ABSTRACT

BACKGROUND

Diabetes and thyroid disorders are the two commonly encountered endocrine diseases in adult population in many parts of the world. However, just like many other noncommunicable diseases there is a gross lack of epidemiological data from India especially on thyroid disorders. Though regarding diabetes and other cardiovascular risk factors there have been few national and regional cross sectional community studies but population of Kerala with very high health indices were not adequately represented in them. Regarding thyroid disorders there are no epidemiological data on adults other than the study on iodine deficient population of Gujarat done many years ago.

OBJECTIVES

The main objectives of this work were to generate valuable epidemiological data regarding the prevalence of thyroid disorders and diabetes mellitus in an adult south Indian population from Kerala. Another aim was to evaluate the iodine status and thyroid autoimmunity and their contribution to thyroid dysfunction and goiter in this population.

METHODS

First phase of the study was conducted as a cross sectional community survey in different parts of Ernakulam District. The study was approved by the institutional ethics committee. In order to get a representative sample, houses were selected from the study area by WHO cluster sampling method and a house-to-house survey was conducted. Residents above the age of 18 years from selected houses were interviewed by trained field workers using a validated questionnaire and details of socioeconomic status, diet, and lifestyle pattern, history of relevant illnesses and drug history from each individual were collected. After the initial
survey, anthropometric measurements, physical examination including BP and goiter evaluation as well as biochemical evaluation of blood and urine were conducted on the surveyed subjects at their locality. Blood tests such as blood sugar, lipid profile, thyroid function tests, anti TPO and anti TG antibody were done in AIMS hospital laboratory. The urine iodine excretion estimation was done in AIIMS IDD laboratory, New Delhi. In this study 3064 subjects were surveyed and among them 986 subjects were subjected to further evaluation.

During the second phase of the research, another cross sectional community survey was carried out regarding thyroid problems in females who were middle age and above in a different locality of Ernakulam district. Houses were selected by WHO suggested cluster sampling method and one female above 35year was selected randomly from each house for the study. In addition to the questionnaire survey, physical examination including BP measurement and goiter assessment, blood tests, and urine tests were done. All subjects underwent ultrasound scan of the thyroid for assessing thyroid volume and nodularity using a portable ultrasound machine. Among the 540 females surveyed, 508 participated in the further checkup. All data were entered into SPSS software and analyzed using appropriate statistical methods.

RESULTS

Initial study was conducted as a cross sectional house to house survey of adults 18-80years in Ernakulam district. Among 3069 subjects surveyed, 986 (M 389, F 587) participated in clinical examination and biochemical tests. Mean age was 44.8 ± 14.9 years. Iodine status of this adult population was found to be Iodine sufficient with a median urine iodine level of 211.4mcg/l. Iodine deficiency was seen only in 15.1% of the subjects while 30.1% had more than adequate iodine levels. The total prevalence of goiter was 12.2% (Grade 1- 8.7%, Grade 2 - 3.5%) and was significantly higher (p < 0.001) in females than males (16.1% vs. 6.0%).
Among this population 19.6% had thyroid function abnormalities; subclinical hypothyroidism being the most common disorder. Thyroid dysfunction was found significantly (p<0.001) more frequently among females than males. Among the study population anti TPO antibody was positive in 16.7% and anti TG antibody was positive in 12.1% of the subjects. Both antibodies were positive in 5.8% Females had significantly higher prevalence of both antibodies than males [anti TPO antibody 19.8% vs. 11.8% (p<0.001) and anti TG antibody 15.1% vs. 6.1% (p<0.00)]. In the population with normal thyroid function only 9.5% had positive Anti TPO antibody and 8.5% were anti TG antibody positive whereas of those with thyroid functional abnormalities 46.3% had positive anti TPO antibody and 26.8% were anti TG antibody positive.

