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Magnitude of cardiac abnormality and its associated factors among hyperthyroidism patients on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

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Abstract

Background Thyroid hormones have an effect on every organ system, in particular, the heart responds to minimal changes in serum thyroid hormone level. Thyroid hormone causes a lot of changes in the cardiovascular system, such as increased heart rate, contractility, systolic hypertension, changes in peripheral vascular resistance, atrial fibrillation (AF), and hypercoagulability from the direct effect of thyroid hormone on cardiac myocyte and /or due to increased metabolic state. However, the magnitude of such heart abnormalities and its associated factors were not well studied in Ethiopia.

Objective To determine the magnitude of cardiac abnormality and its associated factors among hyperthyroidism patients on follow-up at Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia, 2022.

Methods An institution-based cross-sectional study was carried out among 318 hyperthyroid patients who were on follow-up at the endocrine clinic of TASH, Addis Ababa, Ethiopia from June to October 2022. The data were collected using a pretested structured interviewer administered questionnaire. The data were entered into the computer using EpiData version 3.1 and analyzed using SPSS version 25 software. Bivariable and multivariable logistic regression models were fitted to determine the association between the independent and dependent variables. Adjusted odds ratio with its 95% confidence interval and p-value < 0.05 were used to declare the presence and strength of statistically significant associations.

Result In this study a total of 318 hyperthyroid patients were participated, most (90.9%) of them were females. The overall prevalence of heart failure among hyperthyroid patients was 17.0% (95% CI = 13.0, 21.6). More than half (52.7%) and one third (33.2%) of the participants showed abnormal electrocardiographic and echocardiographic findings respectively. Marital status (not married) [AOR = 2.37, 95% CI (1.03, 5.44)], pattern of hyperthyroidism [AOR = 13.09, 95% CI (4.70, 36.41)], being Asthmatic [AOR = 7.63, 95% CI (1.55, 37.52)], type of medication [AOR = 3.49, 95% CI (1.11, 11.02)] and duration of treatment [AOR = 4.95, 95% CI (2.05, 11.99)] were significantly associated with cardiac abnormality.

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Conclusion A significant portion of hyperthyroid patients overburdened by cardiac abnormalities. Being unmarried, overt hyperthyroid, Asthmatic, long stay on treatment and type of treatment were significantly associated with cardiac abnormality. Hence, attention should be given for cardiac abnormalities while treating hyperthyroid patients.

Keywords Cardiac abnormality, Hyperthyroidism, Tikur Anbessa Specialized Hospital, Ethiopia

Introduction

The term hyperthyroidism, refers to a clinical state due to inappropriately high synthesis and secretion of thyroid hormone(s) by the thyroid [1]. The commonest causes of hyperthyroidism are Graves' disease, toxic multinodular goiter and toxic adenoma [2, 3]. The prevalence of overt hyperthyroidism ranges from 0.2 to 1.3% in iodine-sufficient parts of the world. Almost one-third of the world's population lives in areas of iodine deficiency. The populations at particular risk tend to be remote and live in mountainous areas in South-East Asia, Latin America, and Central Africa [3].

Thyroid hormones have an effect on every organ system, in particular, the heart responds to minimal changes in serum thyroid hormone level [4]. Thyroid hormone causes a lot of changes in the cardiovascular (CV) system, such as increased heart rate, contractility, systolic hypertension, changes in peripheral vascular resistance, atrial fibrillation (AF), and hypercoagulability from the direct effect of thyroid hormone on cardiac myocyte and /or due to increased metabolic state. Subclinical hyperthyroidism is also associated with cardiovascular abnormalities [5]. Changes in cardiac parameters encountered in hyperthyroidism result from the activity of thyroid hormone, particularly T3, on certain molecular pathways in the heart and vasculature [4].

The pattern of cardiac abnormalities is differing from study to study; most complications are reversible with a timely treatment [5, 6]. Abnormal cardiac signs (including arrhythmias, systolic hypertension, orthostatic hypotension, cardiomegaly, and rales) and symptoms (like palpitation, chest pain, and shortness of breath) are common in hyperthyroid patients. Hyperthyroidism may cause increased cardiovascular mortality, and risk of embolic events. Atrial fibrillation (AF) is a common cardiac complication of hyperthyroidism [7].

