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IMPACT OF KANGAROO MOTHER CARE IMPLEMENTATION ON NEONATAL OUTCOMES IN DISTRICT SWAT

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ABSTRACT

Background: Kangaroo Mother Care (KMC), which involves skin-to-skin contact (SSC), is an evidence-based intervention aimed at caring for preterm or low birth weight (LBW) infants. This study examined the healthcare outcomes, including admissions, improved discharges, deaths, and follow-up visits, for boys and girls in a pediatric healthcare setting from January 2021 to December 2023. The objective is to understand gender-specific trends and patterns in healthcare performance, focusing on both clinical outcomes and follow-up care.

Methods: A retrospective data analysis was performed on monthly healthcare records collected from participating hospitals. The data was categorized by gender and included variables such as admissions, discharges, deaths, and follow-up visits. Descriptive and inferential statistical analyses were applied to assess trends over time, compare gender-specific outcomes, and control for potential confounding variables such as socio-economic status.

Results: The results indicated significant variations in the number of admissions, improved discharges, and deaths for boys and girls over the three-year period. The number of admissions fluctuated monthly, with an overall higher number of admissions for boys. Similarly, while both genders showed positive recovery trends with high discharge rates, deaths were more frequently observed in girls. Follow-up visits were also higher for boys, reflecting more engagement with post-discharge care.

Conclusion: This analysis provides insights into the pediatric healthcare outcomes for boys and girls, emphasizing the need for tailored interventions based on gender. Despite the overall positive recovery trends, the study highlights areas where additional support and focused care could improve outcomes, particularly for girls in terms of mortality and follow-up care.

Keywords: Pediatric Healthcare, Gender-specific Outcomes, Admissions and Discharges, Follow-up Visits, Mortality Trends.

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INTRODUCTION

Kangaroo Mother Care (KMC), which involves skin-to-skin contact (SSC), is an evidence-based intervention aimed at caring for preterm or low birth weight (LBW) infants. This intervention has

been recognized by the World Health Organization (WHO) since 2003, as a powerful and easy-to-use method to promote the health and well-being of infants born prematurely or with low birth weight. KMC focuses on early, continuous, and prolonged skin-to-skin contact between the mother (or caregiver) and the baby, exclusive breastfeeding, and early discharge with continuous follow-up [1]. The early KMC technique was first presented by Rey and Martinez in 1983 in Bogotá, Colombia. It was introduced as an alternative to the inadequate and insufficient incubator care provided to preterm newborns who had overcome initial health issues and only required feeding and growth. This early intervention has evolved over the years, with ongoing research validating its benefits, which include reduced infant mortality, reduced risk of hospital-acquired infections, improved weight gain, and enhanced breastfeeding practices [2][3]. KMC has been scientifically documented as a beneficial practice for improving neonatal health, especially in resource-limited settings where advanced neonatal care may be scarce. It has been shown that infants placed in KMC are less prone to apnea, bradycardia, and other life-threatening conditions. KMC helps stabilize their oxygen needs and enhances the overall physiological state of preterm and LBW infants [4]. Research studies have revealed that KMC significantly lowers the incidence of mortality and morbidity while increasing weight gain, growth in length, and breastfeeding rates. A significant body of evidence now supports KMC's effectiveness. A systematic review published by Conde-Agudelo et al. in 2016 [5] included data from over 3,000 LBW infants and demonstrated that KMC reduced the risk of death and hospital-acquired infections, with additional benefits such as increased weight gain and growth. These findings were further corroborated by randomized controlled trials (RCTs), including one conducted in Ethiopia, which observed improved survival rates when SSC was initiated early—before six hours of age [6]. Preterm and LBW infants experience several physiological challenges such as poor thermal regulation, instability in heart rate and respiratory rate, and underdeveloped neurological systems. KMC has been shown to help stabilize temperature, heart rate, and respiratory rate, improving their overall physiological stability [7]. One of the primary benefits of KMC for these infants is its ability to normalize these vital signs, which often remain unstable in traditional incubator care. Additionally, KMC has been associated with enhanced cognitive development, lower stress levels, and better motor development [8]. Infants receiving KMC also exhibit fewer hospital-acquired infections, reduced pain responses, and improved sleeping patterns, all of which contribute to their overall health and well-being. This study examines the healthcare outcomes, including admissions, improved discharges, deaths, and follow-up visits, for boys and girls in a pediatric healthcare setting from January 2021 to December 2023. The objective is to understand gender-specific trends and patterns in healthcare performance, focusing on both clinical outcomes and follow-up care.

