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Original Research Article

Prevalence of hypothyroidism and its epidemiological parameters among the adults in selected urban areas of Amritsar

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ABSTRACT

Background: The endocrine system plays a vital role in orchestrating cellular interactions, metabolism, growth and senescence. The prevalence of hypothyroidism in the developed world is about 4-5% and subclinical hypothyroidism is 4-15%. Hypothyroidism is the most common of thyroid disorders in India, affecting one in ten adults. Although millions of men experience thyroid dysfunction, women are 10 times more likely to have a thyroid imbalance.
Methods: A descriptive longitudinal study was adopted among 800 adults residing at Kitta, a community area under SGRDUHS. Data was collected from adults (Baseline datasheet, clinical variables, dietary and lifestyle characteristics) through simple random sampling. Thyroid screening was done using Zulewski clinical score of hypothyroidisms.
Results: The present study findings revealed overall prevalence of hypothyroidism as 9.3%. Using regression analysis, various epidemiological parameters of hypothyroidism were identified i.e., age, gender, usage of salt etc was found highly significant at $p<0.05$ level of significance.
Conclusions: The prevalence of hypothyroidism was high, affecting approximately 9.3% of adults in the study population. Epidemiological parameters like age, female gender etc were identified in hypothyroidism.

Keywords: Adults, Hypothyroidism, Prevalence

INTRODUCTION

Hypothyroidism is one of the most the prevalent endocrine disorders, presenting a spectrum of clinical symptoms. These symptoms can range from mild manifestations, such as fatigue, weight gain, cold intolerance and depression, to more severe complications, including myxedema, which can potentially lead to fatal outcomes.[1,2] It can be easily diagnosed and treated but can be fatal in severe cases if left untreated.[3] Hypothyroidism is a prevalent endocrinological condition with a significant global impact. In developed nations, the prevalence of hypothyroidism is estimated to be around 4-5%, while that of subclinical hypothyroidism ranges from 4-15%.[4] It is 10 times more common in women, with incidence figures of 4.1/1000 women/year and 0.8/1000 men/year.[5] Hypothyroidism is a very serious problem in India, where 1 in every 10 men and women suffer from hypothyroidism.42 million people in India have thyroid disorders and hypothyroidism is the most common of thyroid disorders in India, affecting one in ten adults.[6]

The prevalence of hypothyroidism in India is 11%, compared with only 2% in the UK and 4·6% in the USA. This is possibly linked to long-standing iodine deficiency in the country.[7] Due to the asymptomatic nature of subclinical hypothyroidism, the American Thyroid Association recommends routine thyroid-stimulating hormone (TSH) screening for both sexes at the age of 35

years and every 5 years thereafter.[8] Serum TSH levels are the most sensitive indicator of thyroid function and can be influenced by various factors such as iodine nutrition, age and autoimmunity.[9] There are no sufficient studies on the prevalence of hypothyroidism in different geographical territories of India. Although patients with hypothyroidism in India often remain undetected and untreated and thus the disease impairs the work performance and economic productivity of Indian people. The present study is to determine the prevalence of hypothyroidism in adults in north India.

Objectives

To estimate the prevalence of hypothyroidism among the adults in urban areas of Amritsar. To identify the epidemiological parameters of hypothyroidism among adults in urban areas of Amritsar.

METHODS

A descriptive longitudinal study was adopted among 800 adults residing at community area under Sri Guru Ram Das University of Health Sciences (SGRDUHS). Study was approved by Institutional Ethical Research Committee under SGRDUHS. Data was collected in the month of July-December 2023. Sample size was calculated from prevalence in previous studies (n=4pq/L2). All the samples were randomly selected through computer generated table. Data was collected from adults i.e., Tool I: Prevalence and epidemiological factors of hypothyroidism.

Part A-Baseline datasheet (age, sex, marital status, socioeconomic status, family history of hypothyroidism, CVI: 1), Part B-clinical variables (BMI, Menstrual status, Co-morbidities, CVI:1) Part C-dietary and lifestyle characteristics (history of smoking and alcohol, frequency of exercise, dietary habits, habit of taking junk food, frequency of consumption of fruits, servings of fruits, consumption of vegetables, usage of salt, storage of salt and addition of salt while cooking, CVI:0.9) through interview method. Tool II: Thyroid screening was done using Zulewski clinical score of hypothyroidisms. Reliability of tool found to be 0.76. Furthermore, advised for thyroid testing for suspected cases of hypothyroidism. After detailed history, screening and testing results were obtained and analyzed by descriptive and inferential statistics.