Evidences from various studies showed that overt hyperthyroidism and subclinical hyperthyroidism were associated with ischemic heart disease (IHD), stroke, and cardiovascular mortality [8]. As a result clinical manifestation of heart failure, abnormal electrocardiographic and echocardiographic findings might be diagnosed [9–11]. Atrial fibrillation (AF) is the most common cardiac condition associated with hyperthyroidism; its prevalence was estimated to be 10–15% in overtly hyperthyroid patients [12]. Studying the magnitude of cardiac disorders and its associated factors among risk groups has significant public health implications. It provides potential

evidence for early detection, risk assessment, prevention, treatment optimization, resource planning, patient education, and health policy development. By understanding and addressing the specific cardiac complications in this population, public health efforts can improve the overall management and outcomes of hyperthyroid patients with cardiac disorders [13]. However, such information is scarce in Ethiopia, particularly the study area. As a result, there is a clear gap of understanding among physician about the burden and pattern of thyro-cardiac disease among hyperthyroidism patients in the study area.

Methods and materials

Study setting and period

The study was conducted at the endocrine clinic of Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa which is the oldest and largest tertiary hospital in Ethiopia (established in 1972). The hospital is located in Addis Ababa City, the capital of Ethiopia. The hospital is serving as a teaching hospital for Addis Ababa University (AAU), college of health science, providing undergraduate, post-graduate, and fellowship programs in different fields of clinical medicine. It is providing services for millions of people from different parts of the country and the horn of Africa. It is a hospital with well-organized and functioning endocrinologic department providing service to thousands of people with endocrine problems and the only hospital in the country providing endocrinology fellowship. The services are provided by medical residents, fellows, and consultant endocrinologists. The study was conducted from July to October 2022 over a four-month period.

Study design

An institution-based cross-sectional study was conducted to determine the magnitude of cardiac abnormality at the Endocrine Clinic of TASH.

Population

All hyperthyroidism patients who had follow-up at the endocrinology clinic of TASH were the source population. All eligible patients with hyperthyroidism on follow-up at endocrinology clinic of TASH during the study period were the study population.

Eligibility criteria

All patients who have confirmed hyperthyroid state (overt or subclinical) who were under follow up at the

endocrinology clinic of TASH during the study period were included in this study. Patients who had incomplete charts and electronic records were excluded from the study.

Sample size determination

All hyperthyroid patients attending follow up at endocrine clinic in TASH during the study period were included in to the study. Hence, this was a census type study (didn't considered sample size determination).

Data collection tools and procedure

Data were collected by using pretested structured interviewer administered questionnaire and data abstraction checklist. Experts on the subject area had read and evaluated the data collection tool to make sure that effectively capture the topic under investigation. The data collection tools contained socio-demographic variables, clinical symptoms and signs related variables, biochemical profile, ECG findings, and echocardiographic report. Three experienced physicians were employed to collect the data through face to face interview and by reviewing the chart and electronics record.

Study variables

Dependent variable Cardiac Abnormality (Yes/No).

Independent variables (Includes socio-demographic characteristics like age, sex, marital status, educational status, residence, clinical presentation, biochemical profile, ECG findings, Echo findings, comorbidities, blood pressure e.t.c.)

Operational definition

Euthyroid Refers to normal level of TSH (0.45–4.5 mIU/L), FT3 (2.3 –6.3 pmol/l), FT4 (10.3–24.5 pmol/l) [14].

Subclinical hyperthyroidism Low serum TSH (<0.45 mIU/L), but normal level of FT3 and FT4 [14].

Hyperthyroidism If serum TSH is low (<0.45 mU/l) and FT4>24.5 pmol/l or FT3>6.3 pmol/l or both [14].

Heart failure Defined by modified Framingham criteria, heart failure was diagnosed if a patient had two major or one major and two minor criteria. (Major criteria include paroxysmal nocturnal dyspnea (PND), Orthopnea, raised jugular venous pressure (JVP), pulmonary rales, cardiomegaly, S3 gallop, pulmonary edema: Minor criteria include dyspnea, nocturnal cough, tachycardia (heart rate>120 beats per minute), pleural effusion, weight loss>4.5 kg in 5 days with diuretics [15].

Thyro-cardiac disease A form of heart failure characterized by myocardial damage secondary to excess thyroid hormone leading to electrical or structural cardiac abnormalities [16].

Data quality control

To improve the quality of the data, the questionnaire was pretested among 5% of the study population (population not included in the actual study). The questionnaire was translated from English to Amharic (local language). A two days' training was given for the data collectors about data collection tools and procedures. The collected data were evaluated regularly for completeness and consistency by the principal investigator (BHM) and supervisor.

