Original Research Article

Risk and prevalence of thyroid disorder among Indian population: A meta-analysis

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Abstract

Thyroid disorders are common in India population. This study aimed at synthesized population based studies on prevalence of thyroid diseases in India. General database and subject's specific database were searched for primary studies. Manuscript of appropriate studies was retrieved. Based on some criteria, only eligible studies were included in this study. Combined estimate and confidence interval of the result were obtained by Mata analysis. The prevalence of thyroid diseases was 18.75% and with the 95 % confidence interval of (CI: 21.20%-16.32%). This study showed that prevalence of thyroid diseases is high in India. There is need to developed strategies to prevent, treat and control the thyroid diseases effectively in India

Key Words: Thyroid disease, Hypothyroidism, Hyperthyroidism, Prevalence, disease burden.

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INTRODUCTION

In India thyroid diseases are very common these days and have brought focus on this by a wide range of surgeons and doctors. With the widespread availability of thyroid function testing in recent years, increasing numbers of patients with symptoms, which might be attributable to hypothyroidism and hyperthyroidism, are being tested. Diseases of thyroid gland are among the most common endocrine disorders affecting the population throughout the world. It has been estimated that about 42 million people in India have thyroid dysfunction[1]. Thyroid diseases show variations with age, sex, dietary habits, stress and geographical location. Diseases of the thyroid gland are among the most abundant disorders worldwide second only to diabetes. The most common thyroid problems involve abnormal production of thyroid hormones. Too much thyroid hormone results in a condition known as hyperthyroidism and hypothyroidism conversely. Hypothyroidism was found to be affecting 10.95% of the studied population in India. The older population (above the age of 35 years) seemed to be at a higher risk of hypothyroidism than the younger population. Of the 5,360 people screened for the study, more than one-fourth (26.7%) were from Delhi and remaining from Bangalore, Chennai, Goa, Mumbai Hyderabad, Ahmadabad and Kolkata. Over 11% of the study population from Delhi reported hypothyroidism and one-third of them were not even aware of their disease, said the "Thyroid Epidemiological Study" by Abbot India[2], a leading health care and pharmaceutical company. The most common causes of Hyperthyroidism are Graves's disease followed by toxic multinodular goiter. The prevalence of hyperthyroidism in women is between 0.5 and 2%, and is 10 times more common in women than in men in iodine-replete communities. The prevalence in elderly persons shows a wide range between 0.4 and 2.0%[3,4] and higher prevalence is seen in iodine deficiency areas[5,6]. The incidence data available for overt hyperthyroidism in men and women from large population studies are comparable, at 0.4 per 1000 women and 0.1 per 1000 men, but the age specific incidence varies considerably. Studies in Northern

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Europe, Japan and USA have found the prevalence to range between 0.6 and 12 per 1000 women and between 1.3 and 4.0 per 1000 in men investigated. The prevalence is higher in elderly community[4]. Overt hypothyroidism was found in 7% of 558 subjects of age between 85 to 89 years in Leiden, Netherlands[3]. The mean annual incidence of spontaneous hypothyroidism during the 20-year follow-up period was 3.5 per 1000 and 0.6per 1000 in surviving women and men respectively. Either raised serum TSH or positive thyroid antibodies alone or in combination were associated with significantly increased risk of developing hypothyroidism. The probability of developing hypothyroidism was higher in those women who had serum TSH concretions > 2.0mU/l and high-serum titres of anti-thyroid microsomal antibodies during the first survey. Data from large population study Tayside, UK has demonstrated that the standardized incidence of primary hypothyroidism varied between 3.90 and 4.89 per 1000 women per year between 1993 and 2001. The peak age specific incidence of Grave's disease (which is type of hypothyroidism) was between 20 and 49 years in two studies, but increased with age in Iceland and peaked at 60-69 years in Molmo, Sweden[7]. The peak age specific incidence of hyperthyroidism caused by toxic nodular goiter and autonomously functioning thyroid adenomas in Malmo study was more than 80 years. Tyside study in Scotland, 620 incidence rate of 0.77/1000 per years (95% CL) 0.70-0.84 in women and 0.14/1000 per year (95% CL:0.12-0.18) in men[8]. The incidence increased with age, the affect of thyroid eight times more in women then men. Further analysis suggested that incidence of thyrotoxicosis was increasing in women but not in men between 1997 and 2001[9]. While signs and symptoms of overt hyperthyroidism and hypothyroidism are well known, subclinical thyroid conditions have subtle clinical manifestations and may mimic other diseases. Hence it is important to develop rational laboratory strategies to differentiate the various conditions to guide the physician towards correct diagnosis and treatment[10]. TSH assays are essential for diagnosing subclinical hypothyroidism which is defined by an isolated elevated serum TSH level in the setting of normal serum T4 level, in the presence or absence of symptoms. Controversy prevails on the levels of TSH in subclinical hypothyroid patients. The worldwide prevalence of subclinical hypothyroidism ranges from 1% to 10%; the highest age and sex specific rates are in woman over 60 years, approaching to 20%[11]. Using the TSH of 5mIU/L as a bottom cutoff, the prevalence of subclinical hypothyroidism has been estimated to be about 8% in women and 4% in men, which might be higher for the age above 60 year[12].

