Dr. Dipenti Mehta
Senior Resident, Department of
Obstetrics and Gynecology,
Government Medical College,
Surat, Gujarat, India

Dr. Ritu
3rd Year Resident, Department of
Obstetrics and Gynecology,
Government Medical College,
Surat, Gujarat, India

Dr. Minal Chaudhari
Assistant Professor, Department of
Obstetrics and Gynecology,
Government Medical College,
Surat, Gujarat, India

Dr. Dhwani Desai
Associate Professor, Department of
Obstetrics and Gynecology,
Government Medical College,
Surat, Gujarat, India

Dr. Ragini N Verma
Head of Department, Department
of Obstetrics and Gynecology,
Government Medical College,
Surat, Gujarat, India

An observational study of clinical profile and feto-maternal outcome in ≥ 3.5 kg baby birth weight at tertiary healthcare centre in south Gujarat

Dipenti Mehta, Ritu, Minal Chaudhari, Dhwani Desai and Ragini N Verma

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Abstract
Background: High birth weight, defined here as ≥3.5 kg, though not universally considered macrosomia, is a clinically significant parameter associated with a spectrum of maternal and neonatal complications. With shifting epidemiological trends in maternal health—such as rising obesity and gestational diabetes—the incidence of higher birth weights is increasing, especially in South Asian populations where average maternal anthropometry is smaller.
Methods: A prospective observational study was conducted at a tertiary care Centre in South Gujarat over a period of 12 months. A total of 200 consenting women who delivered babies weighing ≥3.5 kg was enrolled. Data regarding sociodemographic characteristics, obstetric and medical history, antenatal care utilization, delivery mode and maternal comorbidities were collected and analyzed using SPSS software.
Results: The majority of women were aged 20–29 years (77%). They were either primiparous (43%) or nulliparous (30.5%). Obesity (BMI >30) was observed in 47%, and 32% had maternal comorbidities, predominantly diabetes mellitus (45.3% of those with comorbidities). Caesarean section was required in a significant proportion of deliveries due to suspected macrosomia, cephalopelvic disproportion, or fetal distress. Birth weights >3.5 kg was significantly associated with higher maternal BMI, GDM, multiparity, and increased incidence of labor complications.
Conclusion: Deliveries involving neonates weighing ≥3.5 kg is frequently associated with higher maternal BMI, diabetes, and increased risk of operative delivery and neonatal complications. Early identification of at-risk pregnancies through focused antenatal care and tailored labor management strategies can mitigate adverse feto-maternal outcomes.

Keywords: High birth weight, macrosomia, maternal BMI, gestational diabetes, feto-maternal outcome, South Gujarat

Introduction
Birth weight serves as a critical indicator of neonatal well-being and is a significant determinant of perinatal morbidity and mortality. While extensive research has historically focused on the challenges and risks associated with low birth weight, there is an increasing acknowledgment of the clinical complexities presented by neonates weighing ≥ 3.5 kg at birth. Although this weight threshold does not universally qualify as macrosomia (typically defined as birth weight ≥ 4 kg or ≥ 4.5 kg), it represents a clinically important category necessitating systematic investigation due to its potential impact on both maternal and fetal outcomes [1, 2].

The occurrence of high birth weight is influenced by a complex interaction of maternal, fetal, and placental factors. Key maternal contributors often include pre-pregnancy obesity, excessive weight gain during gestation, multiparity, pregnancies extending beyond term, and metabolic conditions such as gestational diabetes mellitus (GDM) and pre-existing diabetes. These factors contribute to enhanced nutrient transfer across the placenta and stimulate fetal insulin production, acting as a growth-promoting hormone that leads to disproportionate fetal growth, particularly of adipose tissue. Additionally, genetic predispositions and ethnic backgrounds may also play a role in influencing fetal growth potential [3].

