



Intrauterine Growth Restriction: Prevalence Rate, Associated Risk Factors and Perinatal Outcomes at Maternity Teaching Hospital in Erbil/Iraq

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Abstract

Background and objectives: Intrauterine growth restriction is well known cause for fetal morbidity and mortality all over the world especially in developing countries. The aim of this study was to assess the prevalence rate, risk factors and perinatal outcomes for intrauterine growth restriction in a hospital setting.

Methods: A case control study design was conducted to estimate the prevalence rate of intrauterine growth restriction to assess the associated risk factors and perinatal outcomes in Maternity Teaching Hospital in Erbil city-Kurdistan region/Iraq from 1st of January to 31st of December, 2023. The perinatal outcomes were assessed in 221 pregnant women with intrauterine growth retardation and 419 healthy pregnant women who served controls.

Results: Intrauterine growth restriction in the study setting was (11.16/1000) total births. The common risk factors of intrauterine growth restriction were low maternal body mass index ($p<0.001$), nulliparity ($p<0.001$), positive smoking history ($p<0.001$), maternal medical disorders ($p<0.001$) and poor obstetrical history ($p\leq 0.05$) were statistically significant. The main adverse perinatal outcomes of intrauterine growth restriction were prematurity ($p<0.001$), low Apgar scores at 1 minute & at 5 minutes and very low birth weight ($p\leq 0,001$).

Conclusions: IUGR is a relatively prevalent obstetric problem & it is significantly related to the adverse perinatal outcomes.

Keywords: Intrauterine growth restriction, Perinatal outcomes, Risk factors

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Introduction

Intrauterine growth restriction (IUGR) fetus may be more susceptible to prenatal morbidity and mortality, particularly if the condition is not identified before the delivery, as well as unfavorable long-term consequences such as adult cognitive impairment or cardiovascular disease.^{1,2} Epidemiologically, early-onset and late-onset IUGR are often distinguished. Despite being significantly early onset less prevalent (0.5–1%) than late onset IUGR (5%–10%), early onset IUGR has a significantly greater clinical impact due to its high rate of morbidity and mortality.³ Approximately 24% of newborns worldwide have been identified to have IUGR, and each year, 30 million babies are affected by the condition.^{4,5} Several factors, involving as maternal age, pre-existing medical problems (e.g., chronic hypertension), and smoking, are consistently associated with IUGR in some studies but not in others.^{6,7} The relationship between socioeconomic status (SES) and IUGR is another source of dispute. Studies have produced inconsistent results, with some indicating a definite link between lower SES and greater risk, while others indicate no significant relationship.^{8,9} There is a growing realization that IUGR is most likely caused by a complex interaction of multiple causes rather than a single culprit. Genetic predisposition, placental malfunction, and fetal anomalies can all contribute, making it impossible to isolate the impact of any one cause.¹⁰⁻¹² Based on Doppler abnormalities, there are five stages of intrauterine fetal growth restrictions. Stage 0 IUGR: expected fetal weight (EFW) <10th percentile with normal Doppler; Stage I IUGR: EFW<3rd percentile or EFW<10th percentile with umbilical artery Doppler perfusion index (UA-PI)>95th percentile. Stage II IUGR: absent diastolic flow on UA Doppler examination and EFW<10th percentile, Stage III IUGR:

reversed diastolic flow and EFW<10th percentile. Stage IV IUGR on UA Doppler study: EFW<10th percentile with pathologic CTG or reversed diastolic flow of ductus venosus (DV).¹³ Stage II IUGR and above have higher rates of perinatal death and morbidity than either stage 0 or I IUGR. Additionally, people with an umbilical artery velocity of absent /reversed end diastolic flow are more likely to give preterm birth.¹⁴⁻¹⁶ The aim of this study was to assess the incidence rate, risk factors and perinatal outcomes for IUGR at the labor room and operation room of the hospital setting.

