

POSTNATAL ASPECTS OF INTRAUTERINE GROWTH RESTRICTION"- A REVIEW

Govindarajan Sumathy¹, Upendhar Reddy P², Rachel Raveena Paul G³, Sudhakara Babu Chelli⁴

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Corresponding Author:

Dr. Sudhakara Babu Chelli,

Email: sudhakarababuchelli@gmail.com

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¹Professor, Department of Anatomy, Sree Balaji Medical College & Hospital, BIHER Chennai, Tamil Nadu, India

²Associate Professor, Department of Anatomy, Vishwabharati Medical college, Kurnool, Andhra Pradesh, India.

³Associate Professor, Department of Anatomy, Government Medical College, Nizamabad, Telangana, India.

⁴Assistant Professor, Department of Anatomy, Government Medical College, Nizamabad, Telangana, India.

Abstract

Intrauterine growth restriction (IUGR) is said to be present in those babies whose birth weight is below the tenth percentile of the average for the gestational age. IUGR shows the clinical evidence of malnutrition. Low birth weight (LBW) is birth weight (less than 2500g) of neonate irrespective of gestational age, race, sex and clinical features. The terms "IUGR" and "small for gestational age (SGA)" have been used synonymously in medical literature, but there exist small differences between the two. SGA definition is based on the cross-sectional evaluation (either prenatal or postnatal), and this term has been used for those neonates whose birth weight is less than the 10th percentile for that particular gestational age. Neonates with a birth weight less than the 10th percentile will be SGA, but not an IUGR if there are no features of malnutrition. Appropriate for gestational age (AGA) infants can be labeled as IUGR if they have features of in-utero growth retardation and malnutrition at the time of birth. In symmetrical growth restriction, fetal insult occurs in an early period, for which there is no effective treatment. IUGR is caused by maternal, fetal, placental, genetics or the combination of all. It has short- and long-term complications. Early identification of IUGR and appropriate timing of delivery will help to adverse pregnancy outcome.

INTRODUCTION

Intrauterine growth restriction (IUGR) is said to be in those neonates whose birth weight is below the tenth percentile of the average for the gestational age.^[1] IUGR is the clinical condition of a neonate born with clinical features of malnutrition and inutero growth retardation irrespective of age of their birth weight percentile.^[2] Though IUGR and Short for Gestational Age (SGA) are simultaneously used for the same problem but there is subtle difference between them. The later refers to birth weight refers to birth weight below 10 percentiles for gestational age, corrected for parity and gender, as per the population growth charts.^[3] Appropriate for Gestational Age (AGA) infants are referred as IUGR if they have features of intrauterine growth retardation and malnutrition at the time of birth. Low Birth Weight (LBW) refers to neonates whose birth weight is less than 2500grams irrespective of gestational age, sex, race and clinical features.^[2]

Classification of IUGR.^[4,5]

- Symmetrical IUGR: It begins early in gestation, where cell number is reduced and is caused by intrinsic factors. Here PI is more than 2.
- Asymmetrical IUGR: it begins in second or third trimester where cell number is normal but cell size is reduced. PI is less than 2. Reduction in the weight and length is observed due to brain sparing.
- Mixed IUGR: decreased in number of cell and cell size.

Postnatal Diagnosis: It includes clinical examination, CAN score, ponderal index (PI), cephalization index (CI), mid arm circumference (MAC), mid head/arm circumference (MHC) ratios, anthropometry.^[2]

Clinical Examination

It includes the following features-

- Large head when compared to rest of the body known as brain sparing effect.
- Old man looks due to absence of buccal fat.
- Loose dry and easily peelable skin and long finger nails.

- Meconium-stained thin umbilical cord.
- Small or scaphoid abdomen.
- Decreased subcutaneous fat and skeletal mass.
- Poor breast bud formation and immature genitalia.
- Poor formation of membranous bones that lead to large and wide anterior fontanel.

Ponderal index (PI): It's the ratio between body weight in grams to length in centimeters expressed as $PI = \frac{\text{weight \{in gram\}} \times 100}{\text{length \{in cm\}}^3}$. Severe fetal wasting is observed when PI is less than

10 percentiles.^[1,5] PI less than 3 percentile indicates severe fetal wasting.

Clinical Assessment of Nutrition Score (CAN Score). Can score was developed by Metcalf J to assess the nutritional status of new born.^[6] It includes nine parameters namely hair, cheeks, chin, neck, chest, abdomen, back, buttocks, legs. Each parameter is given 4 points where the maximum score is 36. CAN Score less than 25 is considered as malnourished.

The following is the table [Table 1] showing the parameters and points given for nutritional status in CAN score.

Table 1: showing the parameters and score for assessment of nutritional status.

