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Gender Based Variation in Birth Outcomes in Terms of Mortality and Morbidity in Lumbini Province, Nepal

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Abstract

Introduction: Gender is a crucial factor in preterm outcomes and should be taken into account when designing clinical and experimental research. Fetal sex is an important risk factor for stillbirths and early neonatal mortality.

Objective: To assess the gender based variation in birth outcomes in terms of mortality and morbidity.

Methods: A descriptive cross-sectional study was conducted at maternity ward and NICU of Rapti Academy of Health Sciences. Records of 2326 neonates born from 17th July 2023 to 16th July 2024 were consecutively sampled and retrieved. Frequencies, mean and median of variables were calculated and for inferential analysis chi square test was used.

Results: Out of 2326 deliveries, majority of the women (66.3%) were aged 20-30 years. Most deliveries (91.5%) occurred at 37- 42 weeks, predominantly via normal vaginal delivery (66.8%). Of 2340 newborns, 55.1% were male, and 97.2% were live births, with 88% weighing 2500- 4000 grams. Neonatal morbidity was observed in 8.4% of cases, mainly caused by sepsis (29.6%) and jaundice (23.5%), among them almost two third (59.7%) were male. Only one male newborn had birth defect. Birth weight showed a significant association with gender (p=0.045).

Conclusion: This study found female neonates had higher rates of low birth weight, while male infants comprised 59.7% of morbidity cases. The findings emphasize the importance of antenatal monitoring for at risk pregnancies, particularly to address low birth weight in newborn, and targeted interventions for sepsis and jaundice as leading causes of morbidity. Multicentre studies are recommended to enhance the generalizability of these findings.

Keywords: Birth outcomes; gender; morbidity; mortality; newborns.

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Introduction

Gender specific medicine can be applied to the neonatal stage to assess sex differences related to diseases.[1] Gender is a crucial factor in preterm outcomes and should be taken into account when designing clinical and experimental research.[2] Fetal sex is an important risk factor for stillbirths and early neonatal mortality.[3] Male sex has been recognized as a risk factor for increased mortality in preterm neonates.[2,4,5,6] The male disadvantage in preterm outcomes is likely due to hormonal, genetic, and immunological differences.[2] They face higher risks of prematurity, growth restriction, respiratory and gastrointestinal complications [5,6] , neonatal death[7], still birth[8] and worse long-term neurological outcomes[9,10] Male fetuses are more prone to labor complications, including abnormal heart rate patterns, cord issues, and low Apgar scores at 5 minutes.[8]

Congenital anomalies like cleft lip and polydactyly are more common in males, whereas neural tube defects and cleft palate occur more in females.[11-13] Male infants face an elevated risk of neurological, pulmonary, cardiovascular, and infectious health issues, as well as a greater overall mortality rate, compared to female infants born at the same preterm gestation.[9] The neonatal mortality rate is 21 deaths per 1,000 live births.[14] Gender-based variations in perinatal outcomes, particularly among neonates, are gaining increasing attention in neonatal healthcare. Understanding these differences is essential for targeted interventions and equitable care. This study examines gender based variations in neonatal mortality and morbidity.

Methods

The study was descriptive cross-sectional study. Data collection was done through maternity register of maternity ward and NICU of Rapti Academy of Health Sciences. Around 3000 deliveries were registered at RAHS from 17th July 2023 to 16th July 2024 through the Maternity Register. After excluding estimated 1000 case records with missing/incomplete data, the calculated sample size was 2000 records. A final sample of 2326 neonatal records that met the inclusion criteria was selected using consecutive sampling. Ethical clearance letter was taken from IRC-RAHS with Ref. No. 378. Permission letter also obtain from Rapti Academy of Health Sciences with Ref. No. 357.

The inclusion criteria were neonates with available birth records and documented gender information and the exclusion criteria was cases with missing or incomplete data between the study periods. Data entry was done in Epidata and Data was analyzed on SPSS Version 16.0. Descriptive analysis was used to summarize the characteristics of the study variables, including frequencies, mean and median. Inferential analysis was employed to examine gender-based differences in neonatal outcomes, including mortality and mortality rates. P value of <0.05% is considered as statistically significant.

