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Serum Thyroid Hormone and Thyrotropin Concentrations During Ramadan in Healthy Women

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ABSTRACT - During the month of Ramadan Muslims abstain from food and drink from dawn until sunset. In order to study pituitary-thyroid function in Ramadan, serum concentrations of T4, T3, T2 and thyroglobulin and estimation of FT4I and FT3I were measured in 12 healthy women before Ramadan, and on days 1,5,10,15,20,25 and 29 of Ramadan and 10 days after fasting was terminated. There were significant decreases in serum T4 and T3 concentrations in the last week of Ramadan. However FT4I and FT3I were normal, suggesting that the decline in T4 and T3 were caused by decreased protein binding. Serum TSH and thyroglobulin were unchanged throughout the fasting period. We conclude that fasting during Ramadan does not cause alterations in the pituitary thyroid axis.

Key Words: Thyroid, Thyroxine, Triiodothyronine, Thyrotropin, Ramadan, Fasting

Intermittent fasting i.e. from dawn to sunset, is obligatory for all adult and healthy Muslims during the month of Ramadan every year. Although millions of Muslims fast in Ramadan, physiological changes occurring during Islamic fasting have only recently received attention^{1,2}. Several studies have demonstrated the effect of prolonged total food abstinence on the hypothalamic-pituitary-thyroid axis and on the peripheral metabolism of thyroid hormones³⁻⁵. We have previously reported that serum thyroid and TSH concentrations and the TSH response to TRH are unaltered during Ramadan fasting in healthy adult men⁵. The purpose of the present study was to evaluate serum thyroid hormones, TSH and thyroglobulin concentrations in healthy women during the month of Ramadan.

Subjects and Methods

Twelve healthy women volunteers aged 20-25 years were studied. Mean body weight was 59.5 ± 6.1 kg. Body mass index was under 25 every subject. Except during their menstrual period, they fasted each day from dawn to sunset. The length of each day of fast was approximately 16 hr (3.30 a.m. to 7.30 p.m.). They had two regular meals, one after sunset and another just before dawn. Before and 10 days after the end of Ramadan blood samples were drawn after a 12 hour fast at 8 a.m. and after an 8 hour fast from 12 noon to 8 p.m. The results of hormone determinations were similar in the two specimens and 8 p.m. results were chosen for comparison with the results of the analy-

during the fasting period. Additional blood samples were collected on days 1, 5, 10, 15, 20, 25 and 29 of Ramadan just after sunset at approximately 7.30p.m. Blood was centrifuged, serum was separated and stored at -20°C until analysis. Serum T4, T3, TSH and thyroglobulin concentrations and resin T3 uptake test were assayed using commercial kits. The inter-assay and intra-assay coefficient of variation for all assays were below 15%. Free T4 index (FT4I) and free T3 index (FT3I) were then calculated⁹. Differences between mean values for quantitative variables were evaluated using student's paired t test.

Results

During Ramadan, there was a significant fall in body weight of approximately 5.7 percent equal to a mean of 2.8 ± 1.3 kg (from 59.5 ± 6.1 before to 56.7 ± 5.8 kg at the end of fasting, $P < 0.001$). Serum T4 decreased from 8.3 ± 1.4 ng/dl to 7.1 ± 1.0 ng/dl ($P < 0.01$) and 7.7 ± 1.1 g/dl ($P < 0.05$) on the 25th and 29th days of Ramadan, respectively. Serum T3 decreased from 126 ± 17 ng/dl to 120 ± 24 ng/dl ($P < 0.05$) and 118 ± 18 ng/dl ($P < 0.05$) on the 25th and 29th days of Ramadan, respectively. Serum T4 was still low 10 days after Ramadan (7.1 ± 1.1 g/dl, $P < 0.05$; as compared to pre-Ramadan values). There were no significant changes in FT4I and FT3I during fasting and 10 days after the end of Ramadan (TABLE I). There was no significant change in serum TSH and thyroglobulin.

Discussion

The present study shows that during Islamic fasting in Ramadan no alteration occurs in pituitary-thyroid axis. The decline in serum T4 and T3 during Ramadan and that of serum T4 after the fasting month seems to be due to a decrease in protein-binding of thyroid hormones, as free thyroid hormone indices remain unchanged as compared to pre-Ramadan values.

Islamic fasting provides a unique model of intermittent fasting every day for one month. It is also distinct from experimental fasting by the fact that the observant of the fast does not drink

fluids during the fasting hours.

In experimental fasting, there occurs a decrease in peripheral conversion of T4 to T3, due to inhibition of 5-monodeiodination, resulting in a decrease in serum T3 and an increase in serum rT3^{6,8}. Basal serum TSH may be normal^{6,10} or decreased^{7,8,11} and TSH response to TRH injection is blunted^{7,10}.

In Islamic fasting, the length of intermittent fasting is not sufficient to cause alterations in the peripheral metabolism of thyroid hormones in either men⁵ or women. However, our previous experience with normal TSH response to TRH in men⁵ and normal TSH in 7 serum samples taken during Ramadan fasting in 12 healthy women in the present study, suggests that no alterations in hypothalamic-pituitary-thyroid axis occur during intermittent Islamic fasting.

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