Inclusion criteria

Adults >18 years of age. Those who were the permanent resident of the community.

Exclusion criteria

Females who were pregnant at the time of data collection. Adults who had diagnosed as hyperthyroidism. Those who were not present at the time of data collection.

RESULTS

Frequency and percentage distribution of socio-demographic variables of adults: 75 with hypothyroidism and 725 were euthyroid. The majority of hypothyroid cases 88% were between 31 and 60 years of age, The mean age among hypothyroid adults was 48.83 years, higher than that of the euthyroid group. Females were predominantly affected, accounting for 88% of hypothyroid cases and were mostly married i.e., 85.3%. Socio-economic analysis revealed that the largest proportion of hypothyroid cases 37.3% belonged to the upper-lower IV class. Hereditary pattern was also found evident, as 41.3% of hypothyroid adults (Table 1).

Frequency and percentage distribution of clinical variable among adults. In hypothyroidism group, 89.3% of participants had a normal BMI. 28% reported irregular menstrual cycles. Co-morbid illnesses i.e., Type II DM was observed among individuals with hypothyroidism in 17.3% (Table 2). Percentage distribution regarding duration of hypothyroidism showed that majority of hypothyroid adults had less than 5 years of duration followed by 29.3% with 6-10 years (Figure 1).

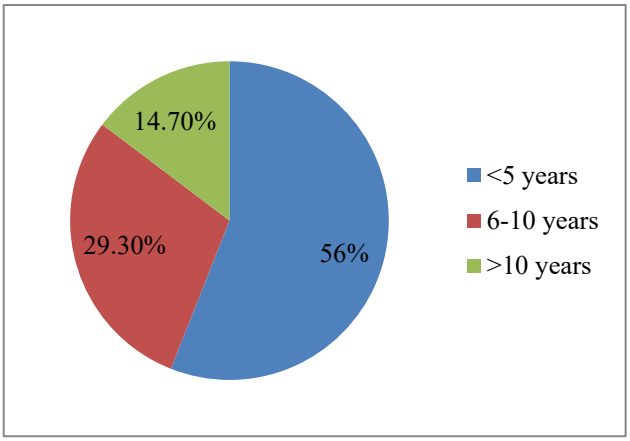

Figure 1: Percentage distribution regarding duration of Hypothyroidism.

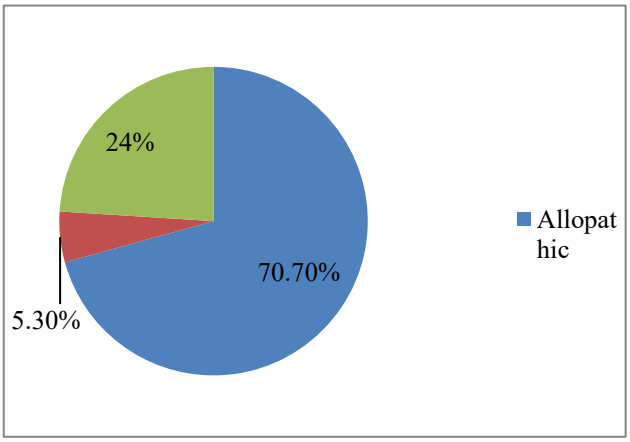

Figure 2: Percentage distribution regarding type of treatment.

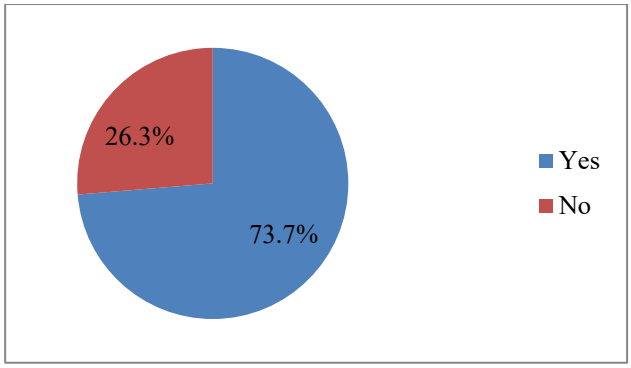

Figure 3: Percentage distribution regarding regular follow up.