Patients and methods

A cross-sectional design was adopted to calculate the prevalence rate of IUGR & to find out the risk factors & adverse perinatal outcomes in the Maternity Teaching Hospital in Erbil City-Kurdistan region/Iraq from 1st of January to 31st of December, 2023. The definition of IUGR was based on Royal College of Obstetricians and Gynecologists as fetal estimated weight or abdominal circumference was <10th centile with diagnosis depending mainly on history, physical examination, ultrasonography and Doppler blood flow velocimetry, in addition to diagnosis of IUGR by observational way for those women who didn't receive antenatal care or ultrasound scan.¹⁷ The inclusion criteria were pregnant women with gestational age of ≥32 weeks and all women with any age group, any parity, social history, maternal medical and obstetrical disorders or previous history of IUGR and accepted to participate in the study. The exclusion criteria were pregnant women with gestational age of less than 32 weeks and those who refused to participate in the study. The study included a sample size of 640. Among them, 221 women with IUGR were classified as the case group, while 419 pregnant women without IUGR were selected from hospital as the control group. The researcher collected the data from the participating women by direct interview





using a well-designed questionnaire. The questionnaire contained general characteristics, maternal medical disorder, maternal obstetrical disorder including (pregnancy induced hypertension, pre-eclampsia, multiple pregnancy, abruptio placenta, placenta previa, incidental cause of antepartum hemorrhage) and pregnancy outcomes of study participants at the labor room and the operation room of the hospital setting. Women's age was categorized into four groups (<20 years, 20-29 years, 30-39 years and ≥40 years). Women's body mass index was classified into four groups (<18.5 underweight, 18.5-24.9 normal weight, 25-29.9 overweight, ≥30 obesity) in regard to WHO classification, while the parity history of enrolled women was categorized into (nulliparous, para 1-4 and para≥5).^{8,18} Antenatal care visits number of eight and more was considered adequate according to WHO antenatal care classification 2016.¹⁹ Gestational age was categorized according to ACOG classification into (preterm, term and post-term).²⁰ The Apgar score was distributed to (normal 7-10, moderately abnormal 4-6 and low 0-3) in regard to American academy of pediatrics, while the birth weight was classified into very low birth weight (1-1.49 Kg), low (1.5-2.49 Kg), normal (2.5-4 Kg) and macrosomia (>4 Kg) in regard to WHO classification of birth weight.^{21,22} The adverse perinatal outcomes including prematurity, low birth weight & low Apgar score were assessed by researcher. Analysis of women's data was done through the statistical package of social sciences (SPSS) program version 26. Suitable statistical tests (Chi square and Fishers exact tests) for categorical variables were applied and the p value of ≤ 0.05 was regarded as significant. Ethical approval was granted by the Research Protocol Ethics Committee of Kurdistan Higher Council of Medical Specialties No. 55, 8 Jan. 2023. Informed written consent was obtained from each

woman who agreed to participate in the study at the time of first interview. All participants were assured that their information would be kept confidential and would be used for research purposes only. All interviews were conducted following the ethical standards of the Declaration of Helsinki for Ethical Principles for Medical Research Involving Human Subjects

Results

The number of deliveries in our tertiary center was (19795) and number of deliveries with IUGR was (221) with incidence rate of (11.16 per 1000 births) in one year. There was no significant difference between study groups in regard to age of women (p=0.7). Underweight, nulliparity, positive antenatal care visit, adequate number of antenatal care visits and positive smoking history were related to IUGR (p≤0.05), Table (1).