This study also looked at diabetes mellitus, another common endocrine problem in this community. The results showed the prevalence of known diabetes as 9.2% and total diabetes as 19.1% in this urban population. Increasing age, positive family history of DM, increasing BMI, gender, high STR and presence of AN turned out to be the significant variables associated with high risk of diabetes. Obesity (BMI >25) was present in 31.7% of the study subjects and was significantly higher in females (35.8%) than males (25.3%). In this study population 20.2% had history of hypertension and after evaluation total prevalence of hypertension was 32% (M 32.5% vs. F 31.8% p NS). In this population 32% had high cholesterol and 23.2% had high triglycerides. Prevalence of thyroid dysfunction, goiter, thyroid autoimmunity in type 2 diabetic subjects and non-diabetic subjects were similar, 16% vs 19.7%, 12% vs12%, and 23.2% vs 20.2% respectively.

To study the thyroid problem in detail, as a second step another cross sectional community survey of middle age and above females subjects (above 35years), who were found to have highest prevalence of thyroid problems. This was conducted as a cross sectional community survey in another area of Kochi Corporation and thyroid was evaluated clinically as well as using a portable ultrasound machine. Among the 540 subjects surveyed, 508 participated in the
health check-up (nonresponse rate 8%). From this population 471 subjects with complete data were analysed. In this population diabetes was present in 19.1% and hypertension was seen in 21.4% of the subjects. Obesity was present in 44.2% of subjects and high cholesterol was seen in 19.7% and high triglyceride was seen in 14.1% of females.

Median UIE of these subjects was 162.8 mcg/l suggesting iodine sufficiency. UIE had negative correlation with age and systolic BP, but had no correlation with thyroid volume, thyroid nodularity, FT4, TSH or Anti TPO antibody levels. Known thyroid problems were present in 7.2% of females but after testing thyroid dysfunction was present in 31.3% of subjects. Commonest problem was subclinical hypothyroidism (17.1%) followed by overt hypothyroidism (10.5%).

From this population, normal healthy females (n109) were selected and normal distribution of thyroid volume was calculated. Mean thyroid volume was 8.80 ± 3.1 ml. The 3rd centile of TV was 4.58ml and 97th centile of TV was 15.3 ml and volume higher than this can be considered as goiter for this population. Age and postmenopausal state showed strong negative correlation with TV whereas triceps and subscapularis skin fold thickness showed positive correlation.

Among these 471 subjects clinical goiter was present in 15.7% (9.10 % Grade1 and 6.60% grade 2). Goiter was significantly (p 0.009) more common among younger subjects than older ones. Ultrasound evaluation showed abnormal sonographic findings in 30% of the subjects as follows: - Nodular changes were seen in 18.7%, diffuse goiter in 10 %, subcentimetric nodules in 5.7%. Thyroid structural abnormalities were more common among subjects above 50yrs and those with goiter.
This study also showed high prevalence (24%) thyroid autoimmunity as evidenced by positive anti TPO antibody which had significant correlations with TSH and thyroid volume.

CONCLUSION

Results of these two community survey revealed a higher prevalence of diabetes and thyroid disorders in this population than previously hypothesized and majority of these were newly detected cases. After nearly two decades of salt iodization, iodine status of these populations was found to be sufficient, probably due to the consumption of iodized salt and seafood, especially fish. However, prevalence of goiter was higher than expected for an iodine sufficient adult population suggesting possible presence of unidentified goitrogens. Thyroid dysfunction was much higher than previously hypothesized and the commonest disorder was subclinical hypothyroidism followed by overt hypothyroidism. However, only about 40-60% of the goiters and thyroid dysfunction had autoimmune etiology. This high prevalence of thyroid dysfunction especially subclinical hypothyroidism among adults without an increase in autoimmunity might be the effect of transition from iodine deficiency to sufficiency even though the lack of pre iodization data makes it difficult to put forward a firm conclusion. Nevertheless, the role of environmental chemicals contributing to this high prevalence of thyroid dysfunction in this population is another possible explanation, which needs further exploration.

As part of the study normal distribution of thyroid volume of the females above middle age was identified and it showed negative correlation with age and positive correlation with body weight. Prevalence of nodular changes in this population by ultrasound was also described for the first time in an adult population of India. All these observations highlight the importance of monitoring thyroid problems periodically with the perspective of iodine status and the need for further larger studies in this direction.