MATERIAL AND METHOD

Meta-analysis is an efficient tool for summarizing the results in the literature in a quantitative way. In most of the cases it results in a combined estimate and a confidence interval. Meta-analysis allows for an objective appraisal of the evidence, which may lead to resolution of uncertainty and disagreement. It can reduce the probability of false-negative results and thus prevent undue delays in the introduction of effective treatments into clinical practice. A priori hypotheses regarding treatment effects in subgroups of patients may be tested with meta-analysis as well. It is an analytical method where both independent and different studies are integrated and their results pooled into a single common result. We searched MEDLINE/Pub Med, Google scholar, EMBASE, and reference lists of prevalence studies from January 2007 to August 2015, We used combinations of medical subject headings (MESH) and free text words that included search terms related to the exposure (e.g., thyroid, DM, hyperthyroidism, hyperthyroidism), which were combined with search terms related to the outcomes (e.g., prevalence, disease burden, estimate). We identified articles eligible for further review by performing an initial screen of identified titles or abstracts, followed by a full-text review. Internet searches used permutations of medical subject headings for prevalence studies on Thyroid in India. The characteristics of included studies for the Meta-analysis are summarized in Table where we have provided all relevant the details namely author name, year of publication, age, state of the study, zone total number of subjects, number of cases and gender respectively. We have checked the eligibility of all the studies for our analysis i.e whether they are relevant or not to our study. Forest plot was used to show the extent of heterogeneity among studies. Since the heterogeneity was measure the degree of inconsistency among the studies. Cochran Q and I^2 was used to measure the heterogeneity and inconsistency across the studies. A useful statistic for quantifying inconsistency is

$$I^2 = \left(\frac{Q - df}{Q}\right) \times 100\%$$

Where Q was the chi-squared statistic and df is its degrees of freedom[13]. This describes the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error.The meta-analysis was performed using Metaxl Software (version 2.2). It is important to be familiar with the type of data (e.g. dichotomous, continuous) that result from measurement of an outcome in an individual study, and to choose suitable effect measures for comparing intervention groups.

RESULTS

The selected studies were published between 2005 and 2015 and number of participants per study varies from 100 to 28677. We have excluded non -eligible studies from the analysis and selected only 28 eligible studies which are from the different zones of India i.e. the included studies from South zone, North zone, West zone, East zone and central zone of the India. In the included studies, the maximum and minimum prevalence of thyroid was 40.52 and 7.75 per respectively. All these can be readily seen from Table 1.2 After analyzing 28 studies, the prevalence of thyroid disorder among the Indian population was found to be 18.75% (95% CI: 21.20%-16.32%). However, calculation of the heterogeneity statistic (I^2=98.5% and Cochran's Q= 1558.50, p <0.0001) indicated significant heterogeneity prevalence of thyroid disorder between the studies. Figure 4.2 shows all the detailed analysis graphically. The prevalence of thyroid disorder in the earlier studies reported by[14] was 19.55%. The prevalence of the thyroid disorder reported in our study was 18.70%. The difference in prevalence is due to number of studies included, age group, and zone difference, region difference and nature of the population included in the study. In the included studies, the maximum prevalence reported by[15] was 40.36%. Overall prevalence of subclinical hypothyroidism was 33% (206 of 612); prevalence of overt hypothyroidism was 5% (31 of 612); and prevalence of hyperthyroidism was 1.6% (10 of 612). There is a high prevalence of thyroid disorders in Kashmir population, and subclinical hypothyroidism is the most prevalent thyroid disorder.

