ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 02 | February - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

TO STUDY SMALL FOR GESTATIONAL AGE AS A RISK FACTOR FOR THYROID DYSFUNCTION

Paediatrics

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ABSTRACT

Introduction: Babies with a birth weight and/or length below the 10th percentile of a population of the same gestational age are defined small-for-gestational-age (SGA). Children born prematurely or small for gestational age are at a higher risk of thyroid dysfunction. Intrauterine growth retardation and the delivery of SGA infants may have a variety of reasons. This illness is characterised by several endocrine-metabolic changes and pathophysiological processes. It has been shown that there are greater rates of diseases including cardiovascular events, metabolic syndrome, hypertension, and obesity. These changes may also have an impact on future health in infancy and adulthood. There aren't many research that compare the thyroid function of SGA and AGA neonates. For newborn plasma concentrations of T4 and TSH, contradictory findings have been reported. **Objective:** The study was conducted to observe the relationship that the weight and/ or the gestational age plays on the thyroid function of the babies. **Materials And Methods:** This retrospective study was conducted in a tertiary care centre. This study focused on the day 3 TSH, Ft4 value of the SGA babies compared with the AGA babies. **Results:** Preterm and term SGA babies had considerably lower blood T4 concentrations and higher TSH values as compared to AGA neonates (P=0.0001). **Conclusion:** SGA babies had a higher incidence of transient hypothyroidism and required accurate follow-up and close monitoring of thyroid function.

KEYWORDS

SGA, T4, TSH, intrauterine growth retardation

INTRODUCTION

A newborn is considered small for gestational age (SGA) if their birth weight or crown-heel length are less than the 10th percentile for gestational age or fewer than two standard deviations (SD) from the GA mean, respectively (approximately the 3rd percentile for GA).

In low- and middle-income nations, including India, 23 million newborns were born undersized for gestational age, according to a recent study. In India, the frequency of SGA varied from 12% to 78.4%, according to a 2015 study. Between 2.3 and 10% of all newborns in India are thought to be born SGA.

The normal development and maturation of the central nervous system is significantly influenced by thyroid hormones. Small for gestational age (SGA) infants have been the subject of several investigations have a different hormonal profile than those born with a birth weight appropriate for gestational age (AGA). In SGA babies, thyroid size is larger when expressed as a percentage of body weight, indicating that low thyroid hormone levels throughout foetal life may be partially compensated for.

Numerous investigations have found that compared to full-term and preterm AGA newborns, full-term and preterm SGA babies had considerably lower thyroid plasma levels..

AIM

1. To determine if the small for gestational age infants are at a higher risk for thyroid dysfunction when compared to appropriate for gestational age infants ,i.e, if the SGA group has a higher TSH than the AGA group admitted to RRMCH

OBJECTIVE

1. To assess the thyroid function in small for gestational age babies.
2. To compare the thyroid function in SGA with AGA babies .

MATERIALS AND METHODS

Source Of Data

Study Group: The study was conducted in neonates delivered via normal vaginal delivery and C section in RRMCH. Cases were selected based on inclusion and exclusion criteria admitted in - RRMCH BENGALURU.

Sample size- based on Yamane equation - SGA – 70
AGA – 70

Study design: RETROSPECTIVE STUDY

Study group: All small for gestational age and appropriate for gestational age babies admitted in RRMCH.

INCLUSION CRITERIA

SGA infants including
preterm (<37 weeks of gestation)
term (37-40 weeks)
– comparing with preterm and term AGA infants.

Exclusion Criteria:

1) Admission after 1 week of age
2) Sepsis and other infectious diseases
3) Maternal thyroid diseases
4) Unwillingness to participate in the study
5) Death

METHOD OF COLLECTION OF DATA

a) Cases were selected based on inclusion criteria and detailed clinical examination was done.
b) This study is designed to compare thyroid hormone levels within the normal range and the incidence of thyroid dysfunction in the SGA group as compared to AGA group.
c) The medical records of all SGA and AGA infants admitted to Rajarajeswari Medical College & Hospital were assessed.
d) Initial TFT performed between 72 and 96 hours of life after admission.
e) Blood samples collected between 72 and 96 h of life are analyzed with TSH and free thyroxine (FT4) assays.

Thyroid function test (TFT) results, and neonatal demographic and clinical factors were analyzed to identify the associations between SGA birth and altered thyroid concentrations and thyroid dysfunction.

Statistical analysis

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. **Chi-square test or Fischer's exact test** (for 2x2 tables only) was used as test of significance for qualitative data.