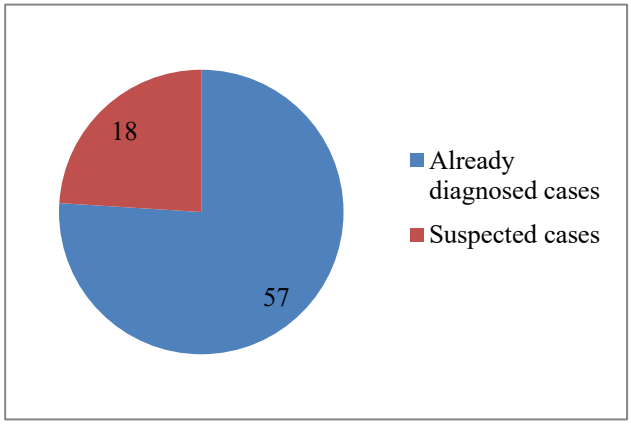

Figure 4: For Hypothyroidism (n=75).

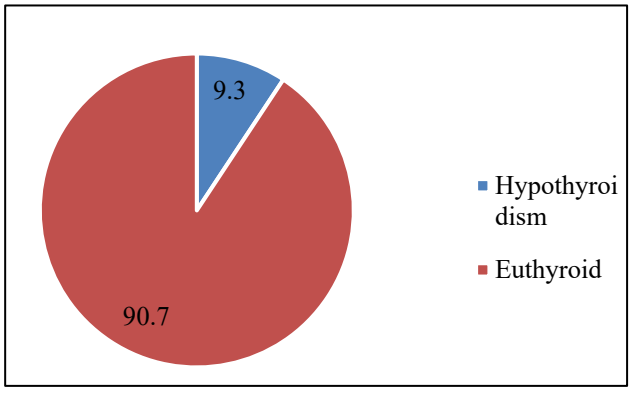

Figure 5: Prevalence of hypothyroidism among the adults.

Percentage distribution regarding type of treatment showed that majority of hypothyroid adults were taking allopathic treatment i.e., 70.7% (Figure 2). Percentage distribution regarding regular follow up showed that majority were having regular follow up visits which was found to be 73.7% (Figure 3).

In frequency and percentage distribution of dietary and lifestyle characteristics of adults, Smoking and Alcohol consumption was noted in 5% and 8% among hypothyroidism. In terms of exercise, daily activity was reported by 23.4% of euthyroid and 10.7% of hypothyroid adults, once-a-week exercise by 30.5% and 28%, twice-a-week by 25.4% and 24% and no exercise by 20.7% and 37.3%, respectively. 85.4% of hypothyroid adults were found with vegetarian diets.

Junk food intake among hypothyroid adults was found daily in 38.7%, once a week in 8%, occasional in 22.7% and none in 30.6%. For fruit servings per day, maximum two servings (38.7%) were consumed by hypothyroid adults. Goitrogen consumption patterns showed that cabbage was consumed 1.3% in hypothyroid adults, cauliflower 33.3% and soya by 65.3%, respectively. Iodized salt use was reported among 50.7% of hypothyroid adults and non-iodized in 49.3% only (Table 3).

Frequency and percentage distribution regarding symptoms and signs as per Zulewski's scale for hypothyroidism among adults. The table represents that 75 adults with hypothyroidism had a Zulewski's clinical score greater than 5, indicating marked symptoms and signs of the condition. Among which 57 adults were already diagnosed with hypothyroidism and 18 adults were found suspected by using Zulewski's scale for hypothyroidism and confirmed from TSH testing thereafter (Table 4), (Figure 4).

The overall prevalence of hypothyroidism among the adults in urban areas of Amritsar was found to be 9.3% (Figure 5). For epidemiological parameters of hypothyroidism among the adults in urban areas of Amritsar, regression analysis was done. This shows that age 31-60 years, female gender, no regular follow up, habit of taking junk food, usage of non-iodized salt and addition of salt at the end were found to be highly significant whereas age >60 years were found significant at $p<0.05$ level of significance (Table 5).