Results

Out of 2326 cases, about one- third of the women were between 20-30 (66.3%) years of age with mean age of 25.43 years. The majority (91.5%) of the women had delivery at gestational age between 37-42 weeks. Among 2340 newborns, 1562 (66.8%) were delivered through normal vaginal delivery, 683 (29.2%) through Caesarean Section and 95 (4.1%) through instrumental delivery. (Table 1). Almost all women (99.4%) had single fetus. Out of total 2340 newborn including 14 twins, more than half (55.1%) of newborns were male. (Table 2)

Table 1: Mother related variables.

Variables	Frequency (f)	Percentage (%)
Age of mother (n=2326)		
Less than 20 years	267	11.5
20-30 years	1543	66.3
30-40 years	499	21.5
40 years and above	17	0.7
Gestational Age (n=2326)		
Less than 37 weeks	177	7.6
37-42 weeks	2128	91.5
More than 42 weeks	21	0.9
Mode of Delivery (n=2340)		
Normal	1562	66.8
Caesarean Section	683	29.2
Instrumental	95	4.1

Table 2: Child related variables.

Variables	Frequency (f)	Percentage (%)
Number of fetus (n=2326)		
Single	2312	99.4
2 and more	14	0.6
Gender of Newborn (n=2340)		
Male	1290	55.1
Female	1050	44.9

Among 2340 newborns, the majority (97.2%) were live births while 65 were stillbirth (2.8%). APGAR score at 1 minute and at 5 minutes both 86.7% and 98.6% respectively fall under 7-10 scores of grading of APGAR. The majority (88%) of newborns had a birth weight between 2500-4000 grams. Additionally, only one newborn had birth defect. (Table 3)

Table 3: Neonatal outcome related variables.

Variables	Frequency (f)	Percentage (%)
Pregnancy Outcome (n=2340)		
Still birth	65	2.8
Live birth	2275	97.2
APGAR score at 1 minute (n=2275)		
0-3	36	1.6
4-6	266	11.7
7-10	1973	86.7
APGAR score at 5 minutes (n=2275)		
0-3	2	0.1
4-6	30	1.3
7-10	2243	98.6
Birth Weight (n=2275)		
<2500 grams	240	10.5
2500-4000 grams	2003	88
>4000 grams	32	1.4
Birth defect (n=2275)		
No	2274	99.95%
Yes	1	0.04%

About 191 (8.4%) neonates had morbidity, with the most common conditions being neonatal Sepsis (29.6%), neonatal jaundice (23.5%) and meconium stain liquor (15%). (Table 4). There were only 2 deaths (0.1%), with the major cause of neonatal mortality being intrauterine growth restriction accounting for 66.7%. (Table 5)

Table 4: Neonatal morbidity related variables.

Variables	Frequency (f)	Percentage (%)
Presence of Neonatal morbidity (n=2275)		
No	2084	91.6
Yes	191	8.4
Types of Morbidity (n=191) (Multiple response)		
Neonatal Sepsis	67	29.6
Neonatal jaundice	53	23.5
Meconium Stain Liquor	34	15
Birth Asphyxia	18	8
LBW	17	7.5
Congenital Pneumonia	10	4.4
IUGR	6	2.7
Others	21	9.3

Table 5: Neonatal Mortality related variables.

Variables	Frequency (f)	Percentage (%)
Neonatal Mortality (n=2275)		
No	2273	99.9
Yes	2	0.1
Cause of Neonatal mortality (n=2) (Multiple response)		
Intrauterine Growth restriction	2	66.7
Birth Asphyxia	1	33.3

Gender of newborn is statistically significant with birth weight of newborn (p=0.045), while other variables such as APGAR score at 1 minute and 5 minutes, birth defect, neonatal morbidity and mortality have no significant association with gender of newborn. (Table 6)

Table 6: Association between Gender of newborn and birth outcome, neonatal morbidity and mortality
n=2275