Data analysis procedures

The collected data were checked for completeness and consistency, entered into EpiData version 3.1 software and exported to SPSS version 25 software for further analysis. The data were described based on background variables using frequency tables. Continuous variables were described using mean and standard deviation. Bivariate and Multivariate logistic regression models were used to show the association between dependent and independent variables. The model fitness was diagnosed using Hosmer and Lemeshow goodness of fit test. The test result revealed that the data had best fitted to the model ($P>0.05$). Adjusted odds ratio (AOR) with its 95% CI and P-value<0.05 were used to measure the presence of and strength of statistically significant associations between independent and dependent variables. The data were presented using narrations, frequency tables and figure.

Results

Socio-demographic characteristics of participants

In this study a total of 318 hyperthyroid patients were participated, most (90.9%) of them were females. The mean (\pm standard deviation) age was 44.2 ± 13.6 years. Majority of the participants (68.9%) were married and (71.4%) live in urban area. Regarding educational status, below half (45.9%) of the participants have attained diploma & above and about 36.8% of them were government employed (Table 1).

Health related behaviors and clinical conditions of the participants

Almost all (98.1%) of the participants were non-smoker and non-alcoholic. Most of the participants (93.4%) were classified as overt hyperthyroidism and manifesting symptoms of hyperthyroidism for a median time of eight months before the diagnosis. The cause for more than half (57.5%) of hyperthyroid cases were multi-nodular goiter. Regarding the type of medications, more than half

Table 1 Socio demographic characteristics of the study participants, TASH, Addis Ababa, Ethiopia, 2022 (n = 318)

Variables	Categories	Frequency	Percent
Sex of the respondent	Male	29	9.1
	Female	289	90.9
Educational status of the participants	Can read and write	77	24.2
	Primary School	40	12.6
	Secondary School	55	17.3
	Diploma	60	18.9
	Degree and above	86	27.0
Occupational status of participants	Housewife	109	34.3
	Government employed	117	36.8
	Merchant	27	8.5
	Retired	31	9.7
	Others*	8	2.5
Residence of the participants	Rural	91	28.6
	Urban	227	71.4
Marital status of the participants	Single	50	15.7
	Married	219	68.9
	Divorced	18	5.7
	Widowed	31	9.7

*Others: Students=2, Farmers=5, Unemployed=1

Table 2 Health related behaviors and clinical conditions of the study participants at TASH, Addis Ababa, Ethiopia, 2022

Variables	Categories	Frequency	Percent
Smoking history	Smoker	6	1.9
	No smoker	312	98.1
Alcohol history	Alcoholic	6	1.9
	Non Alcoholic	312	98.1
Causes of Hyperthyroidism	Graves' Disease	77	24.2
	Multinodular Goiter	183	57.5
	Toxic adenoma	26	8.2
	Others	32	10.1
Initial classification of hyperthyroidism	Subclinical	21	6.6
	Overt	297	93.4
Current degree/pattern of hyperthyroidism	Euthyroid	265	83.3
	Hyperthyroid	53	16.7
Types of medication (n = 280)	PTU	75	26.2
	Beta blocker and PTU	161	56.3
	Carbimazole	14	4.9
	Thyroxine	19	6.6
	Others	11	6.0

(56.3%) of the participants were taking beta blocker and propylthiouracil (PTU). They were taking treatments of hyperthyroidism for a median duration of four months and 83.5% of them had attained the euthyroid state. The maximum time taken to achieve euthyroid state was 48 months (Table 2).

Stroke and other comorbidities

Out of 318 hyperthyroid patients, only eight (2.5%) of them had developed stroke (all of them had abnormal Echocardiographic findings). Regarding other comorbidities, more than one third (35.5%) of the study participants had hypertension, 50 (15.7%) had diabetes mellitus,

31(9.7%) had dyslipidemia, 17(5.3%) had asthma, and 15 (4.7%) had retroviral infection.

Magnitude of cardiac abnormalities

In this study, the overall prevalence of heart failure among hyperthyroid patients was 17.0% (95% CI=13.0, 21.6). Electrocardiographic examination was done for 264 hyperthyroid patients, out of which 139 (52.7%) of them had abnormal findings. Similarly, out of 271 patients who had Echocardiographic work up, 33.2% of them showed abnormal cardiac findings (Fig. 1).

From abnormal Electrocardiographic findings, nearly one third (32.2%) of them were sinus tachycardia.