Continuous data was represented as mean and standard deviation. **Independent t test or Mann Whitney U test** was used as test of significance to identify the mean difference between two quantitative variables and qualitative variables respectively.

Graphical representation was done using bar diagram and line diagram.

P Value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Statistical software: MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyze data

RESULTS

SMALL FOR GESTATIONAL AGE BABIES- TERM – 42 (60%)
- PRETERM– 28 (40%)

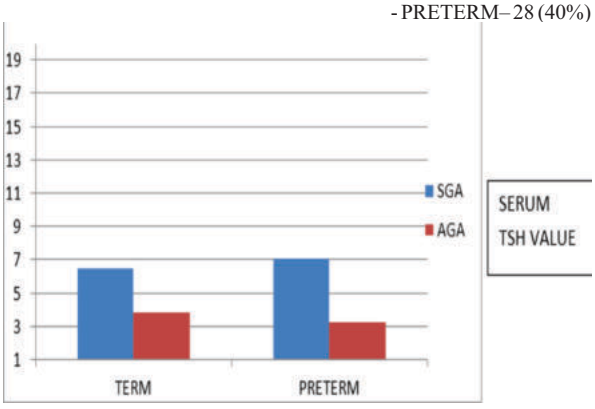

Figure 1: Showing The Mean Tsh Values Between The Term And Preterm Sga And Aga Babies.

Table 1 : Thyroid Stimulating Hormone Levels In Babies Born Small For Gestational Age

TSH level (µIU/ml)	SGA , n	SGA, %
< 1	6	8.5%
1-3	4	5.7%
3-5	12	17.14%
5-7	16	22.8%
7-10	12	17.1 %
>10	20	28.5%

SGA, small for gestational age babies; TSH, Thyroid- stimulating hormone.

This table presents the absolute frequency and percentage distribution of the total sample of small for gestational age babies by range of serum TSH level at day 3 of life.

Table 2: Mean Mother's Age Comparison Between Two Groups

	Group				P Value
	Mother's of AGA Babies		Mother's of SGABabies		
	Mean	SD	Mean	SD	
Age	24.74	4.27	25.29	3.95	0.44

Mean Age in AGA Babies Group was 24.74 ± 4.27 and in SGA Babies Group was 25.29 ± 3.95. There was no significant difference in mean Age comparison between two groups.

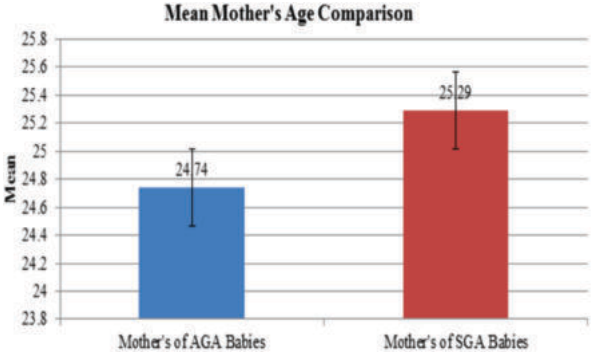

Figure 1: Bar Diagram Showing Mean Mother's Age Comparison Between Two Groups

Table 3: Mean Gestational Age Comparison Between Two Groups

	Group				P Value
	AGA Babies		SGA Babies		
	Mean	SD	Mean	SD	
Gestational Age	38.56	1.14	37.01	1.9	< 0.001*

Mean Gestational Age in AGA Babies Group was 38.56 ± 1.14 and in SGA Babies Group was 37.01 ± 1.9. There was a significant difference in mean Gestational Age comparison between two groups.

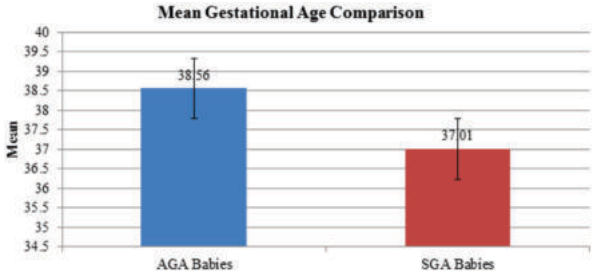

Figure: Bar Diagram Showing Mean Gestational Age Comparison Between Two Groups

Table 4: Mean Baby Weight Comparison Between Two Groups

	Group				P Value
	AGA Babies		SGA Babies		
	Mean	SD	Mean	SD	
Baby Weight	2.99	0.35	2.19	0.32	< 0.001*

Mean Baby Weight in AGA Babies Group was 2.99 ± 0.35 and in SGA Babies Group was 2.19 ± 0.32. There was a significant difference in mean Baby Weight comparison between two groups.

