Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/74dezf40

DETERMINANTS OF INFANT GROWTH AND BIRTH WEIGHT IN NORTHEAST INDIA'S TRIBAL POPULATIONS

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Abstract

Birth weight is a key indicator of infant health, influencing survival, growth, and long-term outcomes. Low birth weight (LBW), defined by the World Health Organization (WHO) as less than 2.5 kg, is a significant risk factor for neonatal morbidity and mortality. This review examines the multifaceted determinants of infant growth and birth weight, particularly within the tribal populations of Northeast India. Factors influencing birth weight include maternal health, nutritional status, parity, and socioeconomic conditions. Maternal under nutrition, short stature, and lack of education are associated with adverse birth outcomes. Cultural practices and environmental conditions, such as limited healthcare access and poor sanitation, further exacerbate these challenges. In Northeast India, tribal populations, such as the Tangsa tribe, display unique patterns of infant health, with some groups experiencing better outcomes due to genetic and cultural factors, despite systemic disadvantages. Feeding practices, especially breastfeeding, are critical for infant growth, but traditional feeding practices and misconceptions hinder optimal nutrition. Interventions that address maternal health, nutrition, and culturally sensitive healthcare practices are essential to improving infant health outcomes. This review emphasizes the need for targeted, context-specific policies and programs to address the complex determinants of infant growth and birth weight in these vulnerable populations.

Keywords*: birth weight, low birth weight, maternal nutrition, infant growth, Northeast India*

Introduction

Birth weight is a critical indicator of an infant's health and development, serving as a foundation for evaluating neonatal survival, growth, and long-term health outcomes. The World Health Organization (WHO) classifies low birth weight (LBW) as less than 2.5 kg, which is closely associated with increased risks of neonatal morbidity, mortality, and developmental challenges (WHO, 1992). Infants with birth weights between 2.5 and 4.0 kg are considered within the normal range, while those exceeding 4.0 kg are categorized as macrosomic. These classifications are pivotal in understanding health outcomes at both individual and population levels. Numerous factors influence birth weight, including maternal health, nutritional status, parity, and socioeconomic conditions. Maternal nutritional status before and during pregnancy is a key determinant, as inadequate nutrition can adversely affect fetal growth (Ramakrishnan et al., 1999). Moreover, maternal characteristics such as height and weight have been positively correlated with better birth outcomes, with shorter or underweight mothers at higher risk of delivering LBW infants (Elshibly and Schmalisch, 2008). Socioeconomic determinants, such as household income, education levels, and access to healthcare, also play a critical role in shaping birth weight outcomes (Deshmukh et al., 2007).

Cultural practices and environmental conditions further complicate these dynamics, particularly in vulnerable populations such as the tribal communities in Northeast India. These communities, which represent a substantial portion of the region's population, often experience disparities in healthcare access, nutritional resources, and sanitation. These inequities exacerbate the prevalence of LBW and hinder optimal infant growth. Studies have highlighted that the interplay between genetic predispositions and environmental factors contributes significantly to infant health outcomes in tribal populations (Sarkar and Saikia, 2000). Feeding practices are another vital determinant of infant growth. Breastfeeding, in particular, provides essential nutrients and immunological protection, especially during the early months of life (Cabigon, 1997). Exclusive breastfeeding for the first six months, as recommended by WHO, has been shown to enhance growth and reduce infection-related mortality, particularly in resource-limited settings (WHO, 1991). However, in many tribal communities, traditional practices and misconceptions about infant feeding can hinder the adoption of optimal breastfeeding practices, further affecting infant growth and survival.

Northeast India presents a unique case for understanding the determinants of infant growth due to its ethnic diversity and distinct cultural practices. The Tangsa tribal group and other communities in the region have been studied for their infant health patterns, with findings suggesting that tribal infants often have better birth outcomes compared to their non-tribal counterparts, potentially due to genetic factors or differences in maternal practices (Sarkar and Saikia, 2000). However, the persistent challenges of maternal malnutrition, poor sanitation, and limited access to healthcare disproportionately affect these populations, making targeted interventions essential (Dharmalingam et al., 2009). This review aims to explore the multifaceted determinants of infant growth among the tribal populations of Northeast India. By examining maternal health factors, feeding practices, and regional variations, this study seeks to provide a comprehensive understanding of the challenges and opportunities for improving infant health outcomes in these communities.

Review of Previous Works

Maternal health remains a critical determinant of infant growth and birth outcomes, with numerous studies emphasizing the importance of maternal characteristics such as height, weight, parity, and nutritional status. Elshibly and Schmalisch (2008) found a significant positive correlation between maternal height and birth weight, with shorter mothers more likely to deliver low-birth-weight (LBW) infants. Kulkarni et al. (2006) further established that maternal parity and lean body mass are key predictors of birth weight, with first-time mothers and those with lower lean body mass tending to have smaller babies. Recent studies such as those by Khatun et al. (2020) and Bhattacharjee et al. (2021) confirm that maternal under nutrition and short stature continue to increase the risk of adverse birth outcomes in rural South Asia. Khatun’s work specifically highlights the higher prevalence of maternal malnutrition in resource-poor settings, exacerbating the risk of LBW births. Additionally, Thakur et al. (2019) reinforced the link between maternal body mass index (BMI) before pregnancy and birth outcomes, showing that underweight mothers are at a heightened risk of delivering LBW infants.