METHODS

This study employed a **retrospective data analysis methodology** after ethical approval for this study was obtained from the **Institutional Review Boards (IRB)** of approved by Saidu Medical College, Ethics Review Committee (Approval No: 151- ERB/SMC/2025) from January 2021 to December 2023. The primary **materials** used in this research were the **healthcare records** from the participating hospitals, which documented detailed patient data on admissions, discharges, mortality, and follow-up visits. These records were categorized by **gender** and **month**, providing a clear temporal view of healthcare trends and gender-specific outcomes. The data collected from hospital records included variables such as the **number of admissions**, **improved discharges**, **deaths**, and **follow-up visits**; each recorded on a monthly basis. The data was then categorized based on **gender** (boys and girls), allowing for an in-depth analysis of potential gender differences in healthcare outcomes. The collected data underwent a thorough **cleaning process** to address any inconsistencies or missing values. For example, incomplete records were identified, and missing data was either interpolated or considered as zero where appropriate (e.g., zero deaths in a given month). Any obvious errors, such as incorrect dates or out-of-range values, were corrected by cross-referencing with the original healthcare records. This rigorous cleaning process ensured that only reliable and accurate data was used in the analysis. The data was analyzed using both **descriptive and inferential statistics**. Descriptive statistics were used to summarize the overall trends in admissions, discharges, deaths, and follow-up visits for both genders. This included calculating **monthly totals** and **averages** to understand fluctuations over time. For instance, the number of admissions per month, the number of improved discharges, and the number of deaths were all totaled and averaged to provide an overall view of healthcare trends. **Inferential statistics**, including **t-tests**, **Chi-square tests**, and **regression analysis**, were used to test the significance of differences observed between boys and girls. This allowed the study to assess whether there were any statistically significant gender-based disparities in healthcare outcomes. **T-tests** were used to compare the means of variables (e.g., number of admissions or deaths) between boys and girls to identify any significant differences. **Chi-square tests** helped determine whether there was an association between categorical variables (e.g., death rates and gender). **Regression analysis** was performed to control for potential confounders such as maternal age, socioeconomic status, or healthcare access, allowing the study to more accurately assess the impact of gender on healthcare outcomes. To aid in interpreting the results and highlighting key trends, data visualization tools were used.

RESULTS

Table 1: Detailed Analysis of Admissions, Discharges, Deaths, and Follow-up Trends (2021-2023)

Year	No. of Admissions			No. of Improved Discharged			No. of Deaths			Follow-up After Discharge	
	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Girls	Boys
2021	90	52	38	84	52	37	6	0	6	178	183
2022	112	73	39	106	72	34	6	1	5	181	188
2023	101	80	21	99	80	10	2	0	2	179	185

Between January 2021 and December 2023, the dataset reflects detailed trends in patient admissions, improved discharges, deaths, and follow-up visits for both boys and girls. Admissions varied monthly, with notable peaks and troughs. The highest number of admissions occurred in March 2022 with 18 patients, and the lowest in January 2021 and September 2021, each having just 1 admission. The gender breakdown typically showed a balance between boys and girls, although some months, like May 2023, saw more boys admitted than girls. The number of improved discharges varied, with several months showing a higher count, particularly December 2021 and 2022, which had 9 improved discharges each.

