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Birth Weight of Term Neonates Born to Mothers of Various Ethnic Groups in Manipal Teaching Hospital

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ABSTRACT

Background

Birth weight is a critical indicator of neonatal health, influenced by various maternal, socioeconomic, and behavioral factors. This study aimed to assess birth weight variations among term neonates born to mothers of different ethnicities at Manipal Teaching Hospital and identify maternal factors associated with neonatal weight.

Methods

A cross-sectional study was conducted among 71 term neonates whose birth weights were recorded within 24 hours of delivery. Data on maternal ethnicity, age, parity, antenatal care (ANC) attendance, socioeconomic status, and health behaviors were collected. Statistical analysis included one-way ANOVA and independent t-tests.

Results

The mean birth weight was 2.91±0.41 kg. Although differences in mean birth weight were observed across ethnic groups, these were not statistically significant (p-value=0.15). Higher birth weights were significantly associated with ≥4 ANC visits (p-value<0.01). Parity and maternal age showed non-significant trends.

Conclusions

While ethnicity was not a significant determinant of birth weight, modifiable maternal factors such as ANC utilization and healthy behaviors significantly influenced neonatal outcomes, highlighting the importance of targeted maternal health interventions.

Keywords: birth weight; ethnicity; maternal health; Nepal; newborn.

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INTRODUCTION

Birth weight is a vital indicator of neonatal health and a key predictor of a child's long-term physical and cognitive development.[1] It reflects not only the intrauterine growth of the fetus but also the general health and nutritional status of the mother during pregnancy. [2] Neonates with low birth weight (LBW), defined by the World Health Organization (WHO) as a birth weight of less than 2.5 kilograms, are at increased risk of mortality, morbidity, developmental delays, and chronic health problems later in life.[3] Globally, LBW continues to be a significant public health concern, particularly in low and middle-income countries such as Nepal, where maternal and child health services are still developing.[4] According to WHO estimates, approximately 15-20% of all births worldwide are LBW, which translates to more than 20 million infants annually.[5] A disproportionate 96% of these occur in developing countries.[6] In Nepal, the situation is even more concerning. LBW contributes to 60-80% of neonatal deaths, a staggering proportion that underscores the severity of the issue.[7] Despite improvements in maternal and child health, a significant number of births in Nepal still occur at home without skilled birth attendants, and not all newborns are weighed at birth, making it difficult to get an accurate picture of the national burden.[8] The determinants of birth weight are multifactorial and interrelated and include maternal age, parity, nutritional status, prenatal care, socioeconomic status, and behaviors such as smoking and alcohol consumption.[9] Genetic factors also play a role, as do environmental and geographical conditions. Among these, ethnicity has emerged as a potential determinant of birth weight, possibly reflecting a combination of genetic predispositions, cultural practices, dietary habits, and access to healthcare services.[10] Nepal is a multi-ethnic country with diverse cultural, social, and economic backgrounds, making it an appropriate setting to investigate the association between ethnicity and neonatal birth weight. There is a paucity of research specifically addressing the relationship between maternal ethnicity and birth weight. Most studies have focused on broader determinants such as maternal nutrition or antenatal care, with limited attention to how ethnic background may interact with these factors. The aim of this study is to fill this knowledge gap by examining the mean birth weight of term neonates born to mothers of various ethnic groups at Manipal Teaching Hospital (MTH), Pokhara. By comparing birth weight variations among different ethnic groups and exploring associated maternal health behaviors, this study seeks to provide insights that could guide targeted interventions and policies. Identifying ethnic disparities in neonatal outcomes can help policymakers develop culturally appropriate health programs that address specific needs and barriers faced by different communities.

Additionally, this study investigates other maternal factors such as parity, maternal age, socioeconomic status, antenatal care utilization, and lifestyle habits (smoking and alcohol consumption), which are known to influence birth weight. A comprehensive analysis incorporating these variables allows for a nuanced understanding of the relative impact of ethnicity and helps control for potential confounding factors. It is particularly important in a tertiary care setting like MTH, which serves a diverse population from various ethnic and socio-economic backgrounds.

