

# Maternal Antepartal TSH Effect on the Progress of Labour

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## ABSTRACT

**Objective:** To evaluate the effect of maternal thyroid stimulating hormone TSH measurement on the need for emergency cesarean section in labour and establish a reference TSH antepartum range for optimal outcome.

**Study design:** prospective observational

**Study setting:** AlKarkh Maternity Hospital

**Material and Method:** A total of 100 term pregnant women admitted to labour ward with signs of labour were included in this study.

We excluded women with diabetes, obesity, high blood pressure and known thyroid diseases. A blood sample was drawn for TSH evaluation to all laboring women, who were followed up and the outcome was noted. TSH values compared between two groups, the first group having a successful vaginal birth, the second group having an emergency cesarean section. Additionally, rates of newborn admission to intensive care unit NICU were also studied. Variables like patient's age, parity, gestational length and newborn birth weight all assessed for correlation with TSH levels. Reference ranges assessed for a successful vaginal birth by identification of 5<sup>th</sup> and 95<sup>th</sup> percentiles.

Patient consent was taken and documented in clinical notes.

**Results:** There were 47 women having successful vaginal birth, and 53 women having an emergency cesarean. The mean TSH in the vaginal group was 2.61 mU/l compared to higher mean TSH in the cesarean group was 2.81 mU/l (t 2.83, p value=.0027), which was of statistical relevance. Newborn admitted to NICU had significantly higher mean maternal TSH level ; 2.89 vs. 2.65mU/l in those not needing admission (p= .019).No significant difference found in TSH values in regard to newborn gender (mean TSH in women giving birth to male newborns 2.72mU/l vs.2.68mU/l in mothers of female newborn babies p=0.4).

Weak correlation between TSH and each of maternal age, parity, gestational length and newborn birth weight (CORRELATION r = 0.1, 0.14, 0.06, -0.13)respectively. The 95<sup>th</sup> percentile for TSH ranges in the emergency cesarean group was 3.36 mU/l, the 5<sup>th</sup>percentile 2.2 mU/l. Corresponding values in the vaginal birth group were 3.1mU/l and 1.9 mU/l.

**Conclusions:** There is a significant effect of TSH level in maternal blood antepartum on the progress of labour, with higher mean TSH having more risk for failed progress, emergency cesarean section and newborn admission to intensive care.

## INTRODUCTION

Cesarean section rates have been on the rise for last year's worldwide, as many may find it a safer alternative to vaginal birth.

But when performed as an emergency cesarean section, while the woman is in labour, in this case, it is well known to be associated with higher risks including pneumonia, thrombotic events, endometritis and transfusions (1). Furthermore, given its unexpected nature, it is particularly traumatic to the patient

psychologically affecting the postnatal quality of life, and reducing the women self-esteem. (2)

*Many studies analyzed factors that would predict the risk of emergency cesarean section, most related to either fetal distress in labour (3) or faulty fetal head position and failed progress (4), two major reasons for emergency cesareans. (5)*

*Thyroid diseases are most studied in term of their effect on fertility, reproduction and pregnancy outcome, and many suggested an evidence of attenuating the risks with levothyroxine treatment in pregnant women with autoimmune hypothyroidism. (6)*

Thyroid hormones are released under control of the hypothalamic pituitary axis, and have an important role in metabolism, growth and development, and thus are expected to have an impact on reproductive organs as well as reproductive outcomes, on the other hand, physiological changes in pregnancy do affect thyroid gland and thus there are international pregnancy specific ranges for thyroid stimulating hormone (TSH). We would usually expect ranges between 0.3 mU/l and 3 mU/l in the third trimester and near term. (7)

*Considering the fact that thyroid hormones affect muscle contractility (8), and guided by the finding that ethnic variation in TSH during pregnancy exists(9), this study comes as an attempt to find the effect of thyroid stimulating hormone TSH on the progress of labour in otherwise healthy women with no known thyroid disease, diabetes or hypertension, and having an average body mass index as well as to establish a safe TSH range to use antepartum at our settings .*

## MATERIAL AND METHOD

A total of 100 term pregnant women admitted to the labour ward at AIKarkh Maternity Hospital during the period extending from January, the first 2019 to October, the first 2019.

All women were examined clinically for signs of labour and if fitting the inclusion criteria, were included in the study.

Inclusion criteria included a term singleton pregnancy with a cephalic presentation in active labour with no contraindications to vaginal birth.

We excluded women with diabetes, obesity, high blood pressure and known thyroid diseases. A blood sample was taken for TSH evaluation to all included laboring women, who then were followed up throughout labour for progress and the outcome was noted. TSH values were compared between the two outcome groups, the first group having a successful vaginal birth, the second group needing an emergency cesarean section. Additionally, rates of newborn admission to intensive care unit NICU was also studied. Variables like patient's age, parity, gestational length and newborn birth weight all were assessed for correlation with TSH levels.