Educational attainment also significantly influences maternal health and infant growth outcomes. Higher maternal education is associated with improved knowledge of nutrition, healthcare practices, and neonatal care. Studies by Ogulensi (2010) and Rahman et al. (2018) found that educated mothers are more likely to initiate early breastfeeding, adhere to nutritional guidelines, and seek antenatal care, which improves neonatal health. Recent evidence further corroborates this, with Rahman et al. (2019) demonstrating that maternal education in rural settings can lead to better adherence to feeding practices, ultimately reducing neonatal morbidity. However, cultural practices, such as tobacco use, remain major risk factors. Critchley and Unal (2003) and Aliyu et al. (2019) have shown that tobacco exposure during pregnancy both smoked and smokeless can lead to adverse outcomes such as LBW, preeclampsia, and stillbirth, with particularly harmful effects in tribal populations where tobacco use is culturally ingrained.

Feeding practices, especially breastfeeding, play a central role in infant growth and survival. Exclusive breastfeeding during the first six months is associated with reduced neonatal mortality and enhanced immunity, as noted by Cabigon (1997) and Victora et al. (2016). Recent studies, such as those by Chetry et al. (2021), highlight the challenges tribal communities face in adhering to these practices, particularly due to delayed initiation of breastfeeding and early introduction of complementary foods. These practices contribute to malnutrition and growth faltering. Baruah et al. (2017) found that in tribal populations of Northeast India, inadequate breastfeeding and suboptimal complementary feeding practices significantly increase the risk of stunted growth and infection. Moreover, tribal mothers' limited access to healthcare further exacerbates the adherence gap to recommended feeding guidelines, as documented by Baruah et al. (2021). These findings stress the need for culturally sensitive health interventions that bridge the gap between traditional practices and modern recommendations, ensuring better infant health outcomes.

Regional and ethnic variations further complicate the determinants of infant growth and birth weight in Northeast India. Research by Sarkar and Saikia (2000) showed that certain tribal groups, such as the Tangsa tribe in Changlang, have relatively healthier birth weights compared to non-tribal populations. This difference may stem from genetic factors, maternal diet, and traditional practices, which can have protective effects on birth outcomes. However, these advantages are often offset by systemic challenges like maternal malnutrition, limited healthcare access, and poor sanitation. Deshmukh et al. (2007) found that maternal weight remains a strong determinant of birth weight, with mothers weighing less than 50 kg being more likely to give birth to LBW infants. More recent findings by Das et al. (2020) and Bhattacharjee et al. (2021) confirm the persistent issue of maternal under nutrition in Northeast India, which contributes to LBW and perpetuates a cycle of poor health outcomes. Additionally, socioeconomic disparities exacerbate healthcare challenges, as tribal populations in the region often face greater barriers to accessing prenatal and postnatal care. Ramakrishnan et al. (1999) highlighted the intergenerational cycle of poor birth outcomes, where LBW in mothers increases the likelihood of LBW infants, underscoring the need for long-term interventions targeting maternal nutrition and healthcare accessibility.

The reviewed literature confirms that maternal health, feeding practices, and regional variations are crucial in determining infant growth and birth weight outcomes in Northeast India. While genetic factors and traditional practices may offer some protection, systemic issues like maternal malnutrition and healthcare disparities continue to undermine infant health. Recent findings reinforce the importance of addressing cultural, socioeconomic, and health system challenges through context-specific interventions. Tailored maternal and child health policies, focusing on improving maternal nutrition, education, and healthcare access, are essential for improving birth outcomes and breaking the cycle of poor health in vulnerable populations.

Materials and Methods

This review employs a qualitative approach to synthesize existing literature on the determinants of infant growth and birth weight, with a focus on tribal populations in Northeast India. The analysis integrates findings from peer-reviewed journals, government reports, and publications by international health organizations to explore the biological, social, and cultural factors shaping infant health outcomes. By drawing on a wide range of secondary data, the study seeks to provide a comprehensive understanding of these multifaceted determinants. Data collection involved a systematic search of academic databases, including PubMed, Google Scholar, Scopus, and JSTOR, as well as reports from organizations such as the World Health Organization (WHO) and UNICEF. The search strategy targeted keywords like “low birth weight determinants,” “maternal health and birth outcomes,” and “breastfeeding practices in tribal populations,” applying Boolean operators and filters for relevance, publication date, and geographic focus. Studies published in English between 1990 and 2022, focusing on tribal populations in Northeast India, were included, with preference given to empirical research, reviews, and meta-analyses addressing maternal health, feeding practices, or infant growth. Exclusion criteria ruled out studies with insufficient focus on the target region, non-peer-reviewed literature, or those lacking robust methodology.

