Risk Factors of Small for Gestational Age Newborn Babies

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ABSTRACT:

BACKGROUND:

The most common definition of Small for gestational age (SGA) newborns refers to a birth weight below the 10th percentile for gestational age. Intrauterine growth retardation(IUGR) may be caused by maternal, placental, or fetal factors. However, no underlying etiology can be identified in at least 40 % of SGA infants.

OBJECTIVE:

To evaluate the risk factors of SGA births in a sample of Iraqi term newborns.

PATIENTS& METHODS:

A case control study extended over eight months from Dec. first 2007 to July 31st, 2008 . In this study, 100 SGA newborns &100 control newborns evaluated within the first day of life.

This study was performed in delivery rooms &neonatal special care birth unit in Baghdad Teaching Hospital in Medical City . Data were collected by direct interview of the mothers. Data included different variables related to mothers & neonates.

RESULTS:

There was a significant relationship between SGA births & maternal urinary tract infections (OR=5.231, P<0.0001) & with antepartum hemorrhage (8.6 time risk ,0R=8.609, P=0.0349).

The majority of SGA newborns(15%) occurred in multiple pregnancies (OR=17.471, P=0.0003). SGA newborns were more common among non employed mothers (OR=2.100, P=0.0355).

Also SGA newborns had significant relationships with mothers not attended antenatal care (OR=3.648, P=0.0001),those with maternal history of SGA births (OR=15.474, P<0.0001) , those mothers with anemia (OR=5.532, P<0.0001) & lastly with mothers suffering from hypertension (OR=8.877, P<0.0001).

CONCLUSION:

There was significant relationship between SGA births and :Multiple pregnancies& maternal history of SGA births, mothers suffering from hypertension& maternal history of APH and maternal anemia& UTI, mother not attended antenatal clinic & with no employment.

KEYWORDS: risk factors, small for gestational age, newborns, birth weight

INTRODUCTION:

The most common definition of small for gestational age(SGA) refers to a birth weight below the 10th percentile for gestational age. This definition is controversial because it does not make a distinction among fetuses who are constitutionally small, growth restricted and small, and growth restricted but not small[1,2].

Moderate and severe IUGR are defined as birth weight in the 3rd to 10th percentile and less than 3rd percentile, respectively. Normal term infants typically weigh more than 2500 g by 37 weeks gestation completed [3].

Anthropometric data from infants born at different gestational ages have been used to generate cross-sectional growth curves .(1,4-7) Ideally, separate growth curves should be used for each sex because male infants weigh more than females at each gestational age [8]. Approximately 10 % of term infants in developed countries are SGA [9], compared to 23 % of term infants in developing countries [10]. SGA infants have either symmetric or asymmetric IUGR. Infants with symmetric IUGR have reductions in both body and head growth. Symmetric IUGR begins early in gestation and usually is caused by intrinsic factors such as congenital infections or chromosomal abnormalities. Infants with asymmetric IUGR have

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reduced body weight and relatively normal length and head growth.[3,9].

IUGR may be caused by maternal, placental, or fetal factors. Approximately one-third of IUGRs are due to genetic causes, and two-thirds are related to the intrauterine environment . However, no underlying etiology can be identified in at least 40 % of SGA infants[11].

1-***Maternal factors:***

Severe maternal starvation during pregnancy, maternal hypoxemia, hematologic and immunologic disorders, maternal medical disorders, Viruses& parasites, maternal substance abuse, high altitude and demographic variables.[12,13,14,15]

2-Placental factors:

Any mismatch between fetal nutritional or respiratory demands and placental supply can result in impaired fetal growth.[16]

3-Fetal factors :

Karyotypic abnormalities, genetic syndromes, and multiple gestation. [17]

This study aimed to evaluate the risk factors of SGA births in a sample of Iraqi term newborns .