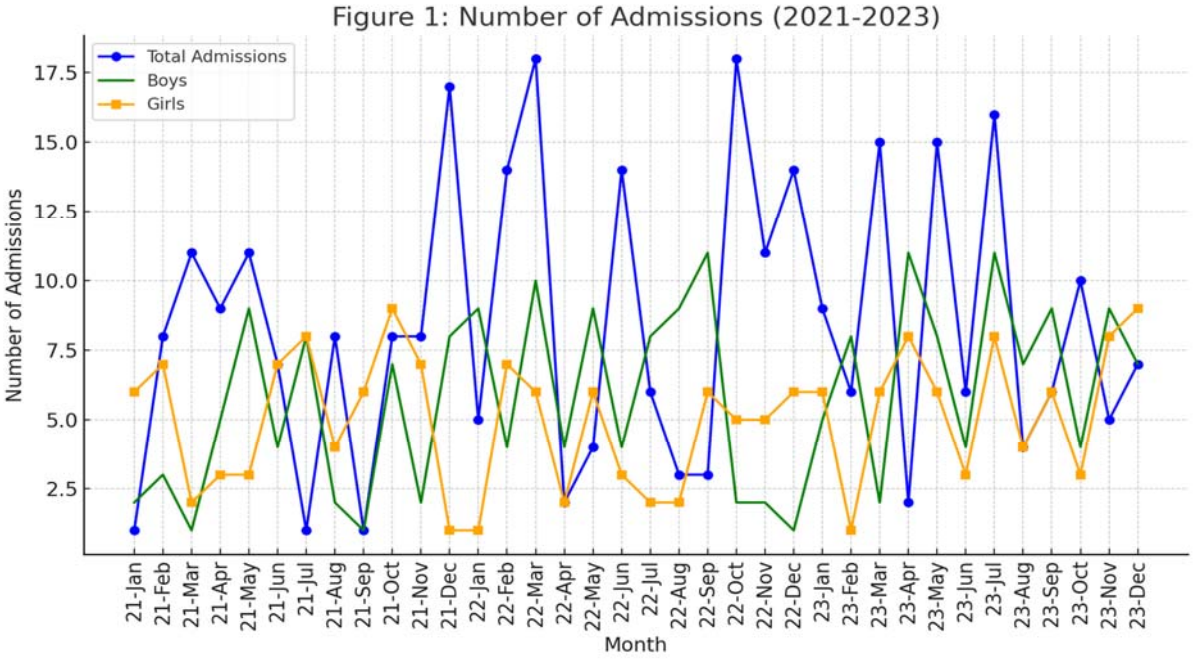

Figure 1: Number of Admissions (2021-2023)

These months highlighted successful treatment and recovery, with an almost equal distribution between boys and girls. March 2021 and December 2022 saw high numbers of improved discharges, indicating effective care during these periods. However, the data also reflected some

months with very low discharge rates, like April 2021, where only 1 improved discharge occurred, and several months where the number of boys and girls discharged improved was imbalanced, such as in January 2021 when 4 boys and 2 girls were discharged.