The clinical profile of mothers delivering babies with birth weights ≥3.5 kg frequently exhibits characteristic trends, such as higher maternal body mass index (BMI) and an increased likelihood of GDM, often necessitating additional antenatal interventions [4]. From the fetal perspective, high birth weight is associated with various intrapartum and postpartum complications, including the significant risk of shoulder dystocia, birth trauma (e.g., brachial

Corresponding Author:
Dr. Dipenti Mehta Senior Resident,
Department of Obstetrics and
Gynecology, Government Medical
College, Surat, Gujarat, India

plexus injury), respiratory distress, neonatal hypoglycemia, and increased rates of Neonatal Intensive Care Unit (NICU) admissions [5, 6]. Maternal complications are equally considerable, with documented increases in caesarean section rates, prolonged labor, perineal lacerations, and postpartum hemorrhage [7, 8].

Given these potential adverse outcomes, a comprehensive understanding of the clinical profile and fetomaternal outcomes associated with babies weighing ≥3.5 kg is crucial. Such research provides vital insights into risk factors, clinical patterns, and outcome predictors, thereby supporting evidence-based decision-making in obstetric care and contributing to the development of effective management protocols aimed at optimizing maternal and neonatal health. The findings can inform clinical guidelines, refine screening tools, and help balance the risks and benefits of early induction, caesarean section, or expectant management in cases of suspected high birth weight. Through detailed evaluation and data-driven strategies, healthcare providers can improve pregnancy outcomes and contribute to long-term public health advancement [9, 10].

Material and Methods
This prospective observational study was conducted enrolling 200 consenting subjects fulfilling inclusion criteria (mentioned below) at New civil Hospital, Surat a tertiary health care centre of South Gujarat over a period of 12 months after HREC approval.

Inclusion criteria
All consenting pregnant women who delivered babies with ≥3.5 kg baby weight irrespective of gestational age by vaginal delivery or LSCS in Obstetrics and Gynecology department of tertiary health care centre.

Exclusion criteria
- Women delivering babies with birth weight of less than 3.5 kg.
- Non-consenting women who delivered babies with ≥3.5 kg baby weight

The data was compiled and analyzed using statistical tests, chi square test, t test using SPSS software.

Observations and Discussion

Table 1: Baseline criteria

Age	No. of subjects (n=200)	Percentage
<19Yrs	16	8.00%
20-29yrs	154	77.00%
30-39yrs	30	15.00%
Parity	No. of subjects (n=200)	Percentage
Nullipara	61	30.50%
Primipara	86	43.00%
Multipara	53	26.50%
Mode of delivery in previous pregnancy	Number of subjects (n=139)	Percentage
Vaginal delivery	116	83.45%
LSCS	22	15.83%
Instrumental delivery	1	0.72%
Highest birth weight of previous child	Number of subjects (n=139)	Percentage
2.5-2.9kg	21	15.10%
3.0-3.4kg	89	64.03%
>3.5kg	29	20.87%

For neonates ≥3.5 kg (n=200), most mothers (77%) were aged 20-29. Fewer mothers were ≤19 (8%) or 30-39 (15%), suggesting higher birth weight is common in reproductive age females. a finding comparable to that of Sahu *et al*. (2017), who reported 72% of macrosomia births among women aged 21–30 years [11].

This suggests that a majority of mothers delivering babies ≥3.5 kg was either in their first or second pregnancy, indicating that high birth weight is not limited to multiparity alone.

This distribution suggests that a large majority of the women had undergone normal vaginal deliveries in the past, with a relatively lower incidence of surgical or assisted delivery methods.

Out of 29 subjects, 20.87% had a history of delivering babies weighing over 3.5 kg, indicating a predisposition to macrosomia in subsequent pregnancies.

Table 2: Current antenatal period details

Number of antenatal visits	No. of subjects (n=200)	Percentage
1-3	12	6.00%
4-6	53	26.50%
7-9	68	34.00%
>10	67	33.50%
Comorbidities	Number of subjects (n=200)	Percentage
Present	64	32%
Absent	136	68%
Comorbidities	No. of subjects (n=64)	Percentage
DM (Diabetes Mellitus)	29	45.31%
Hypothyroidism	20	31.25%
PIH (Pregnancy induced HTN)	7	10.94%
Anemia	6	9.38%
Asthma	1	1.56%
Epilepsy	1	1.56%

In the present study, 188 subjects (94%) had four or more antenatal visits as prescribed by WHO. These findings reflect a generally high level of antenatal service utilization in my study. The distribution of number of antenatal visits in my study was similar to study of Telangana (NFHS-5) (70.5%) [12].