Parameter	Score			
	4	3	2	1
Hair	Large, smooth silky, easily groomed.	Thinner, straight, "staring" hair	Still thinner, more straight, "staring", hair doesn't respond to brushing	Less abundant, "staring" hair with depigmented
cheeks	Round, large, fat pad	Slightly reduced fat pad	Significantly reduced	Reduced buccal fat with narrow flat face
Chin and neck	Double or triple neck fat, neck not visible	Submandibular fat, moderate neck fat	Some submandibular fat, minimal neck fat	No submandibular fat, neck with loose wrinkled skin very evident.
Arms	Subcutaneous tissue taught, cannot pick up over elbow or triceps area.	Moderate subcutaneous tissue present on upper and lower arms, cannot pick up over elbow, back of hand.	Some subcutaneous tissue present over upper and lower arm, can pick up over elbow but not on the back of the hand and forearm.	Very little fat, loose skin.
Back	Inter-scapular area of skin cannot be picked.	Skin loose over scapula	Skin loose over scapular and lower back.	Skin very loose very appearance, easily tents over scapula, spine and lower back.
Buttocks	Fat pad thickness, round, full firm	Round, less full, less firm flat but definite fat present	Flat but definite fat present	Flat, appear wasted, little or no fat.
Leg	Thick subcutaneous tissue that can't be picked up	Some subcutaneous tissue, can pick up easily but for good turgor	Easily picked up over anterior thigh but not over tibia	Thighs appear wasted, very poor turgor
Chest	Round, ribs not seen	Intercostals space less prominent, ribs less obvious	Intercostal space revealed	Intercostal space very clear, obvious loss of subcutaneous tissue.
Abdomen	Full round, no loose skin	Round with loose skin, not easily lifted, with no wrinkle	Scaphoid but not very loose, skin easily lifted and with some wrinkle	Distended or scaphoid, but with very loose skin, easily lifted and wrinkled.

Cephalization index (CI): It is the ratio of head circumference to body weight. A higher CI reflects degree of brain vulnerability and increased likelihood of cerebral palsy.^[7]

Mid-arm Circumference and Mid-Arm/Head Circumference Ratios (Kanawati and McLaren's Index)

The normal value of mid-arm/head circumference ratios (MAC/HC) is 0.32-0.33 and in a term IUGR infant, a value less than 0.27 is considered features of fetal malnutrition.^[8]

Anthropometry: A neonate is labelled as SGA/IUGR when weight at birth less than 10 centiles as per the race and sex. In asymmetrical IUGR, only weight will be less than 10 centiles and the rest will be as per gestation age whereas in symmetrical IUGR, weight head circumference and length will be less than 10 centiles.^[5]

Neonatal outcome:

1. **Short term complications:** After birth IUGR neonates acquire separate complications. A few of these complications include pulmonary

hemorrhage perinatal asphyxia, necrotizing enterocolitis meconium aspiration, feeding difficulties, low apgar score, late-onset sepsis.^[10,11] These infants also have neuro-behavioral abnormalities,^[12] and low serum ferritin.^[13]

2. **Long Term Complications:** Infants are prone to have neurodevelopment outcome and poor growth when they reach the school-going age and adulthood.
3. **Long Term Physical Developmental Outcome:** Symmetrical IUGR neonate remain small throughout the life whereas asymmetrical IUGR neonate will catch up growth after birth when provided with an adequate postnatal caloric intake and optimal environment.^[12-14] Symmetrical IUGR infants are underdeveloped postnatally and usually remain small throughout their lives. Good prognosis and good postnatal growth are observed in IUGR.^[12,14,15] In a study conducted by Chaudhari et. al., evaluated low birth weight infants till 18 years of age. In their study preterm

gestational age children had short stature in spite of normal mid-parental height.^[16] In another study conducted by Chaudhari et al., assessed the growth and sexual maturation of low birth weight infants at 12 years of age. They observed preterm short for gestational age children had significant less height, weight and head circumference compared to the others.^[17] Mothers and fathers' height and birth length impacts the final height in IUGR infants.^[18]

4. **Long term neurodevelopmental outcome:** IUGR infants are more prone to develop cognitive and neurodevelopmental abnormalities. Symmetrical IUGR has greater impact on neurologic function than does asymmetrical IUGR. Infant with IUGR and associated illness will have worsened neurodevelopmental outcome.^[19,20] They have poor academic performance, memory, visuospatial and language difficulties and executive function problems. Children with small head circumference has cognitive impairment.^[21] When compared to AGA learning difficulties and behavioural problems are more in IUGR.^[22] Behavioural problems manifest at school age and can also impact school performance and social competence and may have a negative influence on quality of life.^[23] IUGR children have lower nonverbal and verbal IQ than controls.^[24]

Baker hypothesis and fetal programming of adult disease: Bakers hypothesis proposes that short for gestational age neonates are more prone to develop diseases with the onset of adult age. The IUGR infants are susceptible to following disease in adulthood namely hypertension,^[25] Obesity,^[26,27] hypercholesterolemia,^[28] type-2 Diabetes,^[29] Syndrome X,^[30] Parkinsonism,^[25] Ischemia heart disease.^[31,32]

CONCLUSION

IUGR is a vascular disorder caused by maternal, fetal, placental, genetic factors. Micronutrients are essential for fetal growth, their deficiencies of which are frequently linked with IUGR. Vitamin B12 deficiency increases the risk of preterm births, 2 fold of increase in LBW babies and 2-3 fold increase in perinatal mortality and morbidity IUGR will have short and long term complications. They are prone to immediate mortality and morbidities. Depending on the onset of gestation and etiology there are symmetrical and asymmetrical IUGR In symmetrical growth restriction, fetal insult occurs in an early period, for which there is no effective treatment. Early identification of IUGR and appropriate timing of delivery will help to adverse pregnancy outcome. However, some of the therapies are practiced to manage asymmetrical IUGR such as elimination of contributors (like stress, smoking, alcohol), adequate bed rest, balance diet, maternal hyperoxygenation, maternal hyperalimentation (increasing amino acid concentration), low dose aspirin and maternal blood

volume expansion. Maternal risk factor such as obesity, gestational diabetes and preeclampsia are related with undercoiling. Integration and coordination among the primary, secondary and tertiary health care should tackle the problem. Programming the right time to deliver and followup with adequate treatment can be done to avoid adverse perinatal outcome. Due to fetal epigenetic changes the infants are likely to develop adult onset disease. Still IUGR remains as challenge to obstetricians and neonatologist.

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