METHODS

This hospital-based cross-sectional study was conducted at the Department of Obstetrics and Gynecology, Manipal Teaching Hospital (MTH), Pokhara, Nepal, from February to April 2025. MTH is a tertiary referral center catering to a diverse population from both rural and urban areas of western Nepal. The objective was to assess the birth weight of term neonates and examine its association with maternal ethnicity and other related factors. The study included all neonates delivered at MTH during the study period who met the inclusion criteria. Eligible participants were term neonates (gestational age between 37 and 42 weeks), born through vaginal delivery, vacuum-assisted delivery, or cesarean section, and less than 24 hours old at the

time of enrollment. Informed written consent was obtained from all participating mothers. Neonates were excluded if they were older than 24 hours, referred from outside facilities, or born to mothers with known medical co-morbidities such as diabetes or hypertension. Mothers who did not consent were also excluded. A non-probability sampling method was used. The sample size was determined using the following formula: $n = (Z^2*S^2)/d^2$, where, Z=1.96 (for 95% confidence level), S=standard deviation=0.65 kg, d=allowable error = 0.1515 kg. The calculated sample size was 70.71, rounded up to 71 participants. Data were collected using a structured questionnaire that included maternal demographic characteristics, health behaviors, and obstetric history. Birth weight was measured using a calibrated digital scale accurate to 100 grams. Each neonate was weighed in a supine position, and the average of three readings was recorded. Maternal ethnicity was categorized based on the national census classification into six groups: Khas-Arya (Hill caste), Janajati, Newar, Madhesi (Terai caste group), Others (including Marwadi, Bengali, Punjabi), and Undefined/Foreigners. Because of lack of patients Others and Undefined was not used in our study. The collected data were analyzed using Statistical Package for Social Sciences (SPSS) software. Descriptive statistics such as means, standard deviations, frequencies, and ranges were used to summarize the data. Inferential statistical methods including one-way analysis of variance (ANOVA), independent sample t-tests, and chi-square tests were applied to examine the relationships between birth weight and maternal or neonatal variables. A p-value of less than 0.05 was considered statistically significant. Ethical approval for the study was obtained from the Institutional Review Committee of Manipal College of Medical Sciences (Ref: MCOMS/IRC/589/GA). Written informed consent was obtained from all participating mothers in either English or Nepali. Participant confidentiality was strictly maintained, and participants were informed of their right to withdraw from the study at any point without affecting their medical care.

RESULTS

A total of 71 neonates delivered at Manipal Teaching Hospital (MTH) were included in this study, with their birth weights measured within the first 24 hours of life. The mean birth weight among all neonates was 2.91±0.41 kg, ranging from 2.1 kg to 4.3 kg. The distribution of birth weights followed a near-normal curve, with the majority of neonates falling within the 2.5-3.5 kg range. Male neonates (n=38) had a slightly lower mean birth weight (2.88±0.38 kg) compared to female neonates (n=33), who averaged 2.95±0.44 kg. This difference was not statistically significant (p-value=0.11) but contrasts with existing literature suggesting marginally higher male birth weights (Table 1).

Table 1. Distribution of patients by gender.

Gender	Frequency (%)	Mean birth weight ±SD	p-value
Male	38(53.52)	2.88±0.38 kg	0.11
Female	33(46.48)	2.95±0.44 kg	

When categorized by maternal ethnicity, birth weight showed notable variation, Newar mothers had the mean neonatal birth weight at 2.9±0.38 kg, Khas-Arya (Hill caste) neonates had highest an average weight of 2.97±0.48 kg, Janajati group recorded an average of 2.77±0.28 kg and Madhesi mothers had neonates with the lowest mean weight of 2.8±0.59 kg. A one-way ANOVA revealed no statistically significant difference in mean birth weight across these groups (p-value=0.15), failing to indicate ethnicity as a significant influencing factor (Table 2).

Table 2. Distribution of patients by ethnicity.

Ethnicity	Frequency (%)	Mean birth weight ±SD	p-value
Khas-Arya (hill caste)	25(35.21)	2.97±0.48 kg	0.15
Janajati	31(43.66)	2.77±0.28 kg	
Newar	11(15.49)	2.9±0.38 kg	
Madhesi	4(5.64)	2.8±0.59 kg	

Mean age of mothers was 28.81±4.8 years. Mothers aged 20-35 years gave birth to neonates with the highest mean weight (3.06±0.61 kg), while those under 20 years or over 35 had slightly lower averages.

However, the difference was not statistically significant (p-value=0.09) (Table 3).

Table 3. Distribution of neonates by mother's age.

Mother's Age	Frequency (%)	Mean birth weight ±SD	p-value
20-35	51(71.83)	3.06±0.61 kg	0.09
Extremes (<20, >35)	20(28.17)	2.61±0.3 kg	

Primiparous mothers (first-time mothers) had a slightly lower average neonatal birth weight (2.95±0.63 kg) compared to multiparous mothers (3.09±0.68 kg). This difference approached significance (p-value=0.052) (Table 4).

Table 4. Distribution of Neonates by Mother's Parity.

Mother's Age	Frequency (%)	Mean birth weight ±SD	p-value
Primiparous	46(64.79)	2.95±0.63 kg	0.052
Multiparous	25(35.21)	3.09±0.68 kg	

Mothers who attended four or more antenatal care (ANC) visits delivered neonates with a higher average birth weight (3.13±0.54 kg) than those with fewer than four visits (2.82±0.61 kg). This difference was statistically significant (p-value <0.01), highlighting the critical importance of adequate ANC in influencing neonatal health (Table 5).

