Low Concentrations of Maternal Thyroxin During Early Gestation :A Risk Factor of Breech Presentation

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ABSTRACT:

BACKGROUND:

Approximately 3-5% of all pregnancies at term are with the fetus in the breech presentation in which whatever thier mode of delivery, is a signal for potential fetal handicap Little is known about the etiology; However there are several etiological factors might be related to fetal movement during pregnancy. Maternal hypothyroxinaema early in gestation may have effect on fetal movement during pregnancy through its effect on fetal brain maturation.

OBJECTIVE:

To evaluate the relation between breech presentation at term and low maternal free thyroxin levels during early gestation in women not suffering from overt thyroid dysfunction.

DesignA prospective observational study of pregnant women.

METHODS:

Analysis refers to 70 women who met the inclusion and exclusion criteria. Main outcome assessment, Fetal presentation (cephalic–breech) at term gestation in relation to maternal thyroid function at 12 weeks of gestation

RESULTS*:*

Breech presentation at term delivery was independently related to maternal free thyroxin (fT4) levels <10th cectile at 12 weeks of gestation (OR 4.63, 95% CI 0.8- 22)

CONCLUSION:

Women with hypothyroxinaemia (FT level <10th centile) during their early gestation (without overt thyroid dysfunction) are at risk for persistent breech presentation

KEY WORDS: hypothyroxinaemia, breech presentation.

INTRODUCTION:

Thyroid hormone regulation and metabolism

The thyroid gland synthesis and release thyroxin (T4) and Tri-iodothyronine (T3), In a ratio of about 4:1Thier production is controlled by serum thyrotrophin (TSH) synthesized by anterior pituitary gland and release in response to thyrotrophin releasing hormone (TRH) from neurons of the paraventricular nucleus. TRH and TSH further regulated by feed back of circulating thyroid hormones (free T4 and free T3)[1] (fig 1).

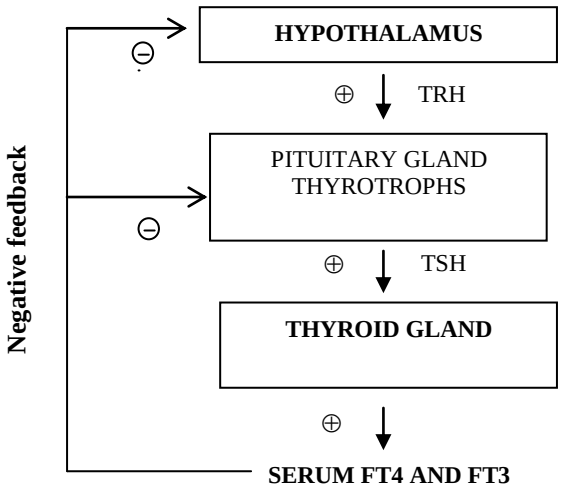

Figure 1: Thyroid hormone regulation by the hypothalamic –pituitary thyroid axis

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Most circulating thyroid hormone is in the form of T4, With 99.7% being protein bound. the main protein involved is thyroxin binding globulin (TBG). Unbound hormones are termed freeT_4(FT_4) and free T_3(FT_3) and are available for tissues uptake.

Conception is followed by a series of hormonal and metabolic changes that involve most maternal endocrine systems. With regard to thyroid metabolism, these include an increase in serum thyroxine-binding globulin and thyroid hormone concentrations, increase renal clearance of iodine, and increase production and turnover of thyroxine (T4)[2].

The negative-feedback control system of the hypothalamic-pituitary-thyroid axis functions normally in pregnant women, in that their serum thyrotropin concentrations during most of pregnancy are similar to those in nonpregnant women. In addition to the thyrotropin secreted by the maternal pituitary gland, the placenta produces large amounts of human chorionic gonadotropin, which has some thyrotropin-like bioactivity[3].

FT4 increases with suppression of TSH in response to placental human chorionic gonadotrophin during the first trimester, While FT4 tends to decrease in late gestation[4]. Increased serum thyroid-binding globulin and decreased albumin during pregnancy result in assay-dependent variations in FT4 levels. These observations have led to the call for using trimester and assay specific reference ranges for thyroid function tests in pregnancy [5].

Fetal thyroid function continues to mature throughout gestation. By 10 weeks after conception fetal thyroid follicles and T_4 synthesis are demonstrable. Thyroxine-binding globulin and T_4 are first detectable in fetal serum at 8 to 10 weeks of gestation and increase thereafter until they plateau at 35 to 37 weeks[6].

