SSR Institute of International Journal of Life Sciences
ISSN (O): 2581-8740 | ISSN (P): 2581-8732
Soni *et al*., 2024
DOI: 10.21276/SSR-IIJLS.2024.10.5.7

Original Article

open access

Assessment of Maternal Predictors of Intrauterine Growth Retardation-A Case-Control Study

Urveeja Soni[1*], Pooja Deodhar[2], Sonam Tiwari[1], Vyas Shirali[1]

[1]PG Resident, Department of Obstetrics and Gynaecology, Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh, India

[2]Professor and Head, Department of Obstetrics and Gynaecology, Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh, India

***Address for Correspondence:** Dr. Urveeja Soni, PG Resident, Department of Obstetrics and Gynaecology, Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh, India
E-mail: urvija.soni@gmail.com

Received: 14 May 2024/ Revised: 16 Jun 2024/ Accepted: 17 Aug 2024

ABSTRACT

Background: Intrauterine growth restriction (IUGR) is a common disorder in which the birth weight is less than 10th percentile. This ongoing challenging fetal adverse condition leads to postnatal morbidities and fetal mortality.

Methods: Forty postnatal women with newborns weighing less than the 10th percentile for gestational age (GA) were recruited as cases in this case-control research, and forty postnatal women whose neonatal weight was within the GA were recruited as controls. A thorough history of medical, obstetric, and maternal Sociodemographic factors was recorded and compared.

Results: Most mothers (46.3%) were 21-30 with a mean±SD of 24.83±4.09 years. Most of them (78.8%) belonged to the lower middle class; there was significantly poor weight gain during pregnancy among cases (80%) as compared to among controls (60%). Anemia, hypertensive disorders of pregnancy, previous history of abortion, or IUGR were significantly associated with fetal growth retardation ($p<0.05$).

Conclusion: Low socioeconomic level, low gestational weight gain, anemia, hypertensive disorders of pregnancy, and previous history of abortion are potent risk factors for IUGR. Therefore, proper screening of these risk factors is essential to improve neonatal health.

Key-words: IUGR, Anemia, Maternal risk factors, Hypertensive disorder in pregnancy, birth weight

INTRODUCTION

Intrauterine growth restriction is an intricate and frequent obstetric issue among developing countries. IUGR is defined as the inability of the fetus to reach its growth potential or the velocity of fetal growth less than the normal fetus growth potential for a particular neonate [1]. After preterm, IUGR is the second most common cause of prenatal morbidity and mortality in non-anomalous fetuses [2,3].

How to cite this article
Soni U, Deodhar P, Tiwari S, Shirali V. Assessment of Maternal Predictors of Intrauterine Growth Retardation-A Case-Control Study. SSR Inst Int J Life Sci., 2024; 10(5): 6161-6166.

Access this article online
https://iijls.com/

When a fetus exhibits symptoms of persistent hypoxia or starvation and has a birth weight below the 10th percentile for gestational age, it is referred to as an IUGR [4]. IUGR is seen in 23.8% of babies worldwide, with the Asian continent accounting for a large portion of the global burden—roughly 75% of IUGR neonates [5]. About 10-15% of pregnant women have IUGR. IUGR is still prevalent in developing countries despite advancements in obstetric treatment. However, the causes of IUGR in these areas are not the same as those in developed countries. In most Western societies, placental insufficiency is the main cause of IUGR; in underdeveloped countries, however, malaria infections and malnutrition are more important causes [6]. Although IUGR is typically identified in the antenatal stage, it can also be identified in the newborn stage right after

DOI: 10.21276/SSR-IIJLS.2024.10.5.7

delivery [7] by the use of the anthropometry index, clinical assessment of nutritional status (CAN) score, and clinical examination [8,9]. Maternal factors alone are not a substantial cause of IUGR. However, several factors are linked to a high incidence of IUGR, including fetal, placental, and maternal factors. Major maternal risk factors include inadequate prenatal care, short interpregnancy intervals, pregnancy-induced hypertension (PIH), gestational diabetes (GDM), infection, and chronic illness in mothers [10].