Table 1: Frequency and percentage distribution of the socio-demographic variables of adults (n=800).

S. no.	Socio demographic variables	Euthyroid (n=725)		Hypothyroidism (n=75)	
		f	%	f	%
1	**Age in years**				
	<30	175	24.1	0	0
	31-60	459	63.3	66	88
	>60	91	12.6	9	12
	Mean±SD	42.02±8.80		48.83±8.67	
2	**Gender**				

Continued.

S. no.	Socio demographic variables	Euthyroid (n=725)		Hypothyroidism (n=75)	
	Female	369	50.9	66	88
	Male	356	48.1	9	12
3	**Marital status**				
	Married	490	67.6	64	85.3
	Unmarried	196	27	0	0
	Widow	38	5.3	9	12
	Divorced	1	0.1	2	2.7
4	**Socio economic status (as per Kuppuswamy scale)**				
	Upper I	73	10.1	1	1.3
	Upper middle II	128	17.7	24	32
	Lower middle III	311	42.9	21	28
	Upper lower IV	191	26.3	28	37.3
	Lower V	22	3	1	1.3
5	**Family history of hypothyroidism**				
	Yes	83	11.4	31	41.3
	No	642	88.6	44	58.7

Table 2: Frequency and percentage distribution of clinical variables of adults (n=800).

S. no.	Clinical variables	Euthyroid (n=725)		Hypothyroidism (n=75)	
		f	%	f	%
1	**Body mass index**				
	Underweight (<17.5)	1	0.1	1	1.3
	Normal (17.5-22.9)	684	94.3	67	89.3
	Overweight (23-27.9)	40	5.5	7	9.3
	Mean±SD	24.62±2.15		23.21±1.55	
2	**Menstrual status (applicable for females)**				
	Regular	248	34.2	7	9.3
	Irregular	25	3.4	21	28
	Attained menopause	96	13.2	7	9.3
3	**History of co-morbid illness**				
	Hypertension	88	12.1	10	13.3
	Type II DM	36	5	13	17.3
	Heart disease	4	0.5	0	0
	Musculoskeletal problems	2	0.3	0	0

Table 3: Frequency and percentage distribution of dietary and lifestyle characteristics of adults (n=800).

S. no.	Dietary and lifestyle characteristics	Euthyroid (n=725)		Hypothyroidism (n=75)	
		f	%	f	%
1	**History of smoking**				
	Yes	9	1.2	5	6.7
	No	716	98.8	70	93.3
2	**History of alcohol**				
	Yes	87	12	6	8
	No	638	88	69	92
3	**Exercise per week**				
	Daily	170	234	8	10.7
	Once a week	221	30.5	21	28
	Twice a week	184	25.4	18	24
	None	150	20.7	28	37.3
4	**Dietary habits**				
	Type				
	Vegetarian	534	73.7	64	85.4
	Mixed	191	26.3	11	13.6

Continued.

S. no.	Dietary and lifestyle characteristics	Euthyroid (n=725)		Hypothyroidism (n=75)	
	History of taking junk food				
	No	144	19.9	29	38.7
	Daily	90	12.4	6	8
	Once in a week	340	46.9	17	22.7
	Occasionally	151	20.8	23	30.6
	Consumption of fruits per week				
	No	12	1.7	5	6.7
	Daily	75	10.3	13	17.3
	Once in a week	535	73.8	42	56
	Occasionally	103	14.2	15	20
	Servings of fruits per day				
	One	157	21.7	25	33.3
	Two	369	50.9	29	38.7
	Three	199	27.4	16	16
	Consumption of Goitrogens				
	Cabbage	2	0.3	1	1.3
	Cauliflower	407	56.1	25	33.3
	Soya	316	43.6	49	65.3
5	**Usage of salt**				
	Iodized	604	83.3	38	50.7
	Non iodized	121	16.7	37	49.3
	Storage				
	Air tight container	177	24.4	11	14.7
	Loose container	54.8	75.6	64	85.3
	Addition of salt while cooking food				
	At the beginning	573	79	57	76
	At the end	50	6.9	8	10.7
	Not fixed	102	14.1	10	13.3

Table 4: Frequency and percentage distribution regarding symptoms and signs as per Zulewski's scale for hypothyroidism among adults (N=800).

