



PREVALENCE AND ASSOCIATED FACTORS OF THYROID DYSFUNCTION AMONG WOMEN OF REPRODUCTIVE AGE IN AN URBAN RESETTLEMENT: A CROSS-SECTIONAL STUDY

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Abstract:

Background: Thyroid dysfunction is a common endocrine disorder, particularly among women of reproductive age, impacting fertility, pregnancy outcomes, and overall health. There is a paucity of community-based data on its prevalence in vulnerable populations, such as urban resettlement colonies in India. We conducted this study to determine the prevalence of thyroid dysfunction and identify its associated sociodemographic and dietary factors among women of reproductive age in an urban resettlement colony of Delhi.

Methods: A community-based, cross-sectional study was conducted from January to December 2021 in Gokul puri, Delhi. We selected women of reproductive age group using systematic random sampling. Data were collected using a pre-tested, semi-structured questionnaire covering sociodemographics, clinical history, and dietary practices. Venous blood samples were analysed for thyroid-stimulating hormone (TSH), free T3 (fT3), and free T4 (fT4) using electrochemiluminescence immunoassay (eCLISA). Data were analysed using SPSS v25, with Chi-square and Fisher's exact tests used for associations.

Results: We collected data from 180 females. The mean age of participants was 36.3 ± 9.1 years. The overall prevalence of thyroid dysfunction was 28.3% (n=51). Hypothyroidism was present in 25.6% (n=46) of participants, with the majority being previously undiagnosed. 16.7% (n=30) had subclinical hypothyroidism and 5.6% (n=10) had overt hypothyroidism. Known cases of hypothyroidism comprised 3.3% (n=6). Hyperthyroidism was found in 2.7% (n=5) of participants (2.2% subclinical, 0.5% overt). Significant associations with thyroid dysfunction were found for marital status ($p=0.02$), frequent consumption of cabbage/cauliflower ($p=0.00$), a family history of thyroid disorder ($p=0.00$), being overweight or obese ($BMI > 23 \text{ kg/m}^2$, $p=0.03$), and a history of adverse pregnancy outcomes ($p=0.00$).

Conclusion: This study reveals a high, predominantly hidden burden of thyroid dysfunction, particularly subclinical hypothyroidism, in this urban community. The strong association with goitrogenic dietary preferences, family history, obesity, and adverse pregnancy outcomes highlights

an urgent need for targeted community-based screening, health education, and public health interventions for women of reproductive age.

Introduction

Thyroid dysfunction constitutes a spectrum of common endocrine disorders arising from aberrations in thyroid gland function, representing a significant global health concern.^[1] The clinical presentation ranges from asymptomatic, biochemically-defined states to overt, symptomatic disease. Diagnosis and classification are primarily based on the serum concentrations of thyroid-stimulating hormone (TSH) and free thyroxine (fT3, fT4) relative to established reference intervals.^[1,2] Overt hypothyroidism is characterised by an elevated and a decreased level, while overt hyperthyroidism presents with a suppressed and an elevated level. These overt conditions are typically associated with discernible clinical signs and symptoms.^[3,4,5]

A substantial portion of thyroid dysfunction is subclinical, defined by abnormal serum levels in the presence of normal and concentrations. Subclinical hypothyroidism (SCH) is characterised by an elevated (commonly > 4.5 mIU/L) with normal, affecting up to 10% of the adult population and increasing in prevalence with age, particularly in women. Conversely, subclinical hyperthyroidism is defined by a low or undetectable level (< 0.4 mIU/L) with normal thyroid hormone levels. The increasing frequency of biochemical screening has led to a rise in the diagnosis of these subclinical states across all age groups.^[5,6,7,8]

The clinical sequelae of thyroid dysfunction are extensive and affect multiple organ systems, contributing significantly to morbidity. Both overt and subclinical thyroid disorders are implicated in adverse cardiovascular outcomes, including hyperlipidemia, atrial fibrillation, and increased cardiovascular mortality. Thyroid hormones are crucial for skeletal homeostasis; their dysregulation can alter calcium and phosphorus metabolism, leading to an increased risk of osteopenia and osteoporosis. Furthermore, thyroid dysfunction is a recognised contributor to neuropsychiatric illness, with alterations in thyroid status linked to mood disturbances, anxiety, cognitive impairment, and depression. Untreated, severe cases can culminate in life-threatening conditions such as myxoedema coma or thyroid storm.^[9,10,11,12]