The risk of IUGR may be reduced by maintaining a nutritious diet, abstaining from harmful lifestyle choices, getting appropriate prenatal care, and closely monitoring high-risk pregnancies before they become pregnant. This study set out to determine the maternal variables linked to IUGR. A thorough comprehension of these variables would facilitate the provision of early therapies to enhance the perinatal outcome brought on by IUGR.

MATERIALS AND METHODS

Study design- In a tertiary care hospital in central India, the Department of Obstetrics and Gynecology carried out this prospective observational case-control study.

Study population- In total, 80 women were hired based on the selection criteria and split up into two groups of 40 each

Group A: Cases with IUGR (less than 10th percentile from gestational age)

Group B: Controls (Newborn babies normal for gestational age).

RESULTS

Eighty postnatal women were enrolled and randomly divided into two groups of forty each. Most mothers (46.3%) were 21-30 years old, followed by (35%) 31-40 age group with a mean±SD of 24.83±4.09 years. Most (60%) resided in rural areas, and 78.8% belonged to the lower middle class. Regarding gestational age, the maximum number of women (63.8%) was more than 37 weeks of gestation and 61.3% had multiparous. Most subjects (60%) had housewives and 47.5% had education up to primary school (Table 1).

Inclusion criteria- The cases that met the selection criteria were those of postpartum women whose neonatal birth weights fell below the 10th percentile of their gestational age (GA). Women who had given birth recently and had newborn birth weights suitable for GA were assigned as controls. Patients who provided consent for the study.

Exclusion criteria- Patients who did not provide consent for the study were excluded

Data collection- A thorough history was recorded, including the mother's age, socioeconomic status, parity, weight, number of prenatal visits, history of gestational hypertension, preeclampsia, IUFD, anemia, autoimmune disorders, diabetes mellitus, chronic diseases, and any noteworthy medical or obstetric history. Relevant blood investigations and ultrasounds were done for each subject.

Methodology- When the patient and/or infant were discharged, data was gathered for both cases and the control group using an interview-based methodology. A weighing scale was used to measure the birth weight as soon as the baby was delivered.

Statistical Analysis- Data was analyzed by using Statistical Package for Social Sciences (SPSS) version 24.0. Whereas the data on categorical variables are shown as frequency and percent, the data on continuous variables are given as mean and standard deviation (SD). It was considered significant if $p<0.05$.

Table 1: Distribution of sociodemographic variables among study participants

Variables		Frequency (n=80)	Percentage (%)
Maternal Age (Years)	<20	11	13.7
	21-30	37	46.3
	31-40	28	35
	>40	4	5
Mean±SD		24.83±4.09	

DOI: 10.21276/SSR-IIJLS.2024.10.5.7

Locality	Rural	48	60
	Urban	32	40
Socioeconomic Status	Lower class	36	45
	Middle class	27	33.8
	Upper class	17	21.2
Parity	Primigravida	31	38.7
	Multigravida	49	61.3
Gestational Age (in weeks)	28-32	4	5
	33-37	25	31.2
	>37	51	63.8
Maternal occupation	Housewife	48	60
	Daily worker	12	15
	Merchant	20	25
Educational status of the mother	Illiterate	24	30
	Primary school	38	47.5
	Secondary school	14	17.5
	Graduate	4	5

The maternal risk factors for IUGR are: Cesarean section was more in IUGR group (40%) as compared to the control group (32.5%), but not statistically significant ($p>0.05$). BMI did not differ significantly in both groups. There was significantly poor weight gain during pregnancy among cases (80%) compared to controls (60%). Smoking habits were more prevalent in the IUGR group than in the control group but were statistically insignificant (Table 2).

Table 2: Distribution of patients among study groups according to maternal risk factors

Maternal Risk factor		Group A (cases)	Group B	p-value
Mode of delivery	Cesarean section	16 (40%)	13 (32.5%)	0.485
	Vaginal delivery	24 (60%)	27 (67.5%)	
BMI of mother	Normal	18 (45%)	20 (50%)	0.735
	Underweight	10 (25%)	6 (15%)	
	Overweight	8 (20%)	9 (22.5%)	
	Obese	4 (10%)	5 (12.5%)	
Weight gain during pregnancy	Poor	32 (80%)	24 (60%)	0.050
	Good	8 (20%)	16 (40%)	
Multifetal pregnancy	Yes	3 (7.5%)	1 (2.5%)	0.304
	No	37 (92.5%)	39 (97.5%)	
Smoking habit	Yes	12 (30%)	7 (17.5%)	0.188
	No	28 (70%)	33 (82.5%)	

The cases studied in Group A had a significantly higher prevalence of anemia and hypertensive disorders of pregnancy ($p<0.05$) compared to controls in Group B. However, there were no statistically significant differences were found for the following conditions: uterine fibroids, hypothyroidism, antepartum hemorrhage, and gestational diabetes mellitus ($p>0.05$) (Table 3).