PATIENTS AND METHODS:

A case control study extended over eight months from Dec. first 2007 to July 31st, 2008, which was performed in delivery rooms & neonatal special care baby unit in Baghdad Teaching Hospital in Medical City. Data were collected by direct interview of the mothers. Data including different variables of mothers &newborns. In this study, 100 SGA newborns &100 AGA newborns evaluated within the first day of life , they fulfilled the following criteria:1-Singltone and multiple pregnancy. 2-Term newborns (gestational age 37-42 weeks) with no congenital malformations. 3-Neonates of NVD, assisted deliveries by forceps, vacuum or by C.S. 4-Birth Weight of <2500gm for SGA newborns & 2500g or more for AGA newborns was measured for each newborn without clothes using a standard beam scale (secca , 16kg maximum Wt; Germany made).

By last menstrual period, U/S examination and by external physical criteria; Dubowtz criteria (number of creases of the sole, breast nodule size, scalp hair formation, amount of cartilage of ear lobe & examination of testis & scrotum in males and maturation of labia minora and majora in females) for assessment of gestational age of the newborns.

The risk factors taken by history from mothers as :Age of mother and parity, maternal history of SGA births, maternal iron deficiency anemia (hemoglobin level <11gm/dl till-12 weeks of gestation or <10.5gm/dl after that) documented by clinical features &hemoglobin level[18], urinary tract infection and chronic renal disease affecting the mothers documented by clinical features &general urine examination ,Diabetes and hypertension(pregnancy induced hypertension in which blood pressure=140/90 on second half of pregnancy or systolic blood pressure increased 30mmHg &/ or diastole increased 15mmHg over base line in two occasions in addition to edema & albuminurea; and chronic hypertension),[18] antepartum hemorrhage and ANC and employment.

Statistical analysis was made by help of statistician using Graph Pad State Mate complement. As number and percent of patients are the same(100= 100%) , we use only percent in tables .Data was presented through simple frequency distribution tables for each variable in the study that had been considered the relative risk (odd ratio) for SGA births .The 95% confidence interval (95% CI) mean 95% chance that the interval you calculated includes the true difference between population means & not include the true mean value in other 5% & provide a simple means of assessing the potency of different factors in individual patient [18].The P value is statistically significant if below 0.05 using Fisher exact test.

RESULTS:

In this study , (100) SGA newborns & (100) AGA newborns who were delivered at hospital were studied , (48% vs. 40%) of the newborns were females & (52% vs. 60%) were males in SGA and AGA groups ,with male: female ratio of 1.08:1 in SGA group and 1:1.50 in AGA group , with OR (95%CI) of 1.385(0.7905-2.425) and p value of 0.3197(not significant).

The mean birth Wt of SGA cases was 1865g(1250-2480 g)& the mean birth Wt for control group was 3500g (2600-4400g).Female newborns had (1.385) times risk to get SGA births &the P value>0.05, both values were not significant .

In this study, ,(15%) of mothers whose age < 16 years gave rise to SGA newborns &(12%) as AGA newborns, while those mothers whose age ranged 16-35 years gave rise to (85%) SGA , and (88%) AGA newborns. So younger age mothers showed 1.294(0.5724-2.936) times risk to get SGA newborns &it was statistically not significant(p value of 0.679).

In this study, (35%) of SGA newborns were

delivered from primipara mothers and (65 %) from multi mothers, while (29%) of AGA newborns delivered from primi mothers and (71%) from multi mothers. so OR(95%CI) is 1.318(0.2393) and the P value =0.4486(not significant).

In this study ,concomitant illnesses like urinary tract infection in mothers with SGA babies was (48%) & only (15%) in those with AGA babies , So UTI showed (5.231) times risk to get SGA births & it was extremely statistically significant.(P value<0.0001) , as in table 1.

Table 1 :The relationship between SGA&UTI

UTI	SGA	AGA	OR(95%CI)
	%	%	
Yes	48%	15%	5.231(2.66-10.272)
No	52%	85%	
Total	100%	100%	

P<0.0001

This study found that (8%) & (8.609) times risk to get SGA births in mothers with history of APH , while only (1%) for those with AGA births. The P value =0.0349 was statistically significant. Table 2.

Table 2: The relationship between SGA& APH.

APH	AGA	SGA	OR (95%CI)
	%	%	
Yes	8%	1%	8.609(1.056-70.206)
No	92%	99%	
Total	100%	100%	

P=0.034

Only(3%) of mothers in SGA and AGA groups had diabetes mellitus before &during pregnancy, so OR(95%CI) is 1(0.1969-5.080) and(time risk =1 & the P value =1.3173 &both of them were not significant.