Reference ranges drawn for a successful vaginal birth by identification of 5<sup>th</sup> and 95<sup>th</sup> percentiles.

Patient consent was sought and documented in clinical notes.

## TSH ASSAY

TSH is a glycoprotein secreted by anterior pituitary gland. Its beta sub-unit is specific and it regulates thyroid gland hormones production.

The thyroid stimulating hormone ELISA Assay Kit (enzyme -linked immunoassay kit) was used in this study. It is intended for a direct quantitative determination of thyroid stimulating hormone in human serum.

Samples were made by collecting 5 ml of blood into an appropriately labeled tube. Centrifuge and removal of serum done at the same day or an alternate day while storing sample below -4 C.

## DATA COLLECTION

Labour status was determined at the time of admission by the senior obstetrician. Onset of labour was defined as the onset of regular contractions with cervical change exceeding 4 cm dilatation, rupture of the membranes, or complete effacement.

Data collection involved filling paper forms by a competent resident attending the labour ward, reporting demographic information and clinical examination findings, in addition to the results of thyroid stimulating hormone (TSH) assay.

**Items collected** included mother’s age, parity, gestational length, mode of delivery, newborn sex, newborn weight, need to admit to neonatal intensive care unit (NICU).

**Statistical Analysis**

Analysis of data was carried out using the available statistical package of SPSS-17 (Statistical Packages for Social Sciences- version 17).

Statistical analysis involved descriptive statistics such as frequency, percentages, averages, ranges (minimum-maximum values).

The significance of difference between the variables was estimated by using independent student-t-test for

difference between two means, while different percentages were tested using chi-square test ( $\chi^2$ -test). Statistical significance was considered whenever the P value was less than 0.05.

**RESULTS**

The study involved 100 women in active labour, eventually 47 women had a vaginal birth, while 53 women had an emergency cesarean.

The mean TSH level in the vaginal group was 2.62 mU/l while mean TSH in the cesarean group was 2.81 mU/l ( $t = 2.83, p \text{ value} = .227$ ). (table1)

	vaginal	cesarean
Mean	2.617	2.809
SD	0.367	0.300
SEM	0.050	0.044
N	53	47

The *t*-value is 2.83637. The *p*-value is .002772. The result is significant at  $p < .05$ .

Table1: Comparison between mean TSH in two groups

Figure 1, below, illustrates the magnitude of the difference between the two groups in relation to their respective Mean of TSH values.

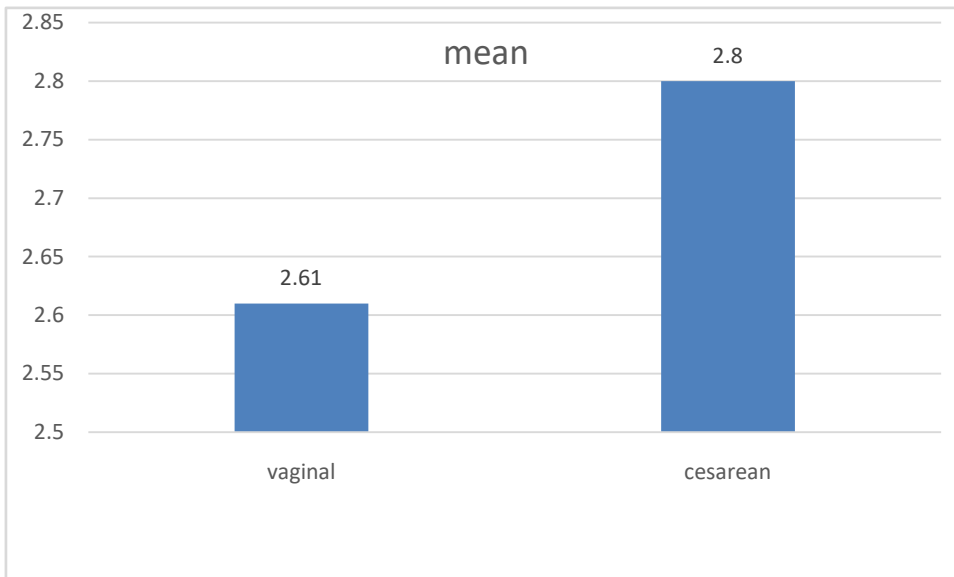


Figure1: comparing means between Vaginal birth and Cesarean

Newborn admitted to NICU (N= 19) had significantly higher mean maternal TSH levels were 2.89 vs. 2.65 mu/l in those not needing NICU admission (p= .019). Interestingly, in the vaginal group four newborns needed to be admitted to NICU, the mean TSH in this subgroup was 3.023 mU/L. (Table2, Figure2)