Table 5: Mean Tsh Comparison Between Two Groups

	Group				P Value
	AGA Babies		SGA Babies		
	Mean	SD	Mean	SD	
TSH	3.76	1.07	7.66	5.21	< 0.001*

Mean TSH in AGA Babies Group was 3.76 ± 1.07 and in SGA Babies Group was 7.66 ± 5.21. There was a significant difference in mean TSH comparison between two groups.

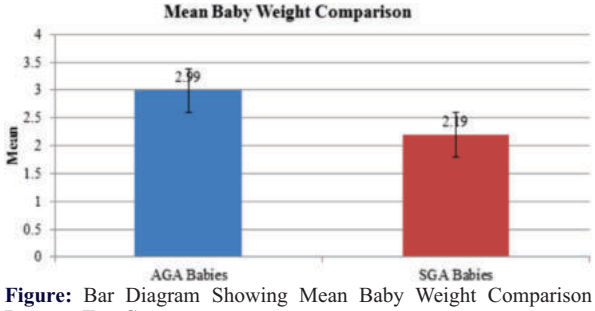

Figure: Bar Diagram Showing Mean Baby Weight Comparison Between Two Groups

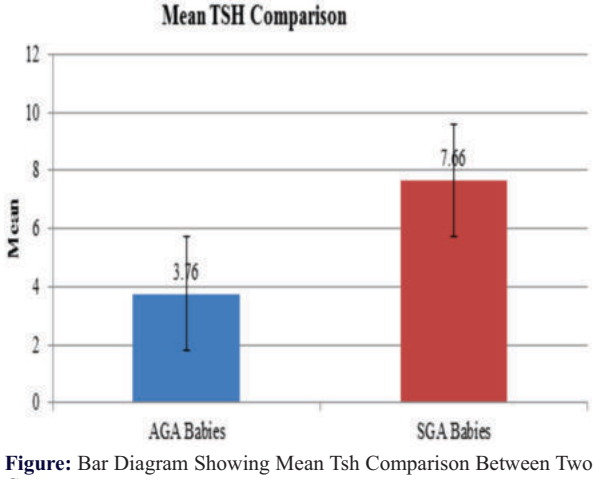

Figure: Bar Diagram Showing Mean Tsh Comparison Between Two Groups

Table 6: Mean Ft4 Comparison Between Two Groups

	Group				P Value
	AGA Babies		SGA Babies		
	Mean	SD	Mean	SD	
FT4	2.73	0.66	1.52	0.51	< 0.001*

Mean FT4 in AGA Babies Group was 2.73 ± 0.66 and in SGA Babies Group was 1.52 ± 0.51. There was a significant difference in mean FT4 comparison between two groups.

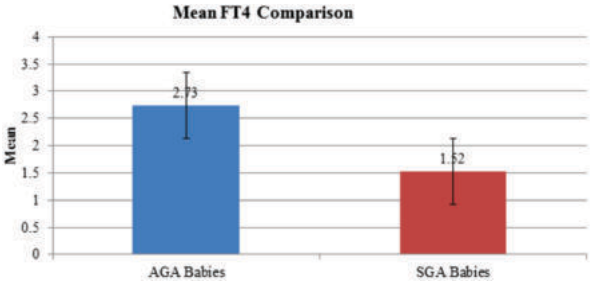

Figure: Bar Diagram Showing Mean Ft4 Comparison Between Two Groups

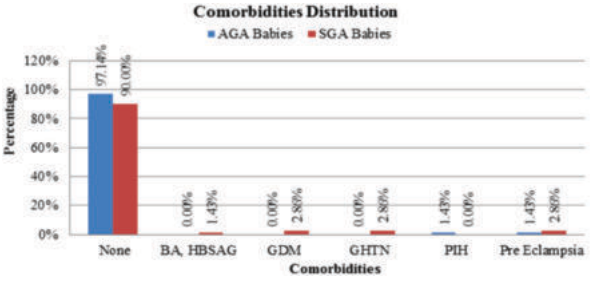

Figure 6: Bar diagram showing Comorbidities distribution between two groups

Table 7: Comorbidities Distribution Between Two Groups

		Group			
		AGA Babies		SGA Babies	
		Count	Column N %	Count	Column N %
Comorbidities	None	68	97.14%	63	90.00%
	BA, HBSAG	0	0.00%	1	1.43%
	GDM	0	0.00%	2	2.86%
	GHTN	0	0.00%	2	2.86%
	PIH	1	1.43%	0	0.00%
	Pre Eclampsia	1	1.43%	2	2.86%

$\chi 2 = 6.524, df = 5, p = 0.258$

There was no significant difference in Comorbidities Distribution between two groups.