S. no.	Symptoms and Signs as per Zulewski clinical scale for hypothyroidism	Euthyroid (n=725)				Hypothyroidism (n=75)			
		Yes		No		Yes		No	
	Symptoms	**f**	**%**	**f**	**%**	**f**	**%**	**f**	**%**
1	Diminished sweating	11	1.5	714	98.5	59	78.7	16	21.3
2	Hoarseness	8	1.1	717	98.9	62	82.7	13	17.3
3	Paresthesia	17	2.3	708	97.7	72	96	3	4
4	Dry skin	17	2.3	708	97.7	74	98.7	1	1.3
5	Constipation	11	1.5	714	98.5	75	100	0	0
6	Impairment of hearing	1	0.1	724	99.9	6	8	69	92
7	Weight increase	8	1.1	717	98.9	78	89.3	8	10.7
	Physical signs								
1	Slow movements	3	0.4	722	99.6	31	41.3	44	58.7
2	Delayed ankle reflex	0	0	725	100	1	1.3	74	98.7
3	Coarse skin	5	0.7	720	99.3	41	54.7	34	45,3
4	Periorbital puffiness	1	0.1	724	99.9	32	42.7	43	57.3
5	Cold skin	8	1.1	717	98.9	48	64	27	36
S. no.	**Zulewski's clinical score for hypothyroidism**	**f**		**%**		**f**		**%**	
1	>5	9		1.2		75		100	
2	<5	716		98.9		0		00	

Table 5: Epidemiological parameters of hypothyroidism among the adults in urban areas of Amritsar.

Demographic variables	β	S.E	Wald	P value	OR	95% CI
Age (in years)						
31-60	1.39	0.4	9.58	0.007**	2.11	1.75-3.63
>60	1.09	0.28	5.27	0.013*	3.1	2.10-3.79
Gender						
Female	0.95	0.19	14.58	0.001**	2.11	2.01-2.79
Marital status						
Married	-0.29	0.27	0.45	0.319	0.69	0.45-1.38
Divorced	-0.15	0.18	0.39	0.427	1.03	0.81-2.31
Widow	-0.1	0.17	0.13	0.712	0.84	0.58-1.95
Socio economic status						
Upper middle II	0.57	0.45	0.25	0.541	1.07	0.75-2.18
Lower middle III	0.4	0.38	0.39	0.487	0.98	0.65-1.98
Upper lower IV	0.21	0.29	0.49	0.621	0.85	0.73-23.10
Lower V	0.1	0.13	0.61	0.675	1.01	0.80-2.15
Family history of hypothyroidis						
No	0.79	0.28	12.89	0.001**	0.51	0.35-1.65
Clinical variables						
Body mass index						
Underweight	-0.38	0.52	0.59	0.512	0.71	0.45-12.71
Normal	-0.25	0.31	0.49	0.61	1.14	0.71-2.34
Overweight	-0.1	0.17	0.09	0.781	0.9	0.77-1.56
Menstrual status (applicable for females)						
Irregular	-0.08	0.32	0.15	0.812	1.03	0.65-1.74
Attained menopause	-0.19	0.25	1.12	0.375	0.94	0.71-2.85
History of any comorbid illness						
Hypertension	-0.28	0.51	0.62	0.415	0.81	0.55-2.65
Type II DM	-0.17	0.31	0.51	0.56	0.98	0.62-1.77
Heart disease	-0.03	0.18	0.48	0.612	0.79	0.45-3.45
Musculoskeletal problems	-0.01	0.17	0.1	0.771	0.65	0.38-1.21
Duration of hypothyroidism (in years)						
<5	-0.34	0.45	0.61	0.512	1.02	0.79-2.15
6-10	0.23	0.3	0.48	0.59	0.89	0.73-3.10
>1	-0.09	0.21	0.09	0.645	0.81	0.65-1.76
Type of treatment						
Homeopathic	-0.08	0.15	0.13	0.491	1.03	0.81-3.15
Ayurvedic	-0.18	0.2	0.49	0.512	1.45	0.91-3.76
Home remedy	-0.15	0.23	0.55	0.635	0.98	0.56-2.24
None	0.05	0.12	0.04	0.724	0.78	0.55-1.76
Regular follow-up						
No	0.89	0.19	20.01	0.001**	1.75	1.35-3.45
Dietary and lifestyle factors						
History of smoking						
No	0.71	0.19	11.15	0.001	1.01	0.65-2.19
History of alcohol						
No	0.09	0.98	0.11	0.825	0.85	0.58-3.15
Exercise per week						
Once a week	-0.48	0.59	0.55	0.527	1.15	0.65-3.10
Twice a week	-0.12	0.24	0.35	0.673 0.773	1.01	0.71-2.56
None	-0.07	0.16	0.21		0.97	0.45-1.87
Dietary habits (type)						
Mixed	0.18	0.14	0.77	0.691	1.1	0.78-2.18
Habit of taking junk food						
Daily	0.96	0.47	7.12	0.001**	1.35	1.10-4.15