Table 1: Prevalence of Thyroid among Indian Population

Study	Total	Cases	Prevalence	LCL%	HCL%	Weight(%)
Nambiar [16]	483	73	15.11	12.05	18.45	3.56
Joshi [17]	259	45	17.37	12.99	22.25	3.35
Tiwari 2[2]	142	11	07.75	03.84	12.79	3.03
Nandyala [18]	100	08	08.00	03.37	14.24	2.79
Sahay[2]	383	37	09.66	06.89	12.84	3.49
Bantwal [2]	867	87	10.03	08.12	12.13	3.68
John[2]	430	45	10.47	07.74	13.55	3.53
Tiwari 3[2]	1254	132	10.53	08.89	12.29	3.73
Tiwari [2]	377	41	10.88	07.92	14.23	3.49
Unnikrishnan [2]	5360	587	10.95	10.13	11.80	3.81
Kalra [2]	1436	164	11.42	09.83	13.12	3.74
Bashir [19]	2550	550	21.57	19.99	23.19	3.78
Ambika[2]	466	106	22.75	19.05	26.67	3.55
Jayshree [20]	876	260	29.68	26.70	32.75	3.68
Tayal [21]	6412	817	12.74	11.94	13.57	3.82
Bose[22]	28677	4520	15.76	15.34	16.19	3.83
Naved[23]	5040	1090	21.63	20.50	22.77	3.81
Marwaha [24]	4302	959	22.29	21.06	23.55	3.80
Bashir [25]	600	180	30.00	26.40	33.73	3.61
Ahmed [26]	4739	789	16.65	15.60	17.72	3.81
Sharma [14]	133	26	19.55	13.21	26.76	2.99
Bhai [27]	3425	840	24.53	23.10	25.98	3.80
Jha [28]	586	176	30.03	26.39	33.81	3.61
Sharma1[29]	1000	390	39.00	36.00	42.04	3.70
Bhimte [30]	300	28	09.33	06.28	12.91	3.41
Dhadhal [31]	300	69	23.00	18.40	27.94	3.41
Nusrath [32]	516	207	40.12	35.92	44.38	3.58
Jaikhani [15]	612	248	40.52	36.66	44.44	3.62

Table 2: Test of Heterogeneity

Test of Heterogeneity	Prevalence	LCL95%	HCL95%	Weight
Pooled Statistics	18.70	16.32	21.20	100.00
I-squared	98.27	97.96	98.53	
Cochran's Q	1558.50			
Chi2, p	0.001			
tau2	0.02			

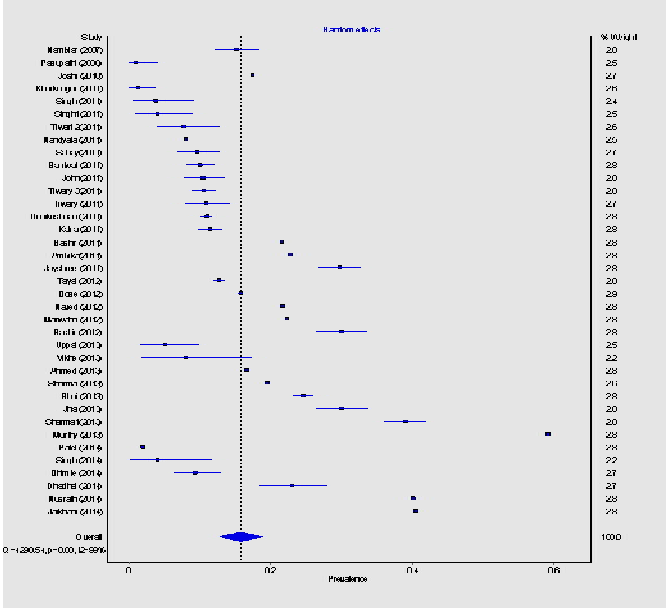

Figure 1: Forest Plot Representing the Prevalence of Thyroid among Indian Population

CONCLUSIONS

Thyroid diseases are growing at a faster rate in human beings in India. Thyroid disorders are common in India but scarce data exists on its prevalence in Indian population. The present study revealed that the prevalence of thyroid increases day by day. The primary cause of poor management encountered in some treated patients is the failure to recognize the presence of abnormal thyroid hormone levels. There are only a very few good quality of studies on risk factors and awareness of thyroid diseases. There is a lack of awareness, suboptimal level of treatment and control of thyroid diseases in Indians. There is a need for good quality studies focusing on thyroid diseases and its treatment in Indians to develop optimal strategies for thyroid diseases management. Special guidelines for desirable levels of risk factors may be necessary for prevention of thyroid diseases. The findings from this review can be useful to implement population-based Indian specific cost-effective thyroid control programs to reduce the burden and optimize patient care in thyroid diseases.

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