Variables	Gender of newborn		p value
	Male f (%)	Female f (%)	
APGAR score at 1 min			
0-3	21 (58.3)	15 (41.7)	0.779
4-6	142 (53.4)	124 (46.6)	
7-10	1091 (55.3)	882 (44.7)	
APGAR score at 5 min			
0-3	0 (0)	2 (100)	0.253
4-6	18 (60)	12 (40)	
7-10	1236 (55.1)	1007 (44.9)	
Birth weight			
LBW (<2500)	115 (47.9)	125 (52.1)	0.045*
Normal (2500-4000)	1119 (55.9)	884 (44.1)	
Overweight (>4000)	20 (62.5)	12 (37.5)	
Birth defect			
Yes	1 (100)	0 (0)	0.367
No	1253 (55.1)	1021 (44.9)	
Newborn morbidity			
Yes	114 (59.7)	77 (40.3)	0.185
No	1140 (54.7)	944 (45.3)	
Neonatal mortality			
Yes	1 (50)	1 (50)	0.884
No	1253 (55.1)	1020 (44.9)	

*Statistically Significant

Discussion

This study analysed 2,326 cases of delivery at Rapti Academy of Health Sciences over one year period, providing insights into

maternal and neonatal outcomes in a tertiary care setting in Nepal. The findings highlight several key trends in maternal demographics, delivery methods, neonatal health, and gender based differences in birth outcomes. In this study, the majority of mothers (66.3%) were between 20- 30 years of age with a mean age of 25.43 years, reflecting a predominantly young reproductive population, aligning with national demographic trends.[14] In addition, male newborns accounted for more than half of all births (55.1%). Most deliveries (91.5%) occurred at term (37-42 weeks) which suggests good antenatal surveillance and care, while 7.6% were preterm (<37 weeks), which shows the consistency with global data.[3] The caesarean section rate (29.2%) was notably high 5,8, possibly due to the study site is referral centre of this region.

The live birth was high (97.2%), with a stillbirth of 2.8%, which is similar to the data of National Demographic Health Survey.[14] Majority of new-borns had normal APGAR scores (86.7% at 1 minute, 98.6% at 5 minutes), indicating effective intrapartum and immediate postpartum care. Birth weight distribution showed that 88% of new-borns were normal weight (2500-4000g), while 10.5% were low birth weight (LBW), a known risk factor for neonatal complications.[4] Only one case of congenital birth defect was reported, which contrasts with studies suggesting higher rates of structural anomalies.[11,13] Importantly, statistical analysis revealed a significant association between gender and birth weight ($p = 0.045$), with a higher proportion of female neonates presenting with low birth weight. This finding aligns with other studies suggesting that male infants generally have higher birth weights than females.[1,4] However, no significant gender differences were found in APGAR scores, morbidity, or mortality, contradicting some studies suggesting male preterm infants has worse outcomes.[2,9]

Neonatal morbidity was reported in 8.4% of live births, with neonatal sepsis (29.6%), neonatal jaundice (23.5%), and meconium-stained liquor (15%) being the most common complications. This result contrasts with another study where pulmonary morbidity dominated along with intracranial haemorrhage and urinary tract infection.[5] Despite this, neonatal mortality was extremely low (0.1%), with both deaths linked to intrauterine growth restriction (IUGR) and birth asphyxia. This contrasts with higher mortality rates in another study[5], and aligns with previous studies linking IUGR and birth asphyxia to adverse outcomes in resource-limited settings.[3] The study was based on a single hospital record. Therefore, findings cannot be generalized at the district and national level.

Conclusion

This study provides valuable insights into maternal and neonatal health in a Nepalese setting. While most newborns had normal APGAR scores and birth weights, a significant gender-based difference was observed in birth weight, with female neonates more likely to be low birth weight (LBW). However, no significant gender disparities were found in morbidity or mortality, despite male infants constituting a higher proportion (59.7%) of neonatal morbidity cases. Since this study was conducted at a single centre, its findings may not be widely applicable, in order to strengthen generalizability. Further research with larger sample size in a multi-center approach is recommended to enhance the generalizability of these findings.

Conflict of Interest: None

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