Original Article

Endocriminology Section

Serum Thyroxin Level during the First-Trimester of Pregnancy

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ABSTRACT

Objective: The aim of this study was to assess the requirement of serum thyroxin levels during the early stage of the first trimester of pregnancy.

Methodology: Serum thyroxin levels of 120 apparently healthy women were evaluated in Gorgan in northern Iran during 2007-08 by the enzyme linked immunosorbant assay (ELISA).

Results: According to the reference intervals of our standard kit, 48% of the pregnant women in this study had elevated thyroxin levels.

Conclusion: The findings of this study can be misleading, because it was based on the laboratory standard kit, women normal range, as general. Pregnant women require higher levels of thyroxin and therefore, a specific normal range for the first trimester of pregnancy should be established in each particular region.

Key Words: Pregnant women, First trimester of pregnancy, Thyroxin

INTRODUCTION

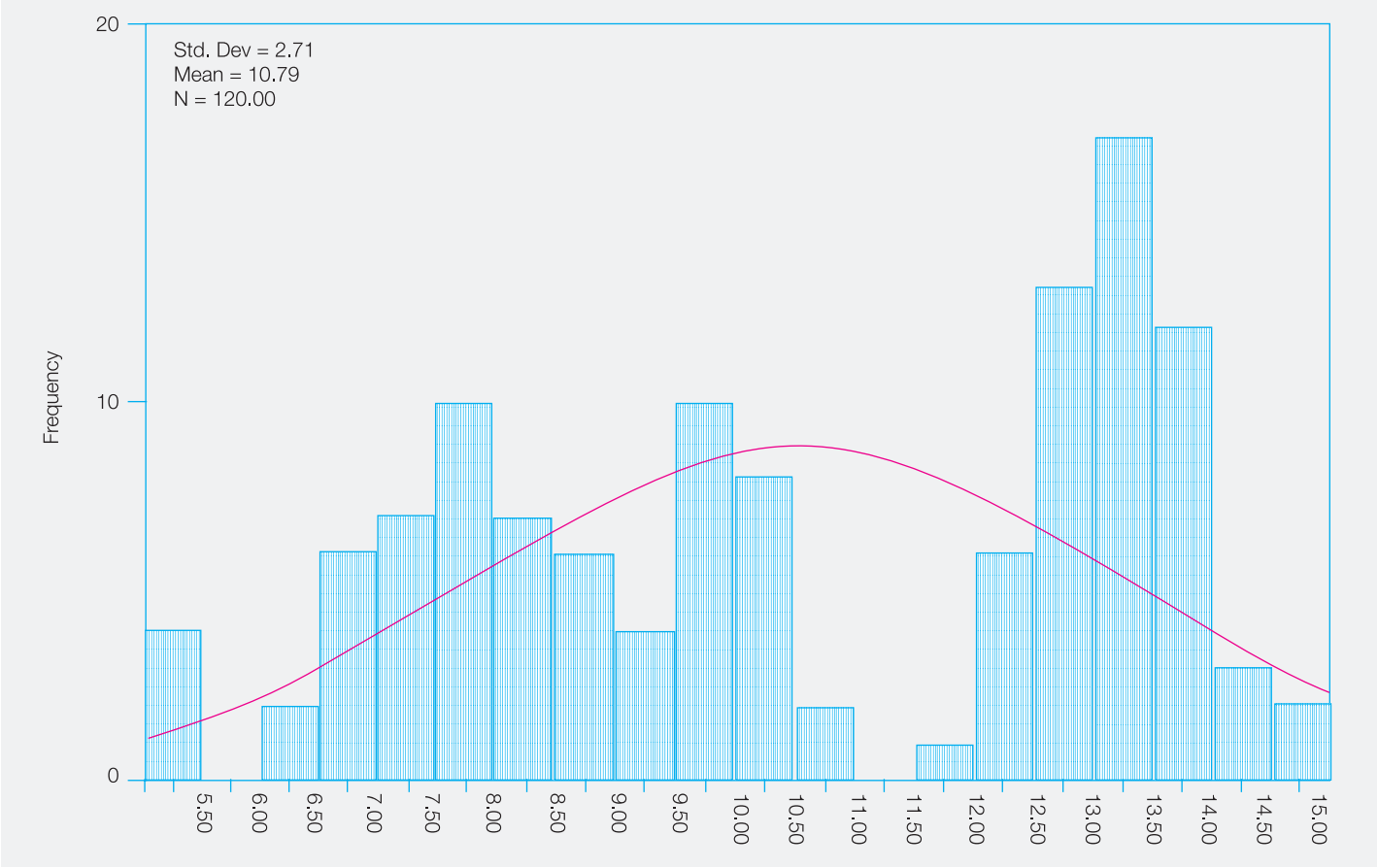
The thyroid should function properly, particularly during pregnancy. Pregnancy itself comprises of major changes which may be accompanied by some undesired effects. Thyroid hormones are needed for the growing foetus and therefore, mostly there is an extra production of thyroid hormones during pregnancy, which can be due to the requirement of the pregnancy itself. The other important fact which should be remembered, is the extra physiological demand of the thyroid hormones, rather than the excessive production of the these hormones [1], [2] The first trimester of pregnancy is of great importance for the well-being of the foetus [3], [4]. The thyroxin which is produced by thyroid gland is vital for the proper physiological function of the foetus, especially for the physical and mental development of the foetus and above all, the proper development of the brain requires a sufficient amount of thyroxin [6]. Maternal hypothyroidism during the first trimester of pregnancy is correlated with the neurophysiological disorder of the foetus, and subsequently the outcome of such a pregnancy, will not be clear-cut for the newborns. Misdiagnosis in such a sensitive field as pregnancy may lead to many unwanted consequences. It should be noticed that not all pregnant women with thyroid dysfunction should be observed with respect to the clinical symptoms which are related to the disease itself and there is a possibility that the clinical picture of pregnant women can be due to the other complications of pregnancy [5]. The first trimester of pregnancy is characterized by a specific requirement of thyroid hormones and in particular, attention should be given to the proper amount of thyroid hormone levels which are required for the physical and mental growth of the foetus in the early stage of pregnancy. Therefore, the optimal requirement of maternal thyroid hormones which are needed in the first- trimester of pregnancy should be assessed carefully, in case there is an extra demand of thyroid hormones. Therefore, the serum thyroxin levels during the early stage of pregnancy should be properly investigated in the laboatory in each region and the manufacturer's laboratory kit should be used only as a guideline for the clinical laboratories, in order to prevent misinterpretation of the thyroxin levels, which can possibly have an effect on the intelligence outcome of the infants [4]. On the basis of these facts, the present study was designed to establish the serum thyroxin levels in healthy pregnant women, in Gorgan in the north-east of Iran, which is located on the south east of the Caspian sea in northern Iran.