This study showed that (15%) of newborns with SGA births resulted from twin pregnancy& only (1%) for AGA group. So SGA had (17.471) times risk than AGA group. The P value<0.0001 was extremely significant. Table 3

Table 3 : The relationship between SGA& twin pregnancy.

Twin	SGA	AGA	OR(95%CI)
	%	%	
Yes	15%	1%	17.471(2.259-135.09)
No	85%	99%	
Total	100%	100%	

P<0.0001

Employment of mothers also had relation to SGA births. In case of no employment ,the mother had (81%) of newborns with SGA newborns ,compared with (67%) of AGA group. so no employment had (2.100) times risk to get SGA births. The P value=0.0355 was statistically significant. Table 4

Table 4 :The relationship between SGA& employment

Employment	SGA	AGA	OR(95%CI)
	%	%	
No	81%	67%	2.100(1.095-4.0250)
Yes	19%	33%	
Total	100%	100%	

P=0.0355

The mothers not attended ANC had (41%) SGA birth, and (16%) AGA births . so it had (3.648) times risk than those who attended ANC. The P value=0.0001 was extremely significant. Table 5

Table 5 :The relationship between SGA &ANC attendance

ANC	SGA	AGA	OR(95%CI)
	%	%	
No	41%	16%	3.648(1.873-7.108)
Yes	59%	84%	
Total	100%	100%	

P=0.0001

The study found that(24%) &(15.474) times risk to get SGA births in mothers with previous maternal history of SGA births in comparison with AGA group with only (2%) .The P value=0.0001 was extremely significant. Table 6

Table 6 :The relationship between SGA &maternal history of SGA

Family history of SGA	SGA	AGA	OR(95%CI)
	%	%	
Yes	24%	2%	15.474(3.545-67.544)
No	76%	98%	
Total	100%	100%	

P=0.0001

Anemia contributed to about (43%) of SGA newborns, while it was (12%) in AGA newborns; so there was (5.532%) times risk to get SGA babies &the P value<0.0001 was extremely significant. Table 7

Table 7 :The relationship between SGA &anemia

Anemia	SGA	AGA	OR(95%CI)
	%	%	
Yes	43%	12%	5.532(2.688-11.384)
No	57%	88%	
Total	100%	100%	

P<0.0001

Twenty-seven percent of mothers had hypertension before &during pregnancy with SGA newborns, which showed (8.877) times risk to get SGA births. The P value <0.0001was extremely significant. Table 8.

Table 8 :The relationship between SGA &hypertension

Hypertension	SGA	AGA	OR(95%CI)
	%	%	
Yes	27%	4%	8.877(2.974-26.496)
No	73%	96%	
Total	100%	100%	

P<0.0001

The study revealed only one smoker mother with SGA birth &zero for AGA group. Also found only (2) cases of mothers with chronic renal failure &SGA births &zero for AGA group.

DISCUSSION:

Of 100 neonates with SGA, the study found that nearly the same frequency in both males &females, (52%) males, (48%) females, so the ratio was (1.08:1) and this agreed with AL.Janabi study (2001-Iraq), , which showed (P=0.887, OR=1.04). [19]

In regard to mother age, SGA neonates had no correlation with maternal age . These results agreed with Al-Rahim study in Iraq (2007) ,[20] but disagreed with Makki study 2002 (Yemen), which showed the younger age of mothers with high percentage of SGA births(16.6%)&(the P=0.0001). [21]

This study showed that the primipara mothers had no association with SGA births (P value=0.4486)& this disagreed with Forman study (Swedish) .[22]

Higher percentage of SGA babies resulted from mothers with UTI & had (5.231) times risk than control group , this probably due to placental insufficiency &this agreed with Makki study , which revealed (OR=1.3, P =0.031) .[21]

This study showed that mothers with history of APH at high risk to get SGA babies (OR=8.609 , P value=0.0349) ,this might attributed to placental insufficiency & this agreed with Makki study, which revealed (OR=2.5& 95%CI=1.8-3.3, P=0.001). [21]