In present study, Diabetes Mellitus (DM) was the most prevalent, affecting 45.31%. Hypothyroidism followed as the second most common co-morbidity, present in 31.25%.

Table 3: Outcome

Birth weight	No of subject (n=200)	Percentage
3.5kg	42	21.00%
3.6kg	79	39.50%
3.7kg	38	19.00%
3.8kg	18	9.00%
3.9kg	20	10.00%
>4.0kg	3	1.50%
Mode of delivery in current pregnancy	Number of subjects (n=200)	Percentage
Vaginal delivery	144	72.00%
LSCS	56	28.00%
Indication of LSCS	Number of subjects (n=56)	Percentage
Nullipara spontaneous labour (Robson class -1)	8	14.28%
Nullipara induced labour (Robson class 2)	5	8.92%
Multipara spontaneous labour (Robson class 3)	16	28.57%
Multipara induced labour (Robson class 4)	7	12.50%
Previous caesarean section in spontaneous labour (Robson class 5)	20	35.73%
Intra and Post partum period	Number of subjects (n=200)	Percentage
Uneventful	183	81.70%
Puerperal pyrexia	12	10.71%
Puerperal sepsis	3	4.02%
Post Partum Hemorrhage	2	3.57%

Out of 200 newborns, the most common birth weight was 3.6 kg (39.5%), followed by 3.5 kg (21%) and 3.7 kg (19%). The majority of neonates weighed between 3.5–3.7 kg, indicating a normal birth weight range. Higher weights (≥3.8 kg) were less frequent, and only 1.5% had a birth weight over 4.0 kg, suggesting a low rate of macrosomia. This distribution may reflect effective antenatal care and maternal health practices in the studied population.

144 women (72.00%) had a vaginal delivery, while 56 women (28.00%) underwent a caesarean section (LSCS). The choice or necessity for a caesarean section could be influenced by various factors such as fetal size, associated maternal health conditions, or complications during labour.

Among the 56 women who underwent LSCS, the most common were previous CS cases (Robson class 5 – 35.73%), followed by multiparas in spontaneous labour (class 3 – 28.57%) and nulliparas in spontaneous labour (class 1 – 14.28%).

Among 200 postpartum women, 183 (91.5%) had an uneventful course. Complications occurred in 17 cases (8.5%), primarily puerperal pyrexia (6%), followed by sepsis (1.5%) and postpartum hemorrhage (1%). Most puerperal complications were infection-related. The overall morbidity was low, highlighting the importance of vigilant postpartum care in high-risk cases.

Table 4(a): Correlation

Birth weight	Parity (P value=0.15)			Comorbidities (P value=0.11)						
	Nullipara	Primipara	Multipara	Overt Diabetes Mellitus	Gestational Diabetes mellitus	Pregnancy induced hypertension	Hypothyroidism	Epilepsy	Asthma	Anemia
3.5kg	17	18	7	1	4	1	4			1
3.6kg	22	34	23	2	10	4	9	1		3
3.7kg	11	17	10	1	4	1	4			1
3.8kg	7	8	3	1	2		1			1
3.9kg	4	8	8	1	2	1	1		1	
>4.0kg		1	2		1					
Mean birth weight	3.63kg	3.65kg	3.68kg	3.68kg	3.67kg	3.64kg	3.63kg	3.6kg	3.9kg	3.63kg

Table 4(b)

Birth weight	BMI (kg/m²) (P value= 0.59)			Weight gain during pregnancy (kg) (P value = 0.028)					HbA1c (P value = 0.010)		
	18.5-24.9 (normal)	25.29.9 (overweight)	>30 (obese)	5-8.9	9-10.9	11-13.9	14-16.9	>17	<5.7%	5.7-6.4%	>6.5%
3.5kg	7	18	17	1	21	9	11		34	6	2
3.6kg	11	33	35		30	19	26	4	60	14	5
3.7kg	7	15	16		13	10	13	2	22	12	4
3.8kg	3	4	11	1	5	8	3	1	11	6	1
3.9kg	4	4	12	1	6	3	5	5	13	4	3
>4.0kg			3		1	1	1		1	0	2
Mean birth weight	3.66kg	3.62kg	3.68kg	3.73kg	3.68kg	3.66kg	3.65kg	3.76kg	3.64kg	3.67kg	3.75kg

Increasing maternal parity showed a trend toward higher neonatal birth weights. Though consistent with existing studies,

the difference in mean birth weight by parity was not statistically significant in this study.

