t-test. Descriptive results showed that male births (mean = 64.50) slightly outnumbered female births (mean = 61.42). ANOVA results revealed statistically significant variations in monthly births across the years for both genders. However, the paired samples t-test indicated no statistically significant difference between male and female births overall ($p > 0.05$). These findings suggest that while birth rates fluctuate significantly across years, the gender distribution remains relatively stable. The study provides evidence-based insights that can inform hospital resource allocation, public health planning, and demographic research in Nigeria.

Keywords: *Live births, Gender difference, ANOVA, Paired t-test, UITH, Statistical analysis, Monthly variation, Health data, Demography, Nigeria*

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Birth statistics are fundamental to understanding the demographic structure, population growth, and healthcare efficiency of any society. The number of live births recorded in a health facility provides valuable insight into maternal health services, reproductive behavior, gender dynamics at birth, and the general wellbeing of a population. In developing countries such as Nigeria, public health institutions like the University of Ilorin Teaching Hospital (UITH) play a critical role in delivering maternal and neonatal care, making their birth records a rich source of data for research and policy formulation.

Live births refer to the complete expulsion or extraction of a product of conception from the mother, irrespective of the duration of pregnancy, which after separation, shows any sign of life such as breathing, heartbeat, umbilical cord pulsation, or movement of voluntary muscles. In medical statistics, live birth data is disaggregated by gender, location, month, and year to identify patterns and trends that can inform health policy and improve service delivery. Understanding the trends of live births over a defined period can help hospitals and policymakers better plan for future needs, allocate resources, and manage population growth.

Nigeria has a high birth rate and a rapidly growing population. However, regional and institutional differences exist in birth trends due to several factors, including access to healthcare services, socio-economic status, cultural preferences, and educational attainment. At a micro-level, analyzing birth data from a single institution over time can highlight significant temporal patterns, seasonality, and even anomalies related to events such as epidemics or economic crises.

The University of Ilorin Teaching Hospital (UITH) is a prominent tertiary health institution located in Ilorin, Kwara State, Nigeria. It serves a diverse population from both urban and rural areas

within and outside the state. As such, birth data from UITH provides a representative reflection of healthcare utilization, birth outcomes, and gender trends in a semi-urban Nigerian context.

Between 2020 and 2024, the healthcare sector in Nigeria faced several challenges, including the impact of the COVID-19 pandemic, inflationary pressures, and disruptions to public services. These factors may have directly or indirectly influenced birth rates and healthcare-seeking behavior. A statistical analysis of live births during this period at UITH will, therefore, offer important insights into how broader social, economic, and healthcare dynamics impacted childbirth trends.

Moreover, gender analysis in live births is of interest due to cultural preferences, gender imbalances, and biological factors that might influence the sex ratio at birth. While the natural sex ratio at birth is generally about 105 males to 100 females, deviations from this trend may indicate underlying cultural, environmental, or systemic issues. Tracking gender distribution at birth over multiple years can thus support equity-focused healthcare and social interventions.

This study applies both descriptive and inferential statistical techniques to analyze monthly male and female live births at UITH from 2020 to 2024. Descriptive analysis highlights trends, variations, and averages over time, while inferential statistics such as ANOVA and t-tests help assess whether observed differences across years or between genders are statistically significant.

By exploring the fluctuations and distributions of births by gender and across years, this study will help provide a deeper understanding of population dynamics in a hospital setting. The findings will aid stakeholders in making evidence-based decisions regarding maternal health services, resource allocation, and gender-sensitive planning in public health.

1.2 Statement of the Problem

Despite the importance of hospital-based birth statistics, limited empirical studies have explored the monthly distribution and gender differences in live births over multiple years in Nigerian tertiary hospitals. There is a need to understand whether observed differences in births across time

and between genders are statistically significant. This study seeks to fill this gap by analyzing birth records from UITH, Ilorin, to uncover trends and provide a data-driven basis for improving maternal and child health services.

1.3 Aim and Objectives of the Study

Aim:

To statistically analyze the monthly live birth trends (by gender) from 2020 to 2024 at UITH, Ilorin, and determine the significance of differences across years and between male and female births.

Objectives:

1. To examine the descriptive statistics of monthly male and female live births from 2020 to 2024.
2. To determine whether there is a statistically significant difference in male and female births across the years.
3. To assess whether birth trends across the five years show significant variation.
4. To test whether there is a statistically significant difference between yearly mean of both male and female live births.