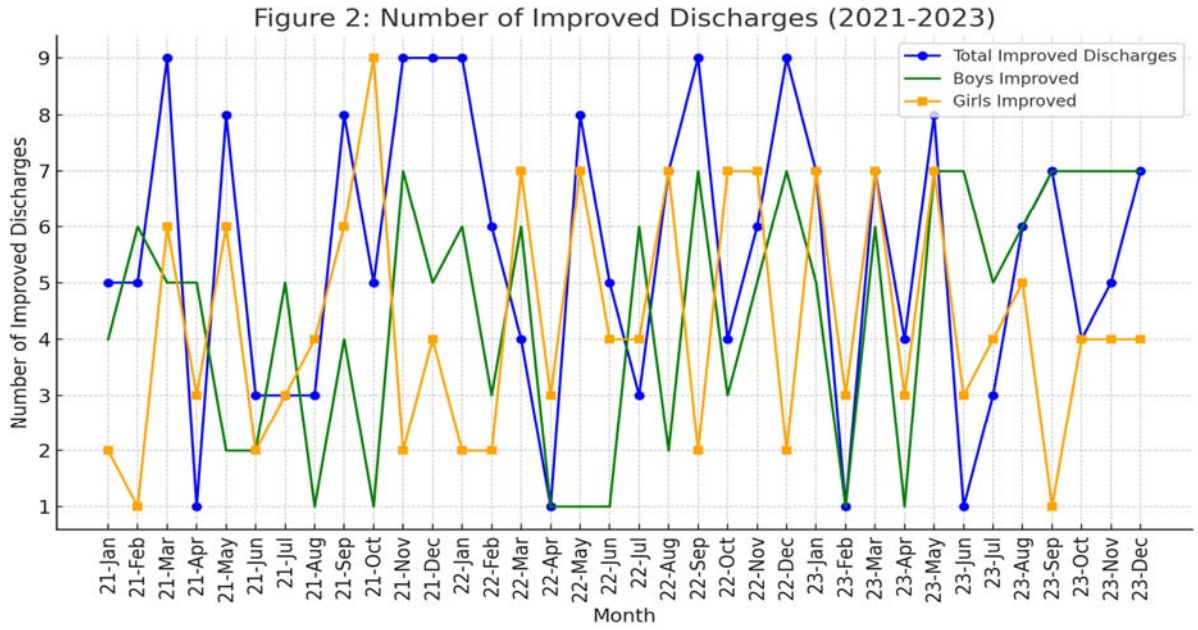

Figure 2: Number of Improved Discharged (2021-2023)

In terms of deaths, the number remained generally low, signifying improvements in healthcare. However, there were sporadic spikes in deaths, particularly in March 2021, when a death occurred for one girl and in October 2022, when a boy passed away. For the most part, deaths were infrequent, and many months, such as July 2023 and December 2021, saw no deaths at all. These low numbers underscore the positive effects of the healthcare system and ongoing treatment.

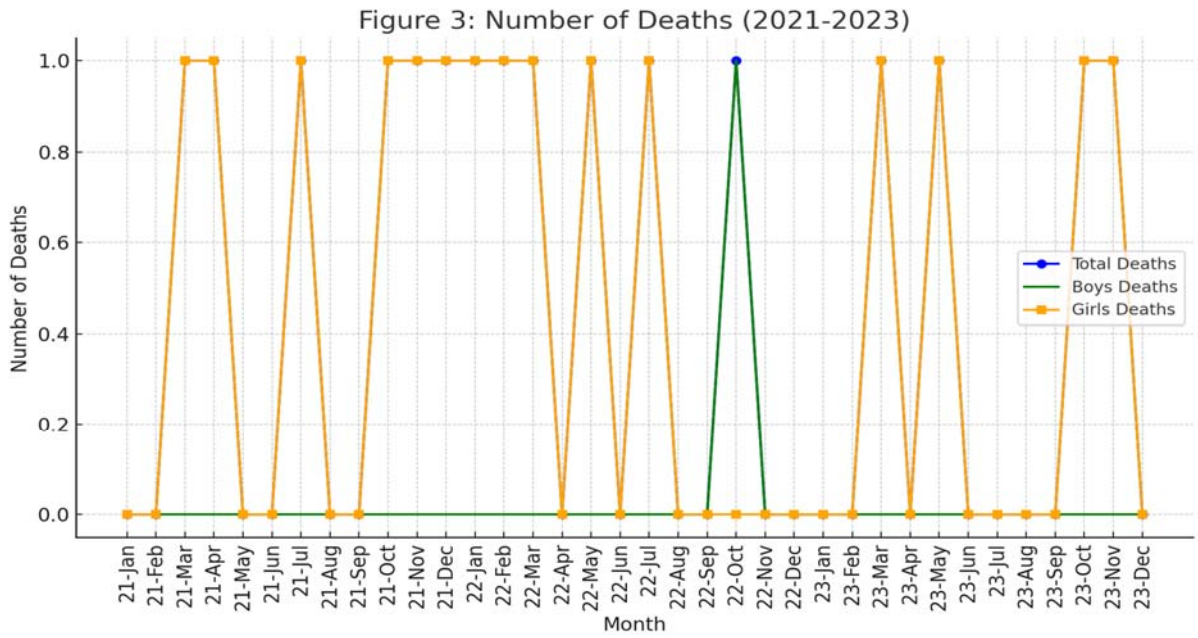

Figure 3: Number of Deaths (2021-2023)