Women of reproductive age (15-49 years) represent a particularly vulnerable demographic. Thyroid dysfunction significantly impacts reproductive health by causing anovulatory cycles, hyperprolactinemia, and sex hormone imbalances, which can manifest as menstrual irregularities, subfertility, and abnormal sexual development.^[13,14] Epidemiological data underscore this gender disparity, with women being up to ten times more likely than men to develop hypothyroidism.^[15,16,17,18] One in eight women may develop a thyroid disorder during her lifetime. In India, the prevalence of hypothyroidism is estimated to be approximately 11%.^[19-23]

Despite the well-documented clinical impact and high prevalence of thyroid dysfunction, particularly among women, there remains a paucity of community-based research investigating its prevalence and determinants in specific, under-researched populations. Therefore, we conducted this study to assess the prevalence of thyroid dysfunction and its determinants in women of reproductive age in urban resettlement area of Delhi.

Methodology:

We conducted a community-based cross-sectional study from January to December 2021 in the field practice area of the Urban Health Centre (UHC), Gokalpuri, attached to the Department of Community Medicine, Maulana Azad Medical College, New Delhi. This area comprises approximately 7,961 households with a total population of about 30,000, distributed across four blocks (A, B, C, and D).

We used systematic random sampling to select 180 reproductive-age females (15–49 years) who resided in the study area for a minimum of six months. We excluded women who were pregnant or critically/terminally ill. We interviewed the participants in selected households using a semi-structured, pre-tested, pre-validated questionnaire. Before the interview, we obtained written

informed consent and explained the study's purpose. If a household contained more than one eligible woman, we selected a single participant using the Kish method. If a household was closed during the initial visit, we made up to three successive visits before excluding the subject and selecting the next household.

We contacted eligible participants telephonically at least one day before the interview and requested that they report for the interview with a fasting blood sample. Following the interview, the researcher drew 4 mL of peripheral venous blood and collected the sample in a plain vacutainer under all necessary aseptic precautions. We placed the collected blood samples in a labelled collection box and transported them to the Department of Biochemistry laboratory at Maulana Azad Medical College to measure TSH (Thyroid Stimulating Hormone), T3 and T4.

We entered the generated data into MS Excel and analysed it using the Statistical Package for the Social Sciences (SPSS version 25). We present quantitative data as mean and standard deviation (SD) and express categorical data as percentages or proportions. We applied statistical tests of significance to compare differences in values across sociodemographic and other variables. To test differences in proportions, we used the Chi-square or Fisher's exact test. We considered a two-sided p-value of <0.05 statistically significant.

ETHICAL CONSIDERATION: Ethical clearance was taken from the Institutional Ethics Committee of Maulana Medical College and study was conducted after the due approval 14/01/2021(F.1/IEC/MAMC/(82/10/2020/No.38).

Results:

Table 1: Descriptive and clinical findings in the study participants (N = 180)

Characteristics	Count (%)
Age Group	
15-25 years	29(16)
25-35 years	53(29)
35-45 years	68(38)
≥45 years	30(17)
Religion	
Hindu	170(94)
Muslim	10(6)
Type of family	
Nuclear	170(94)
Joint	5(3)
Three generation	5(3)
Marital status	
Married	167(93)
Unmarried	13(7)
Occupation	
Homemaker	150(83)
Unskilled Worker	25(14)
Other*	5(3)
Educational status	
Illiterate	41(23)
Primary school	28(16)
Middle	35(19)
High school	39(23)
Intermediate or diploma	24(13)
Graduate and above	13(7)

Thyroid status	
Hypothyroid	6 (3)
Euthyroid	174 (97)
Chronic Disease	
Hypertension	3 (2)
Diabetes Mellitus	3 (2)
None	174 (96)
Adverse Pregnancy outcome	
Abortion	11 (6)
Still birth	2 (1)

*Clerk, Shop owner, farmer

Table 2: Result of Thyroid Function Test (TFT) of the participants

TFT	Decreased	Normal	Raised	Total
fT3(ng/dl)	78 (43.3%)	95 (52.8%)	7 (3.9%)	180
fT4(ng/dl)	29 (16.1%)	150 (83.4%)	1 (0.5%)	180
TSH (mIU/L)	5 (2.7%)	131 (72.9%)	44(24.4%)	180