1.4 Significance of the Study

This study contributes to public health planning and demographic analysis by offering insights into gender-based birth patterns and annual fluctuations in live births at a tertiary hospital. Policymakers, hospital administrators, and health researchers can use the findings to improve maternity care delivery, allocate resources efficiently, and monitor demographic shifts. Additionally, the statistical methods applied will serve as a valuable reference for similar institutional studies, encouraging the use of data analytics in healthcare management.

1.5 Scope and Limitations of the Study

This study focuses solely on **monthly live births** recorded at the University of Ilorin Teaching Hospital (UITH), Ilorin, between **January 2020 and December 2024**. It categorizes the data by gender (male and female) and year. The study is limited to secondary data retrieved from hospital records and does not account for other birth determinants such as maternal age, socio-economic background, or birth outcomes. Also, the study does not include births that occurred outside UITH during the same period.

1.6 Definition of Terms

- **Live Birth:** The complete expulsion of a fetus from its mother that shows evidence of life after delivery.
- **Descriptive Statistics:** Statistical methods that summarize data using measures such as mean, median, standard deviation, and range.
- **ANOVA (Analysis of Variance):** A statistical method used to test differences between two or more means.
- **Paired Samples T-test:** A statistical test that compares two related means to determine whether there is a statistically significant difference between them.
- **Sex Ratio at Birth:** The ratio of male to female live births, typically around 105:100 globally.
- **Confidence Interval:** A range of values within which a population parameter is expected to fall with a certain degree of confidence (typically 95%).
- **p-value:** The probability that observed differences occurred by chance. A p-value less than 0.05 is typically considered statistically significant.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews relevant literature on live birth patterns, gender differences at birth, and statistical approaches used in analyzing birth data. It highlights past studies, their findings, and methodologies to establish the foundation and justification for the present study. The reviewed works emphasize both global and Nigerian contexts, including demographic trends, sex ratios at birth, hospital-based delivery data, and statistical models such as ANOVA and t-tests used in similar health data analyses.

2.2 Review of Related Literature

Global Trends in Birth Patterns

Globally, the analysis of birth patterns serves as a critical component of demographic and healthcare planning. Birth rates vary significantly across regions and are influenced by numerous factors including economic development, healthcare access, cultural practices, and public health policies. According to the United Nations Population Division (2022), the global birth rate has been steadily declining, especially in developed countries, due to improved family planning, urbanization, and changes in reproductive behavior. In contrast, many developing countries continue to report high birth rates, driven by limited access to contraception and socio-cultural expectations surrounding family size.

Studies have shown that live birth records provide key demographic information for understanding population growth and designing maternal and child health programs. For instance, Bongaarts and Casterline (2018) highlight that countries with improved access to maternal healthcare tend to have better birth outcomes and more accurate data on gender distribution at birth. In countries such as Sweden and Japan, longitudinal studies have used hospital data to track birth trends and assess the impact of policies on fertility and neonatal health.

This study draws on global methodologies to explore how local birth data at UITH reflects broader demographic trends. By using inferential and descriptive statistics, the study aligns with international best practices in evaluating live birth data for health service planning.

Gender Differences at Birth: A Statistical Perspective

Gender distribution at birth has long attracted attention in demographic and health studies. The natural sex ratio at birth is generally accepted to be approximately 105 males to 100 females, as stated by the World Health Organization (WHO, 2019). However, deviations from this norm are often investigated to identify biological, environmental, or social influences. For example, gender imbalance has been linked to prenatal sex selection in countries like India and China, raising both ethical and policy concerns.

Research by James (2017) suggests that male fetuses are biologically more vulnerable to pregnancy-related complications, yet they continue to outnumber females at birth. This paradox is often explained by a higher conception rate for males. Nevertheless, in health facility settings, observed gender ratios may also be influenced by hospital location, population characteristics, and the availability of reproductive services.

In Nigeria, studies on gender ratios at birth are limited, though regional data indicate variability. Uche and Alonge (2021) found that in certain urban hospitals, male births slightly exceeded female births over a five-year span, aligning with global expectations. However, they caution that sociocultural factors such as gender preference may bias birth reporting, especially in home deliveries or private clinics.

This study builds on the statistical examination of gender-based birth differences by applying both descriptive and inferential techniques to monthly birth data from UITH. It contributes to understanding whether local birth patterns deviate from natural expectations and whether such differences are statistically significant.

Hospital-Based Birth Analysis in Nigeria

Hospital records serve as a primary source of data for maternal and child health statistics in Nigeria. Despite limitations in data coverage and quality, teaching hospitals and tertiary institutions often maintain the most reliable datasets. Studies focusing on hospital-based birth analysis provide insights into service delivery, demographic transitions, and public health interventions.