The presence of occupied T_3 nuclear receptors in brain tissue early in fetal development supports the role for maternal thyroid hormones in the maturation of the brain[7]. In humans living in iodine-deficient areas, maternal hypothyroxinemia is common and is associated with neonatal hypothyroidism and defects in IQ and neurologic function offspring. Neurologic damage in the absence of neonatal hypothyroidism has been postulated to be due to maternal hypothyroxinemia early in gestation[8].

Approximately 3–5% of all pregnancies reach term with the fetus in the breech presentation. In general, It is believed that breech deliveries are associated with higher morbidity and mortality, especially after vaginal delivery[9]. It was questioned whether there is still a place for planned vaginal breech birth, 20% patients have a cesarean section during labor for vaginal-birth failure, with a higher rate of neonatal and maternal morbidities[10]. Primary caesarean section was advocated for all breech term presentations, which is protective against anoxic or mechanical deaths and increased use of planned caesarean delivery accounted for 16% of the decline in anoxic and mechanical deaths over the study period[11].

Little is known about the aetiology of breech presentation. Together, factors such as prematurity, Intrauterine growth retardation, Pelvic abnormalities, as well as uterus anomalies, Placenta praevia, polyhydramnios, multiparty, umbilical cord problems and congenital fetal abnormalities only explain 15% of breech presentations. However there are several etiological factors(umbilical cord problems, congenital akinesia syndrome) might be related to fetal movements during pregnancy. Interesting to note that, in a few congenital endocrinological syndromes, (prader-Willi, pituitary agenesis) in which hypothalamic function is impaired (and as a consequence , fetal thyroid function is impaired) , The rate of breech presentations is very high: up to 20%[12].

AIM OF STUDY:

To evaluate the relation between breech presentation at term (>37 weeks of gestation) and <10th centile maternal fT4 levels during early gestation in women not suffering from overt thyroid dysfunction.

PATIENTS AND METHOD:

This a prospective cohort study was conducted at the out-patient clinic of a tertiary care university hospital, AL-Yarmuk teaching hospital in Baghdad city, Iraq. Between March 2006 –November 2006 , A total of 120 pregnant women were enrolled to participate in the study at antenatal booking. Thyroid parameters (TSH ,FT4,T3)were assessed at 12 weeks of gestation.

The lowest 10^{th}(49 nmol/l) and the 50^{th} -90^{th}FT4 centiles (100-149 nmol/l) were calculated within the first 12 weeks of thier gestation. Two groups of participants were defined , women with <10th centile FT4 levels (n= 15) and women with FT4-between the 50th and 90^{th} centiles at 12 weeks of gestation (n= 105).

Only 70 women complete the study due to obstetrical complications (such as abortion, preterm delivery), Refusal of follow up and poor compliance. women with FT4<10^{th} centile (n=14) and those with FT4 between the 50^{th} and 90^{th} centiles (n= 56) at 12 week gestation were

completed the study and assessed by ultrasound examination during late gestation as well as at delivery for fetal presentation

RESULTS:

70 pregnant aged 15-43 years with a mean age of 28.95 ± 7.69 and parity ranged from 0-9 with mean 2.37 ± 2.28. Thyroid parameters(TSH, FT4, T3) were assessed at 12 weeks of gestation, ultrasound examination was done to detect the presentation of the fetus at term (gestational age >37 week).

The level of T3 concentration was with in 50^{th} – 90^{th} centile value with mean 2.23 ± 0.89 nmol/l, TSH concentration was with in 50^{th} – 90^{th} centile value with mean 2.43 ± 0.88 miu/l.Ft4 concentration was defined by using 10^{th} centile (49 nmol /l) and 50^{th} -90^{th} centile (100- 149 nmol/l).

At term gestation, 11 women showed fetal breech presentation of these 11women, 5(45.5%) belonged to the subject with anFT4<10^{th} centile at 12 weeks of gestation and 6 (54.5%) with ft4 between 50^{th} and 90^{th} centile.

There is a significant relation between presence of <10th centileFT4 level and presence of breech presentation fetus (Odds ratio 4.63 95% CI 0.8-22 (Table 1). this wide range due to small sample size.

There is also a significant relation between the age. and the presence of <10^{th} centile FT4 level(table2) On the other hand no relationhave been found between the presence of <10^{th} centile FT4 level and the parity (table3) or the mode of previous delivery (table4).