	Vaginal	Cesarean	Totals	Mean TSH
NICUadmitted	4	15	19	2.89
Discharged	49	32	81	2.65

Totals	53	47	100	p = .019**
Mean TSH	2.61	2.8	P =.002 *	

\*t test 2.83(95% confidence interval of this difference: From 0.058 to 0.326)

\*\*t test 2.36(95% confidence interval of this difference: From 0.033 to 0.378)

Table2: Comparing NICU admissions and mean TSH per subgroups

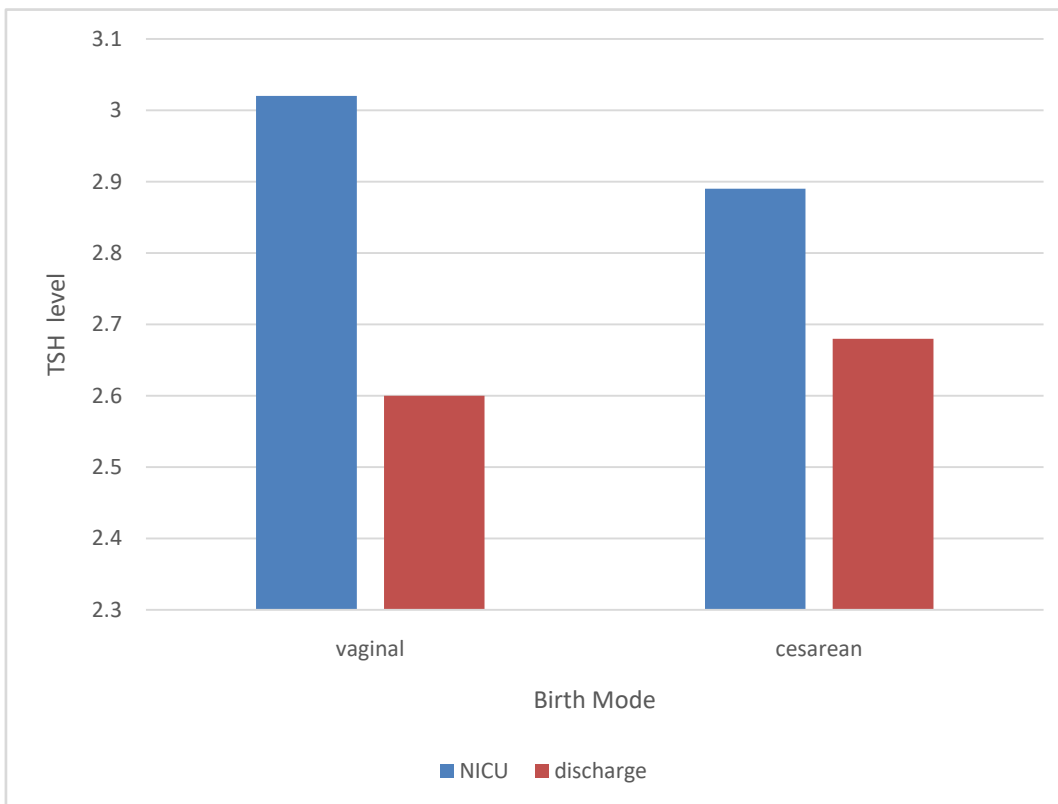


Figure2: Comparing TSH means in subgroups

No significant difference found in TSH values in relation to gender of the newborn (mean TSH in women giving birth to male newborns 2.72mu/l vs.2.68mu/l in mothers of female newborn babies p=0.4).

Weak correlation between TSH and each of maternal age, parity, gestational length and newborn birth weight (CORRELATION r = 0.1, 0.14, 0.06, -0.13, p= 0.2, 0.4, 01, 0.07) respectively.

The 95<sup>th</sup> percentile for TSH ranges in the emergency cesarean group was 3.36 mu/l, the 5<sup>th</sup> percentile was 2.2 mu/l. Corresponding values in the vaginal birth group was 3.1mu/l and 1.9 mu/l.

Shown in Figure 3 is a whisker plot display of minimum, median, maximum, 25<sup>th</sup> and 75<sup>th</sup> percentile of TSH values in both vaginal and cesarean group.