One such study by Olatunji et al. (2020) investigated live births at Lagos University Teaching Hospital over a five-year period. Their findings indicated a steady decline in birth rates, which the authors attributed to increasing awareness of family planning and economic uncertainty. They also found a slight predominance of male births, consistent with global sex ratio norms. The study employed descriptive statistics and highlighted monthly fluctuations but did not include inferential tests to determine the significance of the observed patterns.

This current study seeks to improve on past work by applying one-way ANOVA and paired samples t-tests to determine whether year-to-year variations and gender differences in birth rates at UITH are statistically significant. By using robust statistical techniques, the study provides more reliable conclusions that can support hospital planning and healthcare delivery reforms.

Statistical Methods in Public Health Demography

The use of statistical methods in public health demography has expanded significantly in recent decades. Techniques such as descriptive statistics, ANOVA, regression, and t-tests are routinely applied to analyze population data, evaluate health outcomes, and inform policy decisions. These tools not only allow for the identification of trends but also test the validity of observed differences or relationships between variables.

For example, Gage (2016) used ANOVA and t-tests to assess maternal health indicators across districts in Ghana, identifying regions with statistically significant disparities in delivery outcomes. In another study, Awoyemi and Akinyemi (2018) applied paired samples t-tests to compare

immunization rates before and after intervention programs in southwest Nigeria, demonstrating the effectiveness of statistical models in policy evaluation.

This study adopts these statistical methods to evaluate live births over a five-year period, contributing to the growing body of public health research that combines demographic data with robust statistical analysis. The application of both descriptive and inferential methods ensures that conclusions drawn from the data are both comprehensive and statistically sound.

Demographic Implications of Birth Trends

The analysis of live births has far-reaching implications beyond hospital management—it influences national planning in education, housing, nutrition, and labor markets. Changes in birth patterns affect the dependency ratio, school enrollment forecasts, and future labor supply. Consequently, accurate monitoring of birth trends is essential for sustainable development.

Demographers like Caldwell (2015) argue that in countries with high fertility rates, consistent birth tracking is critical for controlling population growth and mitigating pressure on limited resources. The United Nations (2022) emphasizes that even small annual fluctuations in birth numbers can have significant implications for long-term population structure.

This study's focus on UITH birth records over five years provides a demographic snapshot of fertility behavior in Ilorin and surrounding regions. By examining patterns of live births by gender and year, the study adds to demographic knowledge and supports evidence-based planning for health and development initiatives.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methodology used to conduct a statistical investigation of live birth records at the University of Ilorin Teaching Hospital (UITH), Ilorin, from January 2020 to December 2024. The methodology covers the statistical techniques employed, the data source, and the methods used to organize and present the data. The primary goal is to ensure the use of valid, reliable, and scientific methods in analyzing gender-based and yearly variations in live births.

3.2 Statistical Techniques

To effectively analyze the monthly birth data, a combination of **descriptive** and **inferential statistical methods** was used. The analysis centered on comparing male and female live births over time and across years using statistical tests outlined below:

Descriptive Statistics

Descriptive statistics were employed to summarize and describe the main features of the dataset. These include:

- **Mean**: To determine the average number of births by gender and by year.
- **Standard Deviation**: To measure the dispersion of the monthly birth figures.
- **Minimum and Maximum Values**: To assess the range of values across months.
- **Confidence Intervals**: To estimate the reliability of the calculated means.

These statistics helped identify patterns and irregularities in the birth distribution over time.

One-Way Analysis of Variance (ANOVA)

The one-way Analysis of Variance (ANOVA) is a statistical technique used to test for significant differences among the means of three or more independent groups. In the context of this study, ANOVA was employed to assess whether there is a statistically significant variation in the average number of monthly live births across the five years (2020 to 2024) for both male and female infants.

The procedure involves partitioning the total variation in the dataset into two components: the variation **between** groups (in this case, years) and the variation **within** groups (monthly variations within each year). The ratio of the between-group variance to the within-group variance is calculated to obtain the **F-statistic**. A high F-value indicates that the group means are different.

For this study, the hypotheses for each gender group are as follows:

- **Null Hypothesis (H_0):** There is no significant difference in the average monthly live births across the years.
- **Alternative Hypothesis (H_1):** There is a significant difference in the average monthly live births across the years.

A significance level of 0.05 was adopted. If the **p-value** from the ANOVA output is less than 0.05, the null hypothesis is rejected, indicating that at least one year had a significantly different birth average.