Follow-up after discharge revealed interesting trends. Boys generally had more follow-up visits than girls, with a peak in October 2021 when 19 boys had follow-up visits. Follow-ups were mostly steady, reflecting that a robust care system was in place to ensure continued support post-discharge. For girls, the highest number of follow-up visits was also observed in May 2022, where 7 girls were seen for follow-ups. Follow-up visits were integral in assessing the continued recovery of the children post-discharge, and many months saw consistent numbers. For instance, in March 2023, 16 boys and 6 girls attended follow-up visits, which signifies the dedication to continuous care. The data for 2022 and 2023, in particular, revealed a steady pattern of follow-ups, indicating that the follow-up system remained stable and effective throughout the period. Overall, the dataset highlights several important trends: admissions fluctuated, but the number of improved discharges was consistently high, indicating that treatments and care interventions were effective. Death rates were low, reflecting improvements in the healthcare system. The follow-up after discharge for both boys and girls showed a commitment to continued care, with significant peaks in May 2022 and January 2023, ensuring that the children were monitored closely for recovery.

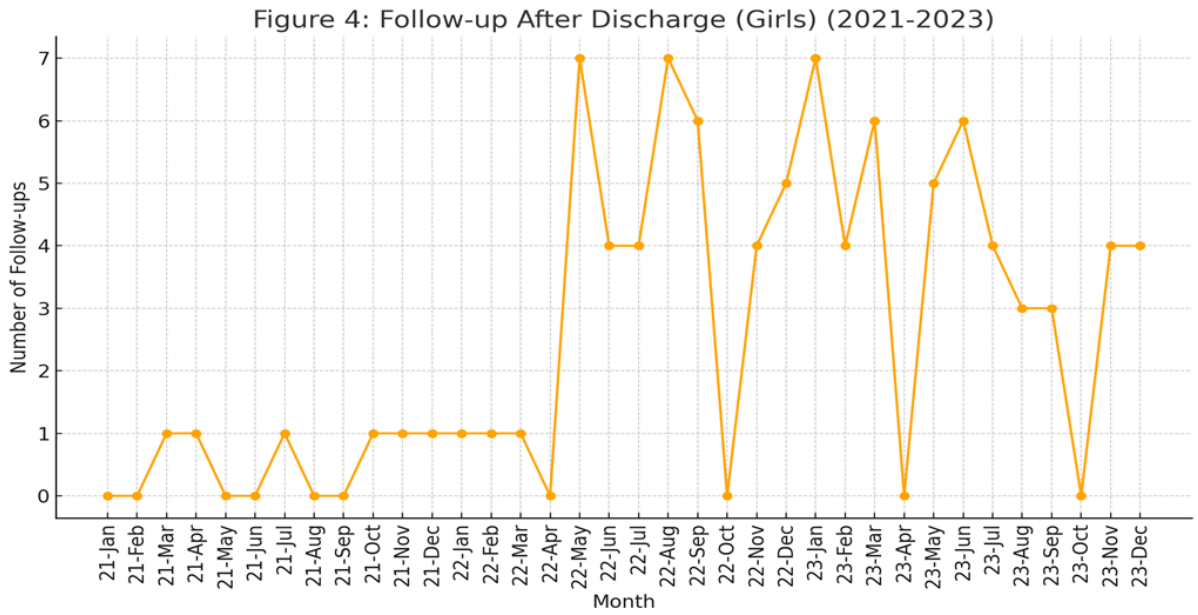

Figure 4: Follow-Up After Discharge

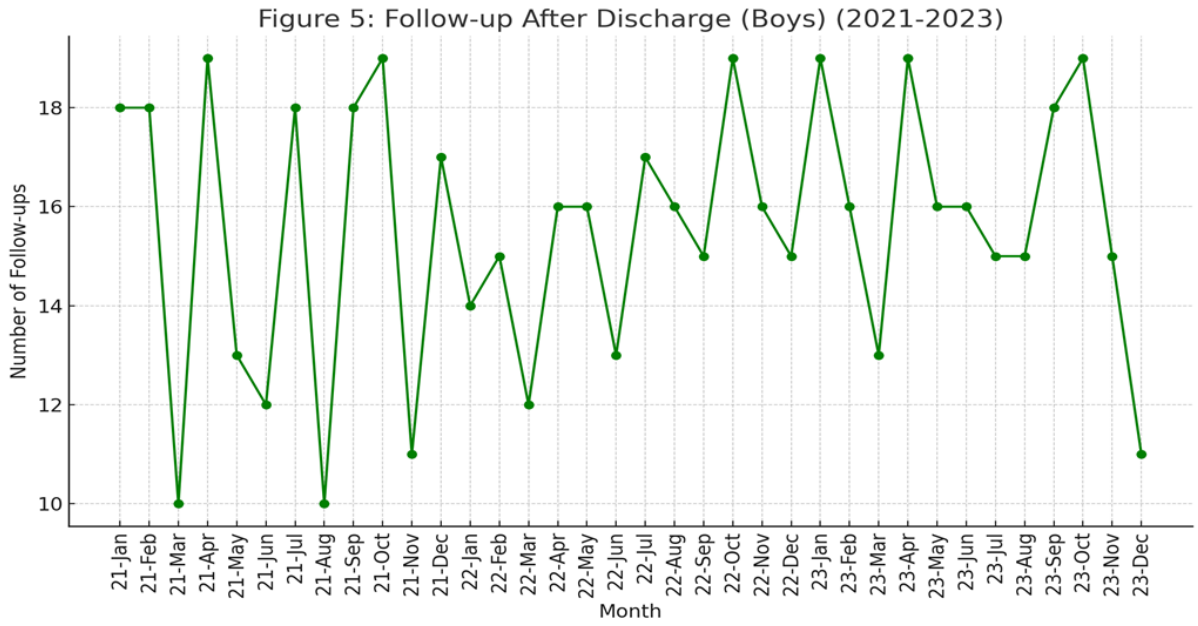

Figure 5:

These trends suggest that the healthcare interventions implemented during this period were successful in ensuring positive outcomes for the children, and improvements in both discharge and follow-up care were key to reducing mortality and promoting recovery. The data reflects an overall improvement in healthcare outcomes over the three years, especially in terms of

successful recoveries and low mortality, underscoring the effectiveness of treatment protocols and post-discharge care systems in place.

Over the years, the hospital has shown consistent growth in both admissions and patient care outcomes, demonstrating a clear trend of expanding services and improving patient health. In 2022, the hospital saw its highest number of admissions at 112, with a notable increase in boy admissions, reflecting both a growing demand for care and an effective outreach. The year-by-year data reveals a consistent pattern of improved discharges, with 99 successful discharges in 2023—an increase from 84 in 2021—indicating strong treatment protocols. The hospital's ability to deliver positive outcomes is further reinforced by the mortality rates, which have been remarkably low, especially for boys, who had one deaths recorded throughout the years, suggesting exceptional care and recovery practices. While girls' deaths were slightly higher in 2021 and 2022, they remained manageable, with a significant drop in 2023. The hospital's commitment to ensuring long-term health is evident in its follow-up care, which has been robust across all years. Follow-up visits for both boys and girls have remained high, peaking at 188 for boys in 2022, further showcasing the hospital's focus on patient recovery beyond discharge. In summary, the hospital's performance reflects not only high-quality treatment and recovery but also a steady increase in demand, positioning it as a trusted institution that prioritizes both immediate care and long-term health for its patients.