DISCUSSION

This study has found that TSH levels were significantly higher in SGA newborns than AGA babies. Findings of previous studies have confirmed our discoveries.

When observed in SGA babies, hypothyroxinemia is frequently temporary and typically disappears by the next check-up. When the blood T4 level in SGA newborns spontaneously returns to normal, it can be assumed that thyroid function has returned as a result of proper nutrition. In IUGR newborns, where low T4 plasma levels have been linked to the gland's delayed development as a result of malnutrition and placental hypoxia, it has been suggested that low T4 plasma levels in SGA newborns may be the result of pathogenetic mechanisms that are comparable to those. Indeed, SGA neonates are typically malnourished children. We did find, however, that TSH serum levels are higher in SGA babies than in AGA controls. This observation could be seen as the pituitary gland's right response to the low T4 levels seen in the SGA population. As a result, it's likely that dietary status has little effect on how well the pituitary gland functions.

The TSH level range was established to 7.5 mU/L in a study by Bosch-Giménez et al which found greater TSH concentrations in SGA newborns. Thyroid hormone levels from newborns that are tiny for gestational age were found to be higher than AGA in our investigation.

According to Franco et al., blood T4 concentrations are lower in both preterm and term SGA infants, while TSH concentrations are only noticeably greater in term SGA infants compared to AGA ones. According to our study analysis, the SGA group had considerably greater FT4 concentrations. Therefore, our findings are consistent with the two studies' findings that SGA babies require constant monitoring since they are more likely to experience temporary hypothyroidism.

De Kort et al. discovered increased TSH levels in preterm short SGA children within the normal range, while mean FT4 is not significantly different. The results clearly indicate that TSH elevation may have a comparable role at various stages of the developmental process, even though they cannot directly support our conclusion. The cause of elevated TSH levels in SGA newborns warrants investigation because thyroid hormones have been linked to a variety of crucial physiological processes. Numerous causes, such as immaturity of the hypothalamic-pituitary-thyroid axis, uterine stress with growth limitation, a less effective thermogenic response, or non-thyroidal illnesses, are hypothesised to be involved. However, it is challenging to determine the temporal pattern of thyroid hormone change brought on by SGA stunting and to differentiate between that of AGA infants, as either NBS or TFT is generally done at separate time points. Additionally, hospitalisation exposure to various medications and the inability to control iodine balance may be additional frequent causes.

Some cohort studies looked into the effects of high newborn TSH levels on long-term developmental and cognitive sequelae, given the significance of proper thyroid function, particularly for the general development in early and later childhood. SGA birth is connected with cognitive ability, as measured by IQ and reading comprehension, while preterm birth was also associated with motor ability, there are differences between the effects of preterm and SGA birth on cognitive and motor development. Additionally, Trumpff et al. showed that preschoolers with high TSH levels between 10 and 15 mU/L had lower verbal IQ scores in univariate analysis, but the finding was not sustained after controlling for confounding variables. Preterm newborns with persistently high TSH levels have worse neurological outcomes than those with transiently high TSH levels, according to Chung et al. However, conflicting findings show that there is still disagreement on the clinical importance of neonatal TSH increase. Preterm SGA children with TSH elevation should receive special monitoring due to the potential cognitive consequences in infancy and youth.

STRENGHTS

According to Chung et al., preterm infants with chronically elevated TSH levels experience worse neurological outcomes than those with transiently elevated TSH levels. The clinical importance of newborn TSH increase is still up for debate, however, as shown by inconclusive results. Preterm SGA children with elevated TSH levels should get close monitoring due to the possible risks to cognitive development in infancy and youth.

LIMITATION OF THE STUDY

- Preterm infants who were born before 37 gestational weeks and admitted to the NICU are included in the study population but these infants would be more immature and sicker and, thus, would be more likely to exhibit higher incidence of thyroid dysfunction requiring levothyroxine treatment.
- The number of cases is relatively small compared to largescale NBS, and further studies including more cases are warranted to confirm the findings.

CONCLUSIONS

In conclusion, preterm and term SGA newborns had significantly higher TSH concentrations within the normal range when compared to AGA babies and an increased incidence of thyroid dysfunction, but most of them were transient and reverted to normal within 6 months of life. SGA newborns with these features should be closely followed up with periodical TFTs and endocrinologic evaluation.

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