Continued.

Demographic variables	β	S.E	Wald	P value	OR	95% CI
Once in a week	0.68	0.42	6.15	0.005**	1.18	1.08-3.57
Occasionally	0.55	0.41	5.27	0.024**	1.1	0.89-2.45
Habit of taking fruits						
Daily	-0.31	0.28	0.97	0.401	0.79	0.55-2.56
Weekly	-24	0.24	0.72	0.515	0.67	0.34-2.35
Monthly	0.09	0.19	0.18	0.719	0.71	0.45-1.67
Consumption of fruit per week						
Daily	0.15	0.11	0.48	0.366	0.97	0.76-2.10
Twice a week	0.09	0.04	0.36	0.455	0.86	0.56-1.97
Others	-0.03	0.02	0.21	0.54	1.05	0.85-2.15
Goitrogens						
Cabbage	-0.11	0.15	0.57	0.459	1.14	0.75-2.18
Cauliflower	0.09	0.25	0.37	0.544	0.99	0.69-1.45
Soya	0.03	0.17	0.18	0.618	0.92	0.66-1.59
Usage of salt						
Non iodized	0.89	0.26	12.85	0.001**	2.01	0.75-4.36
Storage						
Loose container	-0.16	0.21	0.55	0.487	0.91	0.69-2.19
Addition of salt while cooking						
At the end	1.21	0.42	6.14	0.001**	2.31	1.37-4.15
Not fixed	0.91	0.45	5.26	0.010**	1.48	0.98-3.17

(At p<0.05 level of significance).

DISCUSSION

Hypothyroidism is believed to a common health issue in India, as it is worldwide. The clinical manifestations of hypothyroidism are varied including weight gain, cold intolerance, menstrual irregularities, lethargy, fatigue etc. Hypothyroidism has been found to be significantly prevalent condition. In this study, Hypothyroidism was commonly seen in 31-60 age group comprising 88% which indicates that risk of thyroid condition increases with the increasing age. The findings correlate with Age-specific association between thyroid autoimmunity and hypothyroidism in Chinese adults showed the prevalence of hypothyroidism in the elderly increases with age. TAI was a risk factor for Shypo (OR, 1.94, 95% CI, 1.35, 2.80, p<0.01).[15]

Hypothyroidism was found to be more common in females than males. The study was supported by Unnikrishnan, Ambika Gopalakrishnan; Kalra on prevalence of hypothyroidism in adults shows significantly higher (P<0.05) proportion of females vs. males (15.86% vs 5.02%) were diagnosed with hypothyroidism.[16] The findings were also supported by National Family Health Survey IV report (NFHS IV (2015-2016)) was 2.2% among women and 0.5% among men in the age group of 15-49 years, while it was 2.7% for women and 0.5% for men in NFHS-V report (2019-2021) in 15-49 years age group in India.[17] Hypothyroidism was more prevalent among married i.e., 64 (85.3%) as compared to unmarried. The study results were supported by a cross-sectional study of the relationship between perceived stress and thyroid function among apparently normal women in the reproductive age. A highly significant difference was observed for age, BMI, TSH, marital status and duration of married life between women with normal thyroid function.[18]