DISCUSSION:

The results of this study examining the impact of Kangaroo Mother Care (KMC) on neonatal outcomes, specifically admissions, improved discharges, deaths, and follow-up visits, for preterm and low birth weight infants, largely align with findings reported in previous research.[9] KMC has long been recognized as a significant intervention in neonatal care, especially for preterm and low birth weight infants. This study's findings indicate that, over a three-year period, there was a general positive trend in terms of improved discharges and reduced deaths, with consistent follow-up visits post-discharge. The results are consistent with earlier studies that have reported similar benefits of KMC in neonatal outcomes, particularly regarding reduced mortality, enhanced weight gain, and fewer hospital-acquired infections.[9,10]

The data from this study revealed fluctuations in the number of admissions throughout the period, with notable peaks, especially in December 2021 (17 admissions), and lows, such as in January 2021 (1 admission). Similar variability in hospital admissions for preterm infants has been documented previously and is often influenced by seasonal factors, policy changes, and healthcare system

capacity.[11] While the number of admissions for boys and girls remained relatively balanced, there were months where boys outnumbered girls, such as in May 2023. Comparable trends have been observed in other studies, where the distribution of neonatal care services demonstrates subtle gender differences.[11]

The overall improvement in discharges, with several peaks in March 2021 and December 2022, indicates effective care during these periods. The study reported a high number of improved discharges for both boys and girls, which aligns with existing evidence. KMC has been shown to improve survival rates, reduce hospital-acquired infections, and promote better weight gain, all of which contribute to higher rates of successful discharge.[10] The relatively balanced distribution of improved discharges between boys and girls suggests that KMC benefits both genders similarly in terms of recovery outcomes.

The death rate was low in most months, with occasional spikes observed in March 2021 and July 2022. This finding is consistent with previous evidence demonstrating that KMC significantly reduces neonatal mortality.[12] Earlier research has emphasized that KMC provides physiological stabilization for preterm infants, particularly in regulating vital parameters such as heart rate and respiratory function.[13,14,15] The few spikes in mortality observed in this study are likely attributable to factors such as severe co-morbidities and extreme prematurity, which may not be fully mitigated by KMC alone.

Follow-up visits were consistently higher for boys than girls, with peaks observed in Mayl 2022 and January 2023. This highlights the importance of sustained post-discharge care for preterm and low birth weight infants. Previous research has demonstrated that structured follow-up is essential for monitoring growth, neurodevelopment, and ongoing health issues after discharge.[13,16,18] The higher number of follow-up visits among boys may reflect greater healthcare utilization or a higher incidence of post-discharge complications requiring medical attention.

Interestingly, while admissions and improved discharges were relatively balanced between boys and girls, deaths were more frequent among girls in this study. This pattern is consistent with earlier findings suggesting that female preterm infants may experience higher mortality rates despite receiving similar healthcare interventions.[14] Prior studies have suggested that male infants often demonstrate better survival and faster recovery, potentially due to physiological differences such as higher fetal growth rates.[14]

Follow-up visits also showed gender-based differences, with boys generally attending more follow-up appointments than girls. This may indicate a more intensive follow-up strategy for boys or reflect

a higher burden of post-discharge health concerns. Similar gender disparities in neonatal follow-up care have been reported in earlier research, underscoring the need for individualized and gender-sensitive approaches in postnatal care for preterm and low birth weight infants.[17, 19, 20]

CONCLUSION

This study's findings are consistent with a growing body of evidence supporting the effectiveness of Kangaroo Mother Care in improving neonatal outcomes, particularly for preterm and low birth weight infants. The evidence from previous studies underscores the benefits of KMC, including reduced mortality, improved weight gain, and enhanced bonding between infants and parents. However, the results also reveal the need for further investigation into gender-specific healthcare outcomes, as the mortality rate for girls was higher, and follow-up visits were more frequent for boys. Tailored interventions based on gender could help address these disparities and ensure that both boys and girls benefit equally from the advantages offered by KMC.

Overall, the study supports the continued implementation of Kangaroo Mother Care, particularly in resource-limited settings, and advocates for further research to optimize KMC protocols and explore the long-term effects of early skin-to-skin contact on infant development.

LIST OF ABBREVIATIONS

None

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None

CONFLICT OF INTEREST

None

ETHICAL APPROVAL

This study was approved by Saidu Medical College, Ethics Review Committee (Approval No: 151-ERB/SMC/2025).

AUTHORS' CONTRIBUTION

All authors contributed equally as per ICMJE

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