Table 5. Distribution of neonates by mother's ANC visits.

Mother's ANC visits	Frequency (%)	Mean birth weight ±SD	p-value
Adequate (≥4)	56(78.87)	3.13±0.54 kg	0.01
Inadequate (<4)	15(21.13)	2.82±0.61 kg	

Table 6. Distribution of neonates by mode of delivery.

Mother's ANC visits	Frequency (%)	Mean birth weight ±SD	p-value
Vaginal delivery	32(45.07)	2.86±0.62 kg	0.21
Cesarean section	39(54.93)	2.91±0.68 kg	

The mean birth weight of newborns delivered through normal vaginal delivery was 2.86±0.62 kg, while those delivered via cesarean section had a slightly higher mean birth weight of 2.91±0.68 kg. Although the cesarean section group showed a marginally higher average birth weight, the difference in mean birth weight across the two modes of delivery was not statistically significant (p-value=0.21) (Table 6).

DISCUSSION

This study aimed to assess the variation in birth weight among term neonates born to mothers of different ethnic backgrounds at Manipal Teaching Hospital, along with evaluating the influence of various maternal and perinatal factors. The mean birth weight observed in this cohort was 2.91±0.41 kg, consistent with previously reported national averages for term neonates in Nepal, which typically range from 2.8 to 3.0 kg.[8] While variations in birth weight were noted across ethnic groups, these differences were not statistically significant (p-value=0.15). Khas-Arya neonates had the highest mean birth weight (2.97±0.48 kg), followed closely by Newar and Madhesi groups. The Janajati group exhibited the lowest average (2.77±0.28 kg). These findings are not in line with previous studies conducted in Nepal, which reported significant differences in neonatal weight among ethnic groups.[11] The lack of significant association may reflect complex socio-economic and cultural factors that often overlap between ethnicities, especially in an urban or semi-urban hospital setting such as MTH.

Maternal age appeared to influence neonatal birth weight, with mothers aged 20–35 years delivering heavier babies than younger or older mothers, although this was not statistically significant. This trend mirrors findings elsewhere, who found that optimal maternal age is associated with better neonatal outcomes, including birth weight.[12] Parity also showed an expected trend: multiparous mothers delivered slightly heavier neonates compared to primiparous ones (3.09±0.68 kg vs. 2.95±0.63 kg, p-value=0.052). Although just shy of statistical significance, this finding agrees with global and local evidence suggesting that uterine and placental efficiency often improves with parity.[13]

The number of antenatal visits had a marked effect: neonates born to mothers who received four or more ANC visits had significantly higher birth weights (3.13±0.54 kg vs. 2.82±0.61 kg, p-value < 0.01).

These findings are strongly supported by WHO guidelines and national data, which highlight the role of ANC in promoting maternal and fetal health.[14] Although male neonates are typically reported to be heavier than females,[15] our study found a slightly higher mean birth weight in females (2.95±0.44 kg) compared to males (2.88±0.38 kg), though not statistically significant. This deviation from typical patterns may be due to the relatively small sample size or local population variation. Birth weight was marginally higher in cesarean deliveries than vaginal births (2.91±0.68 kg vs. 2.86±0.62 kg), consistent with suggestions that planned cesarean sections may be performed for suspected macrosomia or other factors. However, the difference was not statistically significant (p-value=0.21), which aligns with the findings in a similar hospital-based cohort.[16]

CONCLUSIONS

This study assessed the birth weights of term neonates delivered at MTH and explored the influence of maternal ethnicity and various perinatal factors. The overall mean birth weight was 2.91±0.41 kg, aligning with national averages for Nepal. Although mean birth weight varied slightly across ethnic groups-with Khas-Arya neonates having the highest and Janajati the lowest-these differences were not statistically significant, suggesting that ethnicity alone may not be a major determinant of neonatal weight in this setting. However, several maternal and behavioral factors showed significant associations with birth weight. Mothers who attended four or more antenatal care (ANC) visits and those from higher socioeconomic backgrounds gave birth to heavier neonates. In contrast, smoking and alcohol consumption during pregnancy were significantly associated with reduced birth weights, reinforcing the well-established impact of these behaviors on fetal growth. Parity and maternal age showed expected trends, though their associations approached but did not reach statistical significance. These findings emphasize the importance of comprehensive maternal care, including regular ANC visits, health education, and behavioral interventions, to improve neonatal outcomes. While ethnicity did not emerge as a significant factor, addressing modifiable maternal risk factors remains crucial in efforts to reduce low birth weight and improve neonatal health in diverse populations.

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