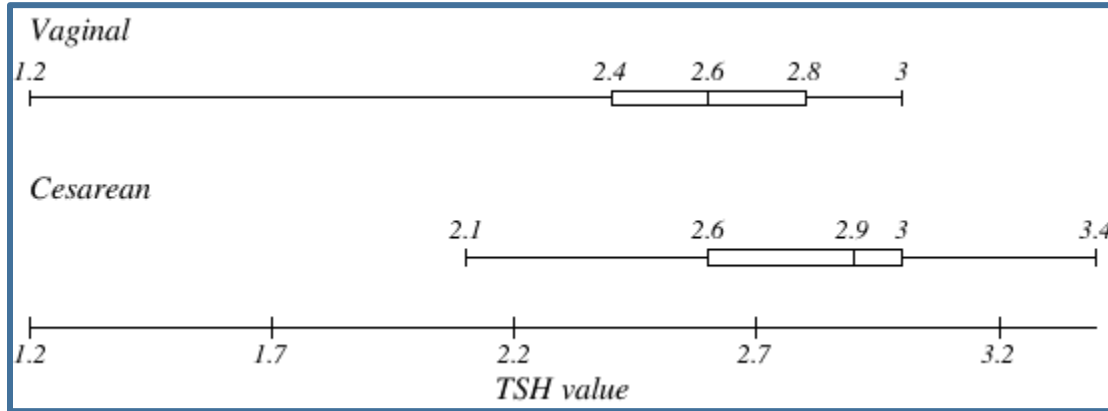


Figure3: Whisker plot graphic display of TSH values in two groups.

**DISCUSSION**

In the recent years, most attention has been given to define proper reference ranges for thyroid function test, specifically the thyroid stimulating hormone TSH.

It is well known that while international reference ranges exist, the use of a population based reference range would improve diagnosis and reduce misclassifications (10), since much controversy exists about the proper lower limit of TSH that defines patients in the subclinical hypothyroidism range ( usually defined as TSH higher than 4.4 mU/l with normal T3,T4 ) and about when subclinical hypothyroidism should be treated. (11)

We found a significantly higher mean TSH in the group of women who while laboring, had a diagnosis of either fetal distress or failed progress and were offered an emergency cesarean section (2.8mU/l vs. 2.6mU/l in vaginal birth group,  $p=.0227$ ).

This finding is comparable to a study by MonenL.etal., stating that women who had emergency cesarean had significantly higher TSH mean (1.63mU/LVS 1.46 mU/L  $P=0.025$ ). (12)

TSH is known to be an important regulator of energy expenditure, development and muscle growth, and has been linked to premature exhaustion and defective

muscle function (13), a causal link we propose as the possible reason , that many of the women in group two, requiring an emergency recourse to cesarean section, had a higher TSH level in their serum , uncovering the fact of a sort of defective thyroid function affecting either maternal uterine muscle by exhaustion, or by affecting estrogen levels (14), or affecting fetal movement and interfering with proper fetal presentation, as proposed in the Kuppens et al. study, stating that *sub-optimal maternal thyroid function has been linked to breech presentation of fetuses and the finding of higher TSH concentrations in their mothers at 36 week gestation(> or = to 2.5mU/l, the 90<sup>th</sup> percentile)*. (15)

From data in this study, TSH limits in these term pregnant women are described to help clinicians better understand reference ranges for this sub-population, and we propose to refer to the 95<sup>th</sup> percentile TSH value in the emergency cesarean group, that was 3.36 mU/l, and the 5<sup>th</sup> percentile, 2.2 mU/l, as the high limit and lower limit of TSH value, respectively, of risk for adverse events and less safe outcome for mother and her baby.

*On comparing Newborn admission to NICU (N= 19) with the group of women having their newborn fit for discharge, TSH mean in the former sub-group was significantly higher (2.89 vs. 2.65 mU/l,  $p= .019$ ).*

Of particular importance, is the finding that even when delivering vaginally, a subgroup of women had babies admitted to neonatal intensive care unit, interestingly, the mean TSH was 3 mU/l, eliciting that possibly, and adverse intrapartum event was not detected with conventional labour room monitoring.

Pearson correlation analysis between maternal TSH and maternal age, parity, gestational length, newborn weight and gender showed no difference in TSH values, although some studies, found that TSH is a possible predictor of low birth weight ( $r = 0.296$ ,  $p < 0.001$ ). (16) This could be related to the population sample in their study.

In conjunction to the study conducted by Batistuzzo et al., we propose that TFT should be a routine test to be

monitored and optimized antenatally to avoid adverse intrapartum events. (17)

## CONCLUSIONS

There is a significant effect of TSH level in maternal blood antepartum on the progress of labour, women with higher mean TSH having more frequently a failed progress, emergency cesarean sections and newborn admissions to intensive care than TSH in the woman delivering vaginally with no need for neonatal intensive care admission.

The possibility of using the 5<sup>th</sup> percentile for TSH value in cesarean group (2.2 mU/l) as population based TSH reference range for safer outcome need to be studied further.

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