Maternal DM showed no significant risk in this study (OR=1.000& 95%CI=0.1969-5.08, P=1.31173) , this result expected unless there was microvascular complications & this agreed with Moses study (Australia) .[23]

The study showed that twin pregnancies have an effect on outcome of birth weight, (15%) of SGA resulted from twin pregnancies and this had (OR=17.471& 95%CI=2.259-135.09) when compared with AGA group ,this might due to fetal transfusion syndrome &this agreed with Okogbo study (Nigeria), which showed the incidence of SGA babies as (13.4%) among twin pregnancies[24] ,and Hanoudi study(Iraq) 2006.[25]

This study showed that higher percentage of SGA babies delivered to non employed mothers (81%) &had (2.100) times risk ,this might be due to low income or maternal education & this agreed with Amine study (Egypt) 2007, which showed (OR=1.41, 95%CI=0.26-0.64). [26]

This study showed that higher percentage of SGA babies to mothers with inadequate ANC attendance (41%) & (3.648) times risk to get SGA babies, this might due to undiagnosed UTI , anemia or pregnancy induced hypertension & this agreed with Rodriguez study (Portugal),which showed (OR=1.86, 95% CI=1.32-2.62). [27]

This study showed (24%) of SGA babies had maternal history of SGA births & (OR=15.474, 95%CI=3.545-67.544, P<0.0001) so there was strong association, this probably due to same risk factors affecting the previous babies &this was compatible with Tsukamoto study (Japan) 2007. [28]

Mothers with anemia had (43%) SGA babies &(OR=5.532, 95%CI=2.688-11.384, P<0.0001) ;so it was associated with significant risk to get SGA births ,this might due to inadequate fetal nutrient& oxygen supply &this agreed with Makki study, which revealed (OR=1.3, 95%CI=1-1.7, P=0.0084) [21] , and also agreed with Al-Rahim study, p value of 0.00000008.[20]

Mothers with hypertension had (8.877) times risk than control group (OR=8.877, 95%CI, P<0.0001) , this probably caused by diminished uteroplacental perfusion & this agreed with Thompson study (New Zealand), 2001, which showed (5.49)times risk to get SGA babies (OR=5.49, 95%CI=1.81-16.71) [29], also agreed with Al-Rahim study(2007) with p value of 0.00002 [20] , and Hanoudi study in 2006.[25]

There was only one case who had history of smoking(one packet/day) with SGA baby, this due to social customs while many studies showed that strong association between SGA births &smoking

during pregnancy like Tsukamoto study (Japan), 2007, which showed the proportion of SGA babies were significantly higher among heavy smokers(>10 cigarettes/day,13.7%, P<0.001). [28]

CONCLUSION:

There was significant relationship between SGA births and multiple pregnancies, maternal history of SGA births, mothers suffering from hypertension, maternal history of APH, maternal anemia& UTI ,and mother not attended ANC& with no employment. There was no correlation between SGA births &sex, maternal age, parity &maternal DM.

So we recommended early diagnosis & treatment of UTI, anemia, APH& hypertension by good ANC attendance , provide good nutrition to pregnant mothers,education of mothers through television & news papers.

REFERENCES:

1. Battaglia FC, Lubchenco LO. A practical classification of newborn infants by weight and gestational age. J Pediatr 1997; 71:159.
2. Sifianou P. Small and growth –restricted babies : drawing the distinction . Acta paediatr. 2005 ;95:1620-4.
3. Bahado-Singh RO , Kovanci E, Jeffres A, et al. The Doppler cerebro- placental ratio& perinatal outcome in IUGR. Am J obstet.Gynecol.1999;180:750.
4. Arbuckle TE, Wilkins R, Sherman GJ. Birth weight percentiles by gestational age in Canada. Obstet Gynecol 1999;81:39.
5. Williams RL, Creasy RK, Cunningham GC, et al. Fetal growth and perinatal viability in California. Obstet Gynecol 1995;59:624.
6. Brenner WE, Edelman DA, Hendricks CH. A standard of fetal growth for the United States of America. Am J Obstet Gynecol 2002; 126:555.
7. Battin MR, McGowan LM, George-Haddad M, Thompson JM. Fetal growth restriction and other factors associated with neonatal death in newzealand . Aust N Z J Obstet Gynecol. Dec.;47(6):457-63.
8. Gardosi J. Customized growth curves. Clin Obstet Gynecol 1997; 40:715.
9. Anderson MS, Hay WW. Intrauterine growth restriction and the small-for-gestational-age infant. In: Neonatology Pathophysiology and Management of the Newborn, 5th ed, Avery, GB, Fletcher, MA, MacDonald, MG (editors), Lippincott Williams and Wilkins, Philadelphia, 1999:411.
10. De Onis M, Blossner M, Villar J. Levels and patterns of intrauterine growth retardation in developing countries. Eur J Clin Nutr 1998; 52 Suppl 1:S5.
11. Wollmann HA. Intrauterine growth restriction: definition and etiology. Horm Res 1998;49 Suppl 2:1.
12. Doctor BA, O'riordan MA, Kirchner HL, et al. Perinatal correlates and neonatal outcomes of small for gestational age infants born at term gestation. Am J Obstet Gynecol 2001; 185:652.
13. Khashan AS, McNamee R, Abd KM, et al. Reduced infant birth weight consequences upon maternal exposure to severe life events. Psychosom Med. 2008 Jul.;70(6):688-94.
14. Badshah S, Mason L, Mckelvie K, Payne R, Lisboa PJ. Risk factors for low birth weight in the public hospitals at Peshawar , NWFP-Pakistan. BMC Public Health 2008 ;8:197.
15. Beard JR, Lincolin D, Donoqhue D ,et al. Socioeconomic and maternal determinant of small for gestational age birth: pattern of increasing disparity . Acta Obstet Gynecol Scand. 2009;88:575-83.
16. Kramer MS, Olivier M, McLean FH, et al. Impact of intrauterine growth retardation and body proportionality on fetal and neonatal outcome. Pediatrics 2000; 86:707.
17. Holtrop PC. The frequency of hypoglycemia in full-term large and small for gestational age newborns. Am J Perinatol 1993; 10:150.
18. Beaglehole R; Bonita R; Kjellstrow T. Type of study in basic epidemiology,Geneva,1933.Chapter 3WHO,P.38.
19. AL-Janabi A.K. Risk factors for SGA; A thesis submitted to the Iraqi Commission for medical Specialization in pediatrics;2001(not published).
20. Al-Rahim QA, Al-Hamdani NNH, Nader KE. Some maternal factors affecting anthropometric measurements of newborns . The Iraqi Postgraduate Medical Journal .2007;6:118-24.
21. Makki AW. Risk factors for SGA in Sana'a University, Yemen. Annals of Saudi Med, 2002;22:5-6.
22. Forman L, Michele R, Heinz W. Effect of age, parity& smoking on pregnancy outcome. American Journal of Obstetrics& Gynecology1993;168:16-21.

23. Moses RG ,Moses J & Knights S. Birth weight of women with gestational diabetes. Diabetes care, 1999;22:1054-62.

24. Okogho ME, Funitusi JB. Low birth weight & its correlates among Nigerian twins. Nigeria, Afr.J.Med.Sci.1997;26:5-7.

25. Hanoudi BM, Rabab H. Effect of maternal gestational conditions on newborns body parameters. Iraqi Medical Journal .2006;52:34-40.

26. Amine T, Arafa MA, Abdel Fattah M. Association of maternal work with adverse perinatal outcome. Can J Public Health.2007;98:217-21.

27. Rodriguez T, Barros H. Comparison of risk factors for small for gestational age &preterm in a Portuguese cohort of newborns . Matern Child Health J.2007;11:417-24.

28. Tsukamoto H ,Fukuoka H, Koyasu M, Nagai Y,Takimoto H. Risk factors for SGA .Pediatr Int.Japan, 2007;49:985-90.

29. Thompson JMD , Clark PM, Robinson E, et al. Risk factors for SGA babies: The Auckland birth weight collaborative study. Journal of Pediatrics & Child Health,2001; 37:369-75.