Extracted data were thematically analysed to identify patterns and relationships among the determinants of infant growth, including maternal health factors, cultural and socioeconomic influences, and regional healthcare disparities. Thematic categorization highlighted key areas such as breastfeeding practices, maternal nutritional status, and the role of regional and ethnic variations. While the methodology provided valuable insights, limitations such as reliance on secondary data, potential publication bias, and challenges in generalizing findings across diverse tribal groups in Northeast India were acknowledged. Despite these constraints, the study offers a nuanced perspective on addressing the complex challenges affecting infant health outcomes in this region.

Analysis and Discussion

Recent findings illuminate the complex determinants of infant growth and birth weight, particularly within Northeast India's tribal populations. Studies increasingly underscore the compounded impact of systemic inequities, such as limited healthcare access, insufficient nutritional education, and sociocultural norms, on maternal and infant health. Emerging evidence highlights the role of environmental stressors, such as food insecurity and seasonal agricultural cycles, which disproportionately affect tribal mothers. Research by Sharma et al. (2021) identifies that food availability and maternal dietary diversity directly correlate with fetal growth, while Das et al. (2022) emphasizes the adverse effects of household air pollution on maternal and neonatal outcomes, an issue prevalent in rural tribal areas reliant on biomass fuel. Advances in maternal health research indicate that intergenerational influences on birth weight are more profound than previously understood. Studies like those of Baruah et al. (2020) demonstrate that mothers born with LBW them are significantly more likely to deliver LBW infants, exacerbating a transgenerational cycle of poor health. Additionally, the influence of micronutrient deficiencies, particularly in iron, folate, and vitamin D, has received renewed attention. A study by Bhattacharjee et al. (2021) links maternal anemia – a condition prevalent among tribal women in Northeast India to increased risks of preterm births and intrauterine growth restriction, suggesting the critical need for focused nutritional interventions in this population.

In the context of feeding practices, recent evaluations have shed light on shifting trends and persistent gaps. For example, studies by Thakuria and Dutta (2022) indicate a slow but measurable improvement in early initiation of breastfeeding among some tribal groups, attributed to localized health promotion programs. However, the inconsistent adoption of exclusive breastfeeding practices remains a significant challenge, as highlighted by Baruah et al. (2021). Moreover, the early introduction of culturally specific weaning foods, which often lack adequate nutritional value, continues to hinder optimal infant growth, reinforcing the need for culturally adapted interventions to improve complementary feeding practices. Finally, recent policy analyses highlight promising interventions tailored to tribal communities. Comprehensive maternal and child health initiatives like the Pradhan Mantri Matru Vandana Yojana (PMMVY) and regional adaptations of WHO’s Integrated Management of Neonatal and Childhood Illness (IMNCI) guidelines have shown potential in bridging gaps in healthcare access and addressing malnutrition. However, a 2022 review by Choudhury et al. underscores that these programs often lack adequate integration of traditional beliefs and practices, limiting their effectiveness in tribal populations. Addressing these gaps through participatory community-based approaches and sustained investments in healthcare infrastructure could significantly improve maternal and infant health outcomes in Northeast India.

Conclusion

Maternal health, cultural practices, and regional disparities are key factors influencing infant growth and birth weight, particularly in Northeast India’s tribal populations. Maternal characteristics such as nutritional status, height, and weight play crucial roles in determining birth outcomes, with under nutrition and low body mass index being strong predictors of low birth weight (LBW). Socioeconomic factors, such as education level and healthcare access, play a significant role in influencing maternal health and infant survival outcomes. Studies indicate that educated mothers are more likely to adhere to

optimal breastfeeding practices, reducing neonatal morbidity and mortality. Feeding practices, particularly exclusive breastfeeding, remain central to infant growth. However, tribal communities often face barriers in adhering to these practices due to cultural traditions and misconceptions. Delayed initiation of breastfeeding and early introduction of inadequate complementary foods contribute to stunted growth and malnutrition. Moreover, regional and ethnic variations highlight the importance of understanding local contexts, as some tribal groups experience better birth outcomes due to genetic factors or maternal practices, though challenges like maternal malnutrition persist.

Recent findings emphasize the intergenerational impact of maternal health, showing that LBW mothers are more likely to have LBW infants, perpetuating cycles of poor health. Nutritional deficiencies, especially in iron, folate, and vitamin D, have been linked to adverse pregnancy outcomes, signaling the need for targeted interventions. While progress has been made in improving breastfeeding practices, gaps remain, and culturally adapted interventions are essential for improving infant growth. To address these complex challenges, it is crucial to tailor maternal and child health policies that integrate both modern healthcare practices and traditional beliefs. Targeted interventions, increased healthcare access, and improvements in maternal nutrition are essential for breaking the cycle of poor health outcomes in these vulnerable populations. Sustainable community-based strategies and enhanced infrastructure will be critical in improving infant health and development in Northeast India.

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