Epidemiological parameter

Socio-economic status was identified among adults with hypothyroidism (OR-1.07, 95% CI 0.75-2.18, at p<0.05). Findings supported by prevalence of thyroid dysfunction and its relationship to income level. The prevalence of hypothyroidism in people with high income (≥100,000 euros/year), medium income (18,000-99,999 euros/year), low income (<18,000 euros/year) and very low income were, respectively, 4.23%, 5.74%, 6.75% and 7.01% (P<0.001). Unemployed people had higher frequencies of hypothyroidism (7.35%) and hyperthyroidism (1.22%) than working people (5.80 and 1.00%, respectively).[19]

Family history of hypothyroidism was also identified as a risk factor of hypothyroididsm. Majority of hypothyroid adults 44 (58.7%) was not having significant family history of hypothyroidism. 31 (41.3%) adults were having positive family history of hypothyroidism. This study findings were correlated with findings of other study on prevalence of hypothyroidism which showed that there was also a significant correlation between hypothyroidism and age, sex, family history of hypothyroidism and the presence of autoimmune diseases among the study group (P<0.05).[20]

Majority of hypothyroid adults were found with normal BMI. Less number i.e., 7 (9.3%) was seen who were overweight. The study results were supported by a Cross-Sectional Study of the Relationship Between Perceived Stress and Thyroid Function Among Apparently Normal

Women in the Reproductive Age. A highly significant difference was observed for age, BMI, TSH, marital status and duration of married life between women with normal thyroid function.[18] Regarding menstrual status, 21 number of adults with 28% shows significance in hypothyroidism. Study supported by prevalence of Hypothyroidism in Women presenting with Menstrual Irregularities. With 24% prevalence, hypothyroidism is a significant contributor to menstrual irregularities, warranting routine thyroid screening to mitigate associated risks.[21]

For history of co-morbid illness, hypertension (13.3%) and diabetes (17.3%) were existing conditions among hypothyroid adults. Study correlated with Brenta G, Gottwald-Hostalek U on co-morbidities of hypothyroidism. This article reviews the common comorbidities of hypothyroidism, as reported in the literature. The comorbidities of hypothyroidism include clinical conditions commonly associated with hypothyroidism, such as dyslipidaemia, hypertension, fatigue or (possibly) cardiovascular disease.[22]

Related to dietary and lifestyle characteristics, drinking alcohol and smoking were not identified as risk factor in hypothyroidism. Majority of adults did not have any history of alcohol 69 (92%) and smoking 70 (93.3%). The results were supported by Xiao et al, on the association between BMI, smoking, drinking and thyroid disease. It was found that there was no significant difference between smoking and drinking and the two kinds of thyroid diseases.[23]

Regarding exercise, majority of adults 28 (37.3%) did not perform any exercise in their daily life. This was supported by study conducted by Wu et al, Zhou on et al lifestyle association with thyroid function. Lifestyle including sleep, smoking, diet and exercise was closely related to thyroid function. exercise was the influencing factor of TSH (β=-0.224, p=0.004).[24]

Related to dietary habits, thyroid was found common in those having habit of junk food in their diet and less consumption of fresh fruits and vegetables. This study was supported by study conducted by Wabha et al on causes of thyroid disease and its relationship with dietary habits. The study showed that iodine deficiency is common in mountainous areas as deficiency of iodine in food and water can lead to thyroid diseases. Low intake of fruits and vegetables, low eating of fish, use of birth control tablets, (75%) eating of chicken (containing hormones), drinking much canned juices (100%) and Lack of exposure to the sun may be causes of the disease.[25]

Regarding usage of non-iodized salt, study findings revealed consumption of non-iodized salt is closely related to thyroid disease (OR: 2.01, 95% CI 0.75-4.36). This study findings were supported by study on Associations of non-iodized salt and thyroid nodule among the Chinese population which showed that adults consuming non-iodized salt had an increased risk of thyroid nodule (OR: 1.36, 95% CI: 1.01, 1.83).[26]

The study participants constitute about only 0.05%of total population of Community area under urban health centre. Another limitation in this study regarding the estimation of iodine content of the iodized salt. The mark of autoimmunity (anti-TPO) was not tested in the current study.

CONCLUSION

Hypothyroidism is a commonly prevailing disorder in adult population. The prevalence of hypothyroidism was high, affecting approximately 9.3% of adults in the study population and there is clear evidence of more prevalence among females rather than males. Epidemiological parameters like Age, Female gender etc were identified in hypothyroidism.

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