DOI: 10.21276/SSR-IIJLS.2024.10.5.7

Table 3: Inter-group comparison of maternal comorbidities

Maternal comorbidities		Group A (cases)	Group B (controls)	p-value
Anemia	Present	14 (35 %)	6 (15%)	0.038
	Absent	26 (65%)	34 (85%)	
Hypertensive disorders of pregnancy	Present	9 (22.5%)	2 (5%)	0.023
	Absent	31 (77.5%)	38 (95%)	
Gestational Diabetes mellitus	Present	8 (20%)	4 (10%)	0.210
	Absent	32 (80%)	36 (90%)	
Antepartum hemorrhage	Present	3 (7.5%)	2 (5%)	0.644
	Absent	37 (92.5%)	38 (95%)	
Hypothyroidism	Present	7 (17.5%)	3 (7.5%)	0.176
	Absent	33 (82.5%)	37 (92.5%)	
Fibroid uterus	Present	3 (7.5%)	1 (2.5%)	0.304
	Absent	37 (92.5%)	39 (97.5%)	

Significantly, a higher proportion of cases had a history of previous abortion and a history of IUGR as compared to controls ($p<0.05$). Perinatal/neonatal mortality and assisted reproductive technique were higher among cases than control but not statistically significant ($p>0.05$) (Table 4).

Table 4: Inter-group comparison of maternal past medical and obstetric history factors

Maternal comorbidities		Group A (cases)	Group B (controls)	P value
Previous abortion	Yes	17 (42.5%)	4 (10%)	0.001
	No	23 (57.5%)	36 (90%)	
Perinatal/neonatal mortality	Yes	3 (7.5%)	1 (2.5%)	0.304
	No	37 (92.5%)	39 (97.5%)	
Assisted reproductive technique	Yes	4 (10%)	2 (5%)	0.395
	No	36 (90%)	38 (95%)	
Previous H/o IUGR	Yes	13 (32.5%)	1 (2.5%)	0.004
	No	27 (67.5%)	39 (97.5%)	

DISCUSSION

In addition to being a prevalent situation in obstetrics, intrauterine growth restriction is also linked to perinatal morbidity and mortality. As such, it is essential to distinguish between it, diagnose it, and act quickly [11]. The bulk of IUGR cases in this study were discovered in women in the younger age (21-30 years) range, with a mean age of 24.83±4.09 years, similar results seen by Romo *et al.* [12]. Jabeen *et al.* [13], in contrast to Odibo *et al.* study [14], found a significant correlation between the risk of IUGR and advancing maternal age. Therefore, it was determined that a young mother's age was a separate risk factor for fetal growth restriction.

In our study, a lower socioeconomic status was linked to a higher prevalence of IUGR, which agrees with a study done by Sinha and Kurude *et al.* [15]. This could be due to Socioeconomic factors like housing quality, employment, education level, and water supply source impacting maternal health and nutrition. In this study, the IUGR was higher in multiparous women as compared to nulliparous; this is comparable with the study done by Arwan *et al.* [16], discordance to another Indian study conducted by Motghare *et al.* [17] reported that the proportion of IUGR was higher in primigravida.

We have not found any significant association between maternal nutritional status (BMI) and IUGR births, as seen by constant observation by Mohammad *et al.* [18].

DOI: 10.21276/SSR-IIJLS.2024.10.5.7

Still, discordance results were seen in a study by Acharya *et al.* [19]. Pregnancy-related weight increases significantly, favorably impacting fetal growth, indicating that energy balance is key in determining the fetus's health. Low weight gain indicates calorie and micronutrient deficiencies, which are critical for embryonic development [20].