The table examines the distribution of maternal comorbidities in relation to birth weight. The most frequently observed conditions were gestational diabetes mellitus (GDM) and hypothyroidism, particularly associated with birth weights of 3.6–3.7 kg. The p-value of 0.11 suggests that the association between comorbidities and birth weight is not statistically significant. However, the clustering of GDM and hypothyroidism around higher birth weights indicates a trend that warrants further investigation with a larger sample size.

In my study, maternal BMI showed no statistically significant impact on birth weight (p = 0.59). In contrast, the study by Mohapatra I et al. found that maternal early pregnancy BMI was more strongly associated with neonatal birth weight [13].

Most births were in the 9-10.9 kg maternal weight gain group, especially at 3.6 kg birth weight. Higher birth weights (≥3.9 kg) were more common with weight gain >14 kg. A significant positive correlation was found (p = 0.028). A similar result was found in the study by Dalya Thamer Ahmad et al. [14].

Most mothers of babies weighing 3.5–3.7 kg had normal HbA1c (<5.7%). Higher weights, especially >3.6 kg, were linked to elevated HbA1c, suggesting impaired glucose control. The association was statistically significant (p = 0.010).

Table 4(c)

Birth Weight	Gestational Age at birth (in weeks) (P value = 0.007)			Mode of Delivery (P value = <0.001)		Gender (P value = 0.0017)	
	37-39+6wk	40-41+6wk	>42wk	Vaginal Delivery	LSCS	Male	Female
3.5 kg	29	13	0	34	8	24	18
3.6 kg	48	29	2	58	21	50	29
3.7 kg	17	21	0	29	9	27	11
3.8 kg	10	7	1	9	9	14	4
3.9 kg	6	13	1	13	7	17	3
>4.0 kg	1	2	0	1	2	3	0
Mean birth weight	3.63kg	3.69kg	3.73kg	3.64kg	3.69 kg	3.67kg	3.62kg

Higher birth weights (≥3.9 kg) were more common at 40–41+6 weeks. Post-term deliveries, though fewer, still showed notable high weights, indicating a possible association between prolonged gestation and increased birth weight. Overall, the data shows that higher birth weights were more common with advancing gestational age and the difference was statistically significant (p value-0.007), especially between 40 to 41+6 weeks, highlighting a trend that may influence delivery outcomes and neonatal care need. Similar results were observed in a study conducted by Weissmann-Brenner et al [15].

Vaginal delivery was more common for babies <3.8 kg, while LSCS rates rose with higher birth weights, especially >4.0 kg. This difference was statistically significant (p < 0.001), likely due to risks linked with fetal macrosomia, such as shoulder dystocia or cephalopelvic disproportion. Our findings align with study done by Weissmann-Brenner et al [15].

Male babies outnumbered females across all birth weight groups, with the largest gap at 3.6-3.7 kg. The association between male gender and higher birth weight was statistically significant (p = 0.0017). An increasing male-to-female ratio with rising birth weight was also reported by Weissmann-Brenner et al., supporting the findings of the present study [15].

Conclusion
Delivering macrosomic infants (birth weight ≥3.5 kg) presents considerable challenges for both mother and child, often resulting in increased maternal and neonatal complications. Maternal conditions such as high parity, gestational diabetes, obesity, and post-term pregnancy are frequently associated with fetal macrosomia. Among mothers, common complications include a higher incidence of cesarean sections, postpartum hemorrhage, and perineal injuries, while affected newborns face risks like birth asphyxia, hypoglycemia, and the need for NICU care.

Recognizing these risk factors early through antenatal care plays a crucial role in minimizing complications. Regular screening for conditions such as GDM and maternal obesity, coupled with timely obstetric management, can significantly improve outcomes. Emphasizing early detection and comprehensive care for high-risk pregnancies through strengthened antenatal services can lead to safer deliveries and better health for both mother and baby.

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