MATERIALS AND METHODS

In this study, 120 apparently healthy pregnant women in the early stage of the first trimester of pregnancy were chosen from those pregnant women who were referred to the Danesh Medical Diagnostic Laboratory for the routine check up of their pregnancy outcome on the advice of their gynecologist during a period of one year (2007-08) in Gorgan, the capital city of the Golestan province, which is located on the south east of Caspian sea in northern Iran. Two milliliter (2ml) of venous blood was taken from each subject. The sera were obtained by centrifugation and after pregnancy was confirmed a questionnaire was given to each subject which contained demographical questions. Subjects with a known history of the thyroid were excluded from this study. The serum thyroxin levels were measured by the enzyme- linked immunosorbant assay (ELISA) method. The SPSS-11.5 software and the Student's t test, were used to analyse the data.

RESULTS

The mean of the maternal and the gestational ages of these pregnant women were 26.06, years and 7.79 weeks respectively. The median of the maternal and the gestational ages of the above population were 25 years and 4 weeks respectively. The maternal serum T4 concentration is presented in [Table/Fig-1]. The mean serum thyroxin level for the sample population was 10.79 micro gram/dl, with a median of 10.40 micro gram/dl. The minimum and maximum serum T4 concentration in this study was 5.60 and 15.20 micro gram/dl respectively. The 20th, 40th, 60th and the



[Table/Fig-1]: Distribution of thyroxin concentration in pregnant women

Statistic	T4 (micro gram/dl)
Mean	10.79
Median	10.40
Minimum	5.60
Maximum	15.20
Percentiles	
20	7.92
40	9.80
60	12.70
80	13.50

[Table/Fig-2]: The statistic of serum thyroxin concentration in firsts-trimester of pregnancy

80th percentiles of T4 in this investigation were 7.92, 9.80, 12.70 and 13.50 micro gram/dl respectively [Table/Fig-2].