The current study's maternal risk factors for IUGR demonstrated that anemia and pregnancy-related hypertension illnesses were important causes of fetal growth restriction. Many other studies supported our findings, including Dapkekar *et al.* [21] and Albu *et al.* [22]. One of the major risk factors for IUGR, antepartum hemorrhage, was not significant in the current study, according to Ashwani *et al.* [23]. A significant association was found between the previous history of abortion and the previous history of IUGR with the retardation of current fetal growth. Our results are comparable with Montvignier *et al.* [24] and Mohammad *et al.* [25].

The current study found that uterine fibroids, antepartum hemorrhage, hypothyroidism, gestational diabetes mellitus, and perinatal/neonatal mortality were not significant contributing factors to the development of IUGR. These findings are consistent with Tesfa *et al.* [26]. Similar to our study, Seravalli *et al.* [27] reported that the history of conception using assisted reproductive techniques was detected in more cases than controls, but the statistical difference was not significant.

CONCLUSIONS

In this study, we have concluded that low socioeconomic status increases the risk of IUGR since it's associated with subpar living conditions, a lower literacy rate, and a lack of awareness. Due to poor growth environments and dietary deficiencies, anemia and hypertensive problems during pregnancy are potential risk factors for intrauterine growth restriction. The previous history of abortion or IUGR may lead to a contributory factor for growth retardation. Hence, identifying the modifiable maternal risk factors of IUGR may reduce neonatal mortality due to IUGR.

CONTRIBUTION OF AUTHORS

Research concept- Urveeja soni, Pooja deodhar, Sonam Tiwari

Research design- Urveeja soni, Pooja deodhar, Sonam Tiwari

Supervision- Urveeja soni, Pooja deodhar, Sonam Tiwari

Materials- Urveeja soni, Pooja deodhar, Sonam Tiwari

Data collection- Urveeja soni, Pooja deodhar, Sonam Tiwari

Data analysis and Interpretation- Urveeja soni, Pooja deodhar, Sonam Tiwari

Literature search- Urveeja soni, Pooja deodhar, Sonam Tiwari

Writing article- Urveeja soni, Pooja deodhar, Sonam Tiwari

Critical review- Urveeja soni, Pooja deodhar, Sonam Tiwari

Article editing- Urveeja soni, Pooja deodhar, Sonam Tiwari

Final approval- Urveeja soni, Pooja deodhar, Sonam Tiwari

REFERENCES

[1] Zeitlin J. Impact of fetal growth restriction on mortality and morbidity in a very preterm birth cohort. J Pediatr., 2010; 157: 733-39.

[2] Turan OM. Duration of persistent abnormal ductus venosus flow and its impact on perinatal outcome in fetal growth restriction. Ultrasound Obstet Gynecol., 2011; 38: 295-02.

[3] Rivka R, Brian R. Prematurity and intrauterine growth retardation-Double jeopardy?. Clin Perinatol., 2004; 31. 453-73. doi: 10.1016/j.clp.2004.04.017.

[4] Kleijer ME, Dekker GA, Heard AR. Risk factors for intrauterine growth restriction in a socio-economically disadvantaged region. J Matern Fetal Neonatal Med., 2005; 18: 23-30.

[5] Menendez C, Ordi J, Ismail MR, Ventura PJ, Aponte JJ, et al. The impact of placental malaria on gestational age and birth weight. J Infect Dis., 2000; 181: 1740-45. doi: 10.1086/315449.

[6] Chauhan SP, Magann EF. Screening for fetal growth restriction. Clin Obstet Gynecol., 2006; 49: 284–94.

[7] Clausson B, Gardosi J, Francis A, Cnattingius S. Perinatal outcome in SGA births defined by customized versus population-based birthweight standards. BJOG Int J Obstet Gynaecol., 2001; 108: 830–34.

[8] Marconi AM, Ronzoni S, Bozzetti P, Vailati S, Morabito A, et al. Comparison of fetal and neonatal growth curves in detecting growth restriction. Obstet Gynecol., 2008; 112: 1227–34.

DOI: 10.21276/SSR-IIJLS.2024.10.5.7

[9] Murki S, Sharma D. Intrauterine growth restriction-A review article. J Neonatal Biol., 2014; 3: 135.