Table 3: Distribution of study participants as per Thyroid status on Biochemical Analysis (N=180)

Status			Count (%)
Euthyroid			131 (73)
Hypothyroid	Newly Detected	Subclinical case	30 (17)
	Known case	Overt case	10 (6)
		Controlled	2 (1)
		Uncontrolled	4 (2)
Hyperthyroid	Newly detected	Subclinical Hyperthyroidism	4 (2)
		Overt Hyperthyroidism	1 (0.5)

Table 4: Possible associated factors with thyroid dysfunction

Characteristics	Absent (n=129)	Present (n=51)	p value
Age-Group			
15-25 years	24 (18.6%)	5 (9.8%)	0.50
25-35 years	38 (29.4 %%)	15 (29.4%)	
35-45 years	46 (35.7%)	22 (43.1%)	
≥45 years	21 (16.3%)	9 (17.6%)	
Marital Status			
Married	116 (90.0%)	51 (100%)	0.02
Unmarried	13(10.0%)	0	
Pre-dominant diet			
Non-vegetarian	82 (63.6%)	35 (68.7%)	
Vegetarian	47 (36.4%)	16 (31.3%)	
Food preferences			
Roots and Tubers	50(38.8%)	18(35.3%)	0.00
Green Leafy Vegetables	20(15.5%)	8(15.7%)	
Cabbage/ Cauliflower	15(11.6%)	20(39.2%)	

Others	44(34.1%)	5(9.8%)	
Family History			
Present	20 (39.2%)	23 (17.8%)	0.00
Absent	31(60.8%)	106(82.2%)	
Menstrual Abnormality			
Present	4(7.8%)	11(8.5%)	0.88
Absent	47(92.2%)	118(91.5%)	
BMI			
<18.5-22.9	52 (81.3%)	12 (18.7%)	0.03
23->25 (Overweight-Obese)	77 (66.4%)	39 (33.6%)	
Adverse pregnancy outcome			
Present	8(17.0)	5(4.2)	0.00
Absent	39(83.0)	114(95.8)	

Discussion:

This community-based study identified a high prevalence of thyroid dysfunction (28.3%) among women of reproductive age in an urban resettlement colony of Delhi. This figure is markedly higher than the 11% reported in a multi-city study of Indian adults but is comparable to another study in South India (29.5%) that also focused on women of reproductive age.^[24-27] The slight difference with broader population studies likely reflects our specific, high-risk study group (women aged 15-49) and our community-based approach, which has found the hidden burden of the disease which was not previously studied in the area.

The strong, significant association ($p=0.00$) between thyroid dysfunction and the frequent consumption of cabbage and cauliflower is a key finding. These cruciferous vegetables are known to contain goitrogens (thiocyanates), which can inhibit iodine uptake by the thyroid gland, particularly in settings of borderline iodine sufficiency.^[28,29,30,31]

The study reinforces the established link between thyroid function and body weight. The significant association with a BMI of 23 kg/m² ($p=0.03$) is consistent with literature showing that hypothyroidism is associated with a decreased metabolic rate, contributing to weight gain and obesity.^[32-35] This creates a potential cyclical problem where obesity may be both a cause and consequence of thyroid dysfunction.

The link to reproductive health was also clear. The statistically significant association with a family history of thyroid disorders ($p=0.00$) confirms the strong genetic predisposition.^[36,37] Furthermore, the significant association with adverse pregnancy outcomes ($p=0.00$) highlights the critical importance of thyroid screening in women of reproductive age, ideally pre-conceptionally, to prevent complications like abortion and stillbirth.^[38-40]

This study has limitations. Its cross-sectional design means we can only report associations, not causation. Dietary intake was assessed via recall, which is subject to bias. Finally, as the study was conducted in a single urban resettlement colony, the findings may not be generalizable to all women in Delhi but are likely representative of similar socio-economic settings.

This study revealed a high and largely undetected prevalence of thyroid dysfunction (28.3%), predominantly subclinical hypothyroidism (16.7%), among women of reproductive age in a Delhi urban resettlement colony. This hidden burden was significantly associated with goitrogenic dietary habits (frequent cabbage/cauliflower consumption), a family history of thyroid disorders, overweight/obesity, and a history of adverse pregnancy outcomes. These findings underscore an urgent need to move beyond opportunistic screening and implement targeted, community-based screening programs and health education, particularly focused on diet and pre-conception care, for this vulnerable population.

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