Table (1): General characteristics of women in regard to study groups

Variable	Study groups				P
	Women with IUGR fetus		Control		
	No.	%	No.	%	
Age					0.7
<20 years	25	11.3	38	9.1	
20-29 years	106	48.0	211	50.4	
30-39 years	70	31.7	136	32.5	
≥40 years	20	9.0	34	8.1	
Body mass index					<0.001
Underweight	5	2.3	1	0.2	
Normal	139	62.9	48	11.5	
Overweight	54	24.4	194	46.3	
Obese	23	10.4	176	42.0	
Parity					<0.001
Nulliparous	92	41.6	123	29.4	
Para 1-4	114	51.6	284	67.8	
Para>5	15	6.8	12	2.9	
Antenatal care					0.01
Yes	170	76.9	285	68.0	
No	51	23.1	134	32.0	
Number of antenatal visits					<0.001
Adequate	58	34.1	29	10.2	
Inadequate	112	65.9	256	89.8	
Smoking history					<0.001
Yes	7	3.2	0	-	
No	214	96.8	419	100.0	





The maternal medical disorders were prevalent among pregnant women with IUGR; especially chronic hypertension, chronic renal disease, type 1 & type 2 diabetes mellitus, antiphospholipid syndrome and constitutional small mother ($p \leq 0.05$). The type 1 diabetes mellitus was not significantly ($p=0.9$) related to IUGR, Table (2).

Table (2): Maternal medical history in regard to study groups

Variable	Study groups				P
	Women with IUGR fetus		Control		
	No.	%	No.	%	
Chronic hypertension					<0.001
Yes	41	18.6	11	2.6	
No	180	81.4	408	97.4	
Chronic renal disease					0.006
Yes	4	1.8	0	-	
No	217	98.2	419	100.0	
Type 1 DM					0.9
Yes	1	0.5	2	0.5	
No	220	99.5	417	99.5	
Type 2 DM					0.001
Yes	6	2.7	0	-	
No	215	97.3	419	100.0	
Antiphospholipid syndrome					<0.001
Yes	8	3.6	0	-	
No	213	96.4	419	100.0	
Constitutional small mother					<0.001
Yes	12	5.4	0	-	
No	209	94.6	419	100.0	

DM=Diabetes mellitus.

The obstetrical disorders were common among pregnant women with IUGR especially preeclampsia, pregnancy induced hypertension, incidental cause of antepartum hemorrhage, multiple pregnancy, fetal congenital anomaly and previous history of IUGR ($p \leq 0.05$). The abruptio placenta and

placenta previa were not related to IUGR ($p > 0.05$), Table (3).

Table (3): Maternal obstetrical history in regard to study groups

Variable	Study groups				P
	Women with IUGR fetus		Control		
	No.	%	No.	%	
Preeclampsia					<0.001
Yes	58	26.2	44	10.5	
No	163	73.8	375	89.5	
Pregnancy induced hypertension					<0.001
Yes	23	10.4	3	0.7	
No	198	89.6	416	99.3	
Incidental cause of antepartum hemorrhage					0.006
Yes	7	3.2	2	0.5	
No	214	96.8	417	99.5	
Abruptio placenta					0.4
Yes	6	2.7	16	3.8	
No	215	97.3	403	96.2	
Placenta previa					0.07
Yes	5	2.3	22	5.3	
No	216	97.7	397	94.7	
Multiple pregnancy					<0.001
Yes	26	11.8	5	1.2	
No	195	88.2	414	98.8	
Fetal congenital anomaly					<0.001
Yes	25	11.3	1	0.2	
No	196	88.7	418	99.8	
Previous history of IUGR					<0.001
Yes	58	26.2	26	6.2	
No	163	73.8	393	93.8	

IUGR resulted in high emergency cesarean section rate; prematurity, perinatal outcome including macerated and fresh still birth baby, low Apgar scores after 1 and 5 minutes and very low birth weight ($p < 0.001$), Table (4).