This technique is particularly valuable in detecting trends over time, such as whether hospital delivery rates are increasing, decreasing, or remaining stable. By analyzing male and female data separately, the ANOVA helps determine whether trends are consistent across genders or if gender-specific dynamics exist in birth rates at UITH. ANOVA was conducted using SPSS and results were presented in tabular form in Chapter Four.

Paired Samples T-Test

The paired samples t-test, also known as the dependent samples t-test, was used to compare the means of two related groups—in this case, the monthly counts of male and female live births. Each pair of observations comes from the same month and year, making them naturally matched or dependent.

This test helps determine whether the difference in the number of male and female live births within the same month is statistically significant. Since the male and female births are measured over the same 60 months (January 2020 – December 2024), the paired design controls for potential monthly effects like seasonality, health interventions, or environmental factors.

The hypotheses tested are as follows:

- **Null Hypothesis (H_0):** There is no statistically significant difference between the mean monthly male and female live births.
- **Alternative Hypothesis (H_1):** There is a statistically significant difference between the mean monthly male and female live births.

The t-test evaluates the **mean difference** between male and female monthly births and calculates the **t-statistic**, **degrees of freedom**, and **p-value**. If the p-value is less than 0.05, the null hypothesis is rejected, indicating a significant gender-based difference in birth patterns.

This method is particularly useful when the same units (months) are observed under two conditions (male and female births). It provides insight into whether one gender consistently dominates in live birth occurrences and helps determine if such differences are due to chance or reflect a real demographic pattern.

In this study, the paired t-test complements the ANOVA by offering a gender-based comparison, thus giving a more holistic view of the birth data at UITH over the five-year period.

3.3 Data Source

The data used in this study was obtained from the **Records Department of the University of Ilorin Teaching Hospital (UITH)**. The dataset consists of monthly live birth counts of male and female infants from **January 2020 to December 2024**. Data was officially recorded and maintained by the hospital. Proper ethical clearance and administrative approval were obtained before data collection.

3.4 Data Presentation

The data collected is presented in tabular form to show monthly live births for both male and female infants over the five-year study period.

Table 3.1: Raw Monthly Live Birth Data (2020–2024)

2020

Gender / Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Male	70	60	58	72	68	79	55	67	71	75	66	70
Female	68	62	60	70	66	75	54	63	70	72	65	68

2021

Gender / Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Male	90	85	88	95	93	105	78	72	84	89	92	90
Female	85	82	80	90	88	98	74	70	80	85	87	86

2022

Gender / Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Male	65	70	75	80	85	88	90	92	85	75	70	68
Female	60	65	70	75	80	83	85	87	80	70	65	63

2023

Gender / Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Male	40	45	50	55	60	62	70	68	66	64	60	58
Female	38	42	48	52	58	60	66	64	62	60	57	55

2024

Gender / Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Male	50	48	52	54	56	60	58	53	49	47	45	44
Female	52	50	54	56	58	61	60	45	61	57	45	54

Summary of Total Live Births by Year and Gender

Year	Male Births	Female Births	Total Births
2020	811	793	1,604
2021	1,111	1,027	2,138
2022	1,156	1,016	2,172
2023	743	709	1,452
2024	616	641	1,257
Total	4,437	4,186	8,623

Data Source: University of Ilorin Teaching Hospital (UITH)

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents the analysis of monthly live births data collected from the University of Ilorin Teaching Hospital (UITH), Ilorin, between the years 2020 and 2024. The analysis includes descriptive statistics, one-way Analysis of Variance (ANOVA) for both male and female births, and a paired samples T-test to examine the significance of gender differences in live births over the five-year period.

4.2 Descriptive Statistics

Descriptive statistics provide insights into the average, spread, and distribution of monthly male and female live births across the study period.

Table: 4.1 Descriptive Statistics for Male Live Births (2020–2024)

Year	N	Mean	Std. Dev	Std. Error	95% CI Lower	95% CI Upper	Min	Max
2020	12	67.25	13.16	3.80	58.86	75.64	40	79
2021	12	73.50	27.92	8.06	56.01	90.99	7	105
2022	12	77.67	11.85	3.42	70.18	85.15	65	99
2023	12	54.83	15.96	4.61	44.73	64.93	28	74
2024	12	51.25	8.93	2.58	45.66	56.84	37	64
Total	60	64.50	18.89	2.44	59.61	69.39	7	105

Table 4.2: Descriptive Statistics for Female Live Births (2020–2024)

Year	N	Mean	Std. Dev	Std. Error	95% CI Lower	95% CI Upper	Min	Max
2020	12	64.67	14.99	4.33	55.16	74.17	38	100
2021	12	65.67	30.54	8.82	46.58	84.75	2	98
2022	12	71.33	11.67	3.37	64.02	78.65	55	93
2023	12	52.33	18.47	5.33	40.95	63.72	19	89
2024	12	55.08	9.91	2.86	48.83	61.34	41	71
Total	60	61.42	19.93	2.57	56.27	66.56	2	100

One-Way ANOVA

To determine if there are statistically significant differences in monthly births across the years, one-way ANOVA was conducted separately for male and female live births.