Table 1 : Relation of fetal presentation with F4 level

Presentation	fT4 Centile				P value
	<10^{th} centile		50-90^{th} centil		
	No	%	No	%	
Breech	5	45.5	6	54.5	0.022
Cephalic	9	15.3	50	84.7	

Table 2 :Relation of FT4 level with age

Age group/ year	fT4 Centile				P value
	<10^{th} centile		50-90^{th} centile		
	No	%	No	%	
<20	-	-	5	100.0	0.001
20-29	12	42.9	16	57.1	
30-39	-	-	26	100.0	
=>40	2	18.2	9	81.8	

Table 3: The relation of FT4 level with parity

Parity group	fT4 Centile				P value
	<10^{th} centile		50-90^{th} centile		
	No	%	No	%	
primigravid	6	31.6	13	68.4	0.323
1-4	6	16.7	30	83.3	
5-	2	13.3	13	86.7	

Table 4: The relation of FT4 level with mode o previous f delivery

Mode of previous delivery	fT4 Centile				P value
	<10th Centile		50-90th Centile		
	No	%	No	%	
Primigravida	6	31.9	13	68.4	0.282
Vaginal delivery	4	12.9	27	87.1	
Previous CS for Breech	-	-	4	100.0	
Previous 2 & more CS	4	25.0	12	75.0	

DISCUSSION:

The first reported study which investigate the relationship between maternal thyroid hormone levels in women with no overt thyroid dysfunction during early pregnancy and fetal presentation at term was published by Victor et al 2004 who found that breech presentation at term was independently related toFT4 < 10th centile at 12 weeks of gestation (OR =4.7, 95%CI 1.1-19), i.e the risk of breech presentation proved to be increased more than four fold in those women with FT4<10th centile at 12 weeks of gestation[13].

Overt maternal hypothyroidism is related to obstetric complications (such as an increased rate of spontaneous abortions, placental disruptions, Fetal distress, malformations, prematurely, Decreased birth weight, poorer perinatal outcome, and pregnancy-induced hypertension), however, It is a rare condition in childbearing women[14].

The mechanism that could explain the association between maternal hypothyroxinaemia and an increased rate of breech deliveries still remains to be explained.

However it could be hypothesized that adequate fetal movement is important for reaching a cephalic presentation. Moreover it could be also hypothesized that inadequate fetal movement interferes with the development of a long enough umbilical cord, which, When it is too short, has been associated with an increased rate of the breech presentation[15].

The direct echo graphical assessment of fetal movements has been developed. However, the standard procedure is to assess fetal movements for a period of at least 40-60 minutes. Up until now, it has not been ascertained whether such long-duration echo graphical examinations have any negative effects on the fetus, which makes it difficult to use this instrument as a standard research tool for assessing fetal movement[16].

A study performed in the US demonstrates that subclinical hypothyroidism in women can result in neuropsychological deficits in their off–spring, and thyroxine supplementation can improve the outcome even when supplementation is inadequate[17].

It has been suggested that maternal hypothyroxinaemia might be related to inadequate iodine intake during pregnancy. The frequency of maternal hypothyroxinaemia is likely to be much higher in areas of iodine deficiency (ID)[18].

Several limitations of the present study need to be mentioned. Firstly, the rather small number of women undergoing breech delivers. Because statistically significant differences were found in rather small numbers in the present study, larger studies with more epidemiological power are needed in order to confirm the association between maternal hypothyroxinaemia and the breech Presentation. Only then can interventional trials with thyroxin replacement possibly be considered. Secondly, only women with two well-defined ranges of thyroid hormone concentration (<10th *vs* 50-90th centile) were included. Preferentially, the relation between thyroid hormone and breech presentation should be investigated in a large open pregnant population in which FT4 is equally distributed and thyroid function is assessed at different times during gestation.

Available epidemiological and experimental evidence strongly support the need for an increasing wide spread attention to maternal thyroid status during pregnancy[19].

However, until one of the main criteria for screening is met (i. e is there any evidence of an effective treatment with a realistic cost/benefit ratio?), we feel that screening should not yet be endorsed[20].

CONCLUSION:

Women with hypothyroxinaemia (FT4 level <10th centile) during early gestation but without overt thyroid dysfunction are at risk for fetal breech presentation at term (>37 weeks of gestation).

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