DISCUSSION

Serum thyroxin levels are increased during the first trimester of pregnancy, particularly in its early stages. The serum of T4 decreased gradually during pregnancy and the level decrease by the third trimester of pregnancy [6], [7]. The alteration in the serum T4 levels during a pregnancy is of utmost importance in healthy women for the proper diagnosis of any thyroid dysfunction, be it hypothyroidism or hyperthyroidism. Thyroid malfunction can occur during pregnancy and it is important to recognize whether the existing hyperthyroidism is due to the adjusted body requirement or it is actual hyperthyroidism. It is the physiological demand that should be looked at differently by the clinicians and the medical team. This is of outmost importance to diagnose the true thyroid hyper-activity, otherwise the side effects may become difficult to be compromised. On condition of hyperthyroidism, the case should be considered carefully, because due to the thyrotrophic activity of the human chorionicgoadotropin (HCG), the thyroid gland usually is activated not only by TSH (Thyroid Stimulating Hormone), but also by HCG, which is a hormone which is produced by the growing placenta. On condition of hypothyroidism the matter should be strictly investigated, due to the crucial role which is played by the thyroid hormones for the well-being of the physical and mental growth of the foetus. If the foetus grow on condition of hypothyroidism, eventually the defect in the physical growth may be resolved following therapeutic regimens, but probably the newborn may be left with mental retardation for the rest of his/her life. It should be remembered that due to the nutritional habits, ethnicity and ecological, socioeconomic and many other factors, the serum thyroxine (T4) levels among normal pregnant women should be assessed in each particular region [4]. A clear and proper clinical diagnosis should be made about the thyroid function during the period of a normal pregnancy. The urgency of this matter has been reported by many researchers throughout the world [3], [5], [7]. It is absolutely clear, that the normal- range of the thyroid hormones for non- pregnant women cannot be the base for the thyroid function assessment of pregnant women and various misinterpretations can occur due to such evaluations [8]. In our study, we assessed the serum thyroid levels of healthy pregnant women and the minimum and maximum serum T4 concentrations in our sample population were 5.60 and 15.20 microgram/ dl respectively. The mean and median of the serum T4 levels were 10.79, and 10.40 microgram/dl. The 20th, 40th, 60th and the 80th percentiles of T4 in this study were 7.92, 9.80, 12, 70 and 13.50 micro gram/ dl ,respectively. The normal range of the manufacturer's laboratory kit was 4.7–12.5 micro gram/dl in this present study. We found that the serum T4 levels in 54 subjects (48%) were well above the

higher range of the normal range of this laboratory kit's reference interval. If the interpretation of the thyroid test is going to be based on the above reference interval, we should consider that 48% of the healthy pregnant women in this region have hyperthyroidism, which in our view, is not a proper clinical diagnosis based on the clinical laboratory findings because all the pregnant women who were randomly selected apparently were healthy subjects. During the first trimester of pregnancy, the maternal thyroxin level is the main interpretation about the thyroid hormone for the requirement of brain development in growing foetus [9]. In a separate report, the importance of thyroxin was demonstrated, in which they found that normal TSH levels with a lower range of thyroxin could not stop neurophysiological dysfunction in the offsprings [6], [7], [10], [11], [9]. The foetus critically depends on its mother's T4 levels during the first trimester of pregnancy. If only high risk pregnant women undergo a medical check-up for the thyroid function examination test, then a great portion of pregnant women with an extra demand to undergo the tests to assess thyroid dysfunction may be missed, during the early stage of pregnancy [12], [13], [14]. On the other hand, screening the thyroid function of pregnant women by using the reference intervals of non-pregnant women was the decision maker of our study, which can produce misleading results with respect to the pregnant women. With thyroid abnormalities being left behind, the other interventional factors such as ethnicity should also be taken into consideration in establishing the normal range for pregnant women in each region [13], [14], [15], [16]. It has been suggested that even in one country, different regions should have their own reference range intervals, if the correct clinical diagnosis has to be decided properly [12], [15], [17], [18], [19-21]. On the basis of available laboratory kits and the normal ranges of the thyroid hormones for the non-pregnant subjects in our sample population, we argue that it is a logic to have elevated T4 levels in up to 48% of the healthy pregnant women. There are a few possibilities for this unacceptable observation, which are as follows:

CONCLUSION

1. The normal range of the non-pregnant women should not be the basis for the interpretation of the T4 levels in pregnant women.
2. The requirement of T4 for pregnant women is much greater than that for non-pregnant women, which is a well known fact. Therefore, if we have 48% pregnant women with elevaed levels of T4, it seems that the pregnant women require extra amount of thyroid hormone for the growing foetus. This complementary level of T4 is a part of a normal and healthy pregnancy period.
3. We argue that in our region, further studies should be undertaken to concentrate on the pregnancy reference intervals for the early stage of the first trimester of pregnancy, as the brain of the foetus entirely depends on the maternal thyroxin.
4. Furthermore with the laboratory test results of our study, the clinicians were confused about whether to treat the pregnant women for hyperthyroid gland, with the consequence of subsequently transforming the normal pregnancy into the hypothyroid state with an irreversible neurophysiological damage to the life of the foetus.

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