Table (4): Pregnancy outcomes in regard to study groups

Variable	Study groups				P
	Women with IUGR fetus		Control		
	No.	%	No.	%	
Mode of delivery					<0.001
Spontaneous vaginal delivery	48	21.7	164	39.1	
Elective CS	7	3.2	99	23.6	
Emergency CS	162	73.3	130	31.0	
Induction of labour	4	1.8	26	6.2	
Gestational age					<0.001
Preterm	83	37.6	37	8.8	
Term	138	62.4	380	90.7	
Post-term	0	-	2	0.5	
Perinatal outcome					<0.001
FSB	1	0.5	9	2.1	
MSB	8	3.6	1	0.2	
Alive with	102	46.2	334	79.7	
Low Apgar	106	48.0	75	17.9	
Early	4	1.8	0	-	
Apgar score 1 minute after delivery					<0.001
Normal	129	58.4	321	76.6	
Moderately	60	27.1	77	18.4	
Low	32	14.5	21	5.0	
Apgar score 5 minutes after delivery					<0.001
Normal	197	89.1	401	95.7	
Moderately	19	8.6	7	1.7	
Low	5	2.3	11	2.6	
Birth weight					<0.001
Very low	26	11.8	0	-	
Low	195	88.2	0	-	
Normal	0	-	399	95.2	
Macrosomia	0	-	20	4.8	

CS=Cesarean section, NICU=Neonatal intensive care unit, FSB=Fresh still birth, MSB=macerated still birth

Discussion

The prevalence rate of IUGR in the study setting was (11.16 per 1000 births) for one year. This rate is lower than rate of (24 per 1000 births) for one year reported by Dankul et al.²³ In same direction, the present study revealed that, IUGR rate was also lower than rate of (14 per 1000 births) documented by Alisjahbana et al.²⁴ However, present study incidence rate of IUGR was higher than results of Unterscheider et al. which reported IUGR incidence rate in one year of (5.5/1000 birth).²⁵ Saleem et al showed a wide variance in IUGR incidence rate between developing and developed countries that was related to discrepancies in poverty, socioeconomic status, nutritional habits and health infrastructure between different world populations.²⁶ The current study showed that lower maternal body mass index, nulliparity and positive smoking history were significant maternal risk factors of IUGR, These findings were similar to results by Patibandla.²⁷ On other hand, current study revealed that IUGR was related to positive and adequate number of antenatal care visit. Consistently, Dinu et al stated that women with IUGR were early screened by antenatal care as high-risk pregnancies (smoking, poor medical and obstetrical history) and for that, had higher rate of ANC visit than controls.²⁸ This study found that maternal medical disorders were significantly prevalent among pregnant women with IUGR; commonly, chronic hypertension, chronic renal disease, type 2 diabetes mellitus, antiphospholipid syndrome and constitutional small mother. These findings were in agreement with results of different literatures that documented the effect of previous maternal medical diseases on the incidence of IUGR.⁹ ²⁹ Present study revealed that poor obstetrical





history was significantly prevalent among pregnant women with IUGR; specifically, preeclampsia, pregnancy induced hypertension, incidental cause of antepartum hemorrhage, multiple pregnancy, fetal congenital anomaly and previous history of IUGR. The international federation of gynecology and obstetrics recommended the earlier screening of maternal obstetric history in order to prevent IUGR.³⁰ A case control study conducted in Iraq by researcher reported that preeclampsia was a common risk factor for IUGR.³¹ This study showed that IUGR resulted in high emergency cesarean section rate, prematurity, low Apgar scores after 1 and 5 minutes and very low birth weight. These findings were consistent with results of previous literatures which all documented that common adverse perinatal outcomes related to IUGR were prematurity, low Apgar score and low birth weight.^{32,33} This study concluded that, IUGR is a relatively prevalent obstetric problem in the current study setting & it is significantly related to the adverse perinatal outcomes like, prematurity, low Apgar scores at 1 and 5 minutes and very low birth weight. Some risk factors were significantly related to have IUGR fetuses like, low maternal body mass index, nulliparity, positive smoking history, maternal medical disorders and poor obstetrical history.

Conclusions

IUGR is a relatively prevalent obstetric problem & it is significantly related to the adverse perinatal outcomes.

Disclosure:

The authors assert that they have no conflicts of interest.

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