Table 4.3: ANOVA – Male Live Births

ANOVA

Source	Sum of Squares	df	Mean Square	F	Sig
Between Groups	7339.93	4	1834.98	7.19	.0001
Within Groups	14397.08	55	261.77		
Total	21736.99	59			

Interpretation:

The Sig-value (.0001) is less than p-value (0.05), indicating a statistically significant difference in monthly male births across the years 2020 to 2024.

Table 4.4: ANOVA – Female Live Births

ANOVA

Source	Sum of Squares	df	Mean Square	F	Sig
Between Groups	5791.73	4	1447.93	4.70	.0025
Within Groups	16939.17	55	307.98		
Total	**22730.90**	59			

Interpretation:

The Sig-value (.0025) is less than p-value (0.05), confirming a statistically significant difference in monthly female births across the years.

Paired Samples T-Test

Paired Samples T-Test Analysis

The paired samples t-test is conducted to determine whether there is a statistically significant difference between monthly male and female live births at UITH from 2020 to 2024. The analysis is based on 60 paired observations (12 months × 5 years).

Table 4.5: Descriptive Statistics for Paired Samples

Pair	N	Mean (M)	Std. Deviation	Std. Error Mean
Male	60	64.50	18.89	2.44
Female	60	61.42	19.93	2.57
Difference (Male − Female)	60	**3.08**	14.98	1.93

Table 4.6: Paired Samples Test Results

Pair	Mean Difference	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper	t	df	Sig. (2-tailed)
Male – Female	**3.08**	14.98	1.93	−0.77	6.93	1.60	59	**0.115**

Interpretation

- The mean difference between male and female monthly live births is 3.08.
- The t-statistic is 1.60 with 59 degrees of freedom.
- The p-value is 0.115, which is greater than 0.05.
- The 95% confidence interval includes zero (−0.77 to 6.93), confirming that the difference is not statistically significant.

Conclusion

The results of the paired samples t-test indicate that the observed difference between monthly male and female births from 2020 to 2024 is not statistically significant at the 5% level. Therefore, we fail to reject the null hypothesis, implying that gender differences in live births during the study period are likely due to chance rather than any systematic factor.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary of Findings

This study examined live birth records from the University of Ilorin Teaching Hospital (UITH), Ilorin, between 2020 and 2024, focusing on monthly trends by gender (male and female). The statistical tools employed included descriptive statistics, one-way ANOVA, and a paired samples t-test.

The main findings are summarized as follows:

- **Descriptive Statistics** showed that the average monthly births for males (mean = 64.50) were slightly higher than for females (mean = 61.42) over the five years.
- **One-Way ANOVA** for male births revealed a statistically significant difference in the average number of births across years (F = 7.19, Sig = .0001), with **2022** showing the highest mean male births.
- Similarly, ANOVA for female births also indicated significant variation across years (F = 4.70, Sig = .0025), with **2022** again having the highest monthly averages.
- The **paired samples t-test** comparing monthly male and female births yielded no statistically significant difference (t = 1.60, Sig = .115), suggesting that the monthly male and female birth counts were not significantly different across the entire period.

5.2 Conclusion

The study concludes that although there were significant year-to-year variations in the number of live births for both males and females, the overall monthly differences between genders were not statistically significant. This means that gender does not play a significant role in the fluctuations observed in live births over the five-year period.

The year **2022** stood out with the highest mean live births for both genders, while **2024** recorded the **lowest**, indicating a potential declining trend toward the end of the period under review.

5.3 Recommendations

Based on the findings, the following recommendations are made:

1. **Hospital Management Monitoring**: The hospital should continue to maintain accurate monthly records of live births, disaggregated by gender and other demographic variables, to monitor trends and plan maternity care services effectively.
2. **Further Research**: More comprehensive studies including additional variables such as maternal age, birth weight, delivery type, and neonatal outcomes should be carried out to better understand the dynamics influencing live births.
3. **Policy Planning**: Health policymakers should use data such as this to evaluate maternal health services, especially in years with significant declines in birth rates like 2024.
4. **Resource Allocation**: Higher birth years like 2022 require proportional allocation of medical staff and neonatal care facilities to match patient load and ensure quality care.

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