[10]Maulik DEV. Fetal growth restriction: the etiology. Clin Obstet Gynecol. 2006; 49(2): 228–35

[11]Romo A, Carceller R, Tobajas J. Intrauterine growth retardation (IUGR): Epidemiology and etiology. Pediatr Endocrinol Rev., 2009; 6(3): 332-36.

[12]Jabeen SS, Raoof M, Mumtaz F, Khan B, Shaheen Z, et al. Intrauterine Growth Restriction Among Pregnant Hypertensive Women of Urban and Rural Areas. Pak J Med Dent., 2023; 12(3): 29-35. doi: 10.36283/PJMD12-3/006.

[13]Odibo AO, Nelson D, Stamilio DM, Sehdev HM, Macones GA, et al. Advanced maternal age is an independent risk factor for intrauterine growth restriction. Am J Perinatol., 2006; 23: 325-28.

[14]Sinha S, Kurude VN. Study of obstetric outcome in pregnancies with intrauterine growth retardation. Int J Reprod Contracept Obstet Gynecol., 2018; 7: 1858. doi: 10.18203/2320-1770.ijrcog 20181918.

[15]Arwan B, Sriyanti R. Relationship between Gravida Status, Age, BMI (Body Mass Index) and Preeclampsia. Andalas Obstet Gynecol J., 2020; 4(1): 13-21. doi: 10.25077/aoj.4.1.13-21.2020

[16]Motghare DD, Vaz FS, Pawaskar AM, Kulkarni MS. Maternal determinants of intrauterine growth restriction in Goa, India: A case- control study. Glob J Med Public Health, 2014; 3: 1-6.

[17]Mohammad N, Sohaila A, Rabbani U, Ahmed S, Ahmed S, et al. Maternal predictors of intrauterine growth retardation. J College Physc Surg Pak., 2018; 28(9): 681-85.

[18]Acharya D, Nagraj K, Nair NS, Bhat HV. Maternal determinants of intrauterine growth retardation: A case control study in Udupi District, Karnataka. Indian J Community Med., 2004; 29: 4.

[19]Sharma M, Mishra S. Maternal risk factors and consequences of low birth weight in infants. IOSR-JHSS, 2013; 13: 39-45.

[20]Dapkekar P, Bhalerao A, Kawathalkar A, et al. Risk factors associated with intrauterine growth restriction: A Case-Control Study. Cureus, 2023; 15(6): e40178. doi: 10.7759/cureus.40178.

[21]Albu AR, Anca AF, Horhoianu VV, Horhoianu IA. Predictive factors for intrauterine growth restriction. J Med Life, 2014; 7(2): 165-71.

[22]Ashwani N, Neela AR, Babu SM, Kumar CS, Pratap OT, et al. Maternal risk factors associated with intrauterine growth restriction: hospital based study. Int J Med Res Rev., 2016; 4: 2125-29.

[23]American College of Obstetricians and Gynecologists. ACOG Practice bulletin no. 134: fetal growth restriction. Obstet Gynecol., 2013; 121: 1122-33. doi: 10.1097/01.AOG.0000429658. 85846.f9.

[24]Montvignier Monnet A, Savoy D, Préaubert L, Hoffmann P, Bétry C, et al. In Underweight Women, Insufficient Gestational Weight Gain Is Associated with Adverse Obstetric Outcomes. Nutr., 2022; 15(1): 57. doi: 10.3390/nu15010057.

[25] Mohammad N, Sohaila A, Rabbani U, Ahmed S, Ahmed S, et al. Maternal predictors of intrauterine growth retardation. J Coll Physc Surg Pak., 2018; 28: 681-65.

[26]Desalegn T, Melaku T, Alemayehu D, Sofonyas A. Intrauterine growth restriction and its associated factors in South Gondar zone hospitals, Northwest Ethiopia. Arch Public Health, 2020; 78: 89.

[27]Seravalli V, Maoloni L, Pasquini L, Bolzonella S, Sisti G, et al. The impact of assisted reproductive technology on prenatally diagnosed fetal growth restriction in dichorionic twin pregnancies. PLoS One, 2020; 15: e0231028.