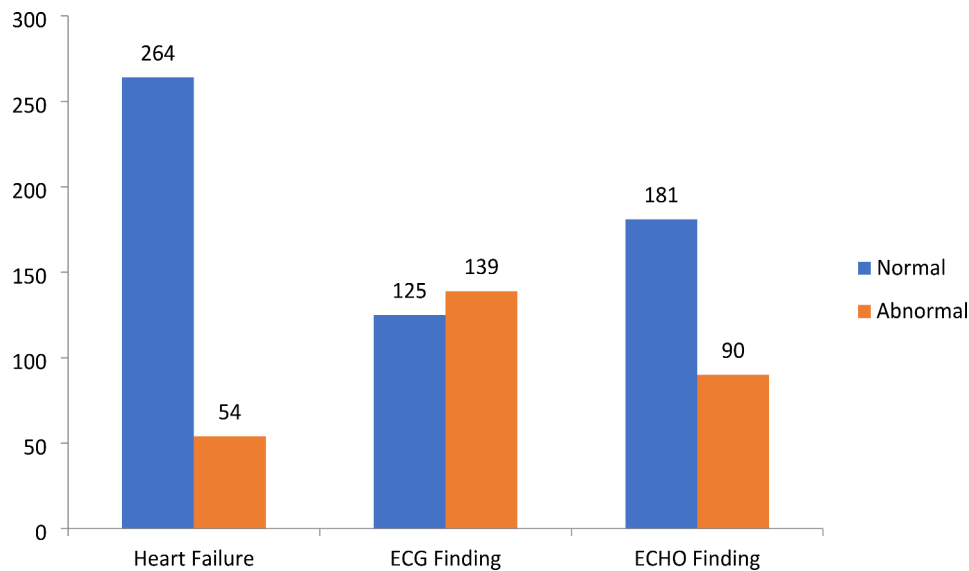


Fig. 1 Thyrocardiac abnormalities among hyperthyroidism patients on follow up at TASH, Addis Ababa, Ethiopia, 2022

Table 3 Thyrocardiac abnormalities and presentation of the study participants at TASH, Addis Ababa, Ethiopia, 2022

Variables	Categories	Frequency	Percent
Electrocardiographic findings (n = 264)	Normal	125	47.3
	Sinus tachycardia	85	32.2
	A fib/flutter	34	12.9
	RVH/LVH	15	5.7
	Others*	5	1.9
	Echocardiographic Findings (n = 271)	Normal	181
	Pulmonary Hypertension	11	4.1
	IHD	12	4.4
	LVH/RVH	23	8.5
	Dilated cardiomyopathy	21	7.7
	Valvular Heart disease	16	5.9
	Others**	7	2.6
Cardiac symptoms (n = 318)	Palpitation	258	81.1
	Shortness of Breath	176	55.3
	Fatigue	246	77.4
	Body swelling	56	17.6
	Chest Pain	9	2.8
	Nocturnal cough	18	5.7
	Orthopnea	54	17.0
	Paroxysmal nocturnal dyspnea	57	17.9
	Cardiac signs (n = 318)	Raised Jugular Vein Pressure	44
	Murmur	40	12.6
	Edema	42	13.2
	Hepatomegaly	24	7.5

*: Right Bundle Branch Block (RBBB)=2, ST T wave change=3 **: Left Ventricle diastolic dysfunction=3, Left Ventricle systolic dysfunction=4

Majority of the study participants had palpitation (81.1%), fatigue (77.4%) and shortness of breath (55.3%). About 44 (13.8%) of the participants had raised jugular vein pressure (JVP) (Table 3).

Factors associated with thyrocardiac abnormality

Bivariable logistic regression was run to identify candidate variables for multivariable analyses. Accordingly, variables with P value ≤ 0.25 were moved to multivariable logistic regression to control the effect of confounders. Variables including marital status (being not married) (COR=2.21, 95% CI (1.22, 4.03)), age category > 50 years

[COR=1.79, 95% CI (0.99, 3.24)], multi-nodular goiter as a cause of hyperthyroidism [COR=4.78, 95% CI (1.64, 13.92)], pattern of hyperthyroidism [COR=16.83, 95% CI (8.34, 33.98)], time taken to achieve euthyroid state [COR=8.17, 95% CI (3.15, 21.15)], having Asthma [COR=20.61, 95% CI (6.41, 66.28)], having

Table 4 Factors associated with Thyro-cardiac abnormality among hyperthyroidism patients on follow up at TASH, Addis Ababa, Ethiopia, 2022

Factors	Categories	Heart Abnormality (n (%))		COR (95% CI)	AOR (95% CI)
		No	Yes		
Marital status	Married	190(86.8)	29(13.2)	1	1
	Not Married	74(74.7)	25(25.3)	2.21(1.22, 4.03)	2.37(1.03, 5.44)*
Age grouped	< 50 years	174(86.1)	28(13.9)	1	1
	≥ 50 years	90(77.6)	26(22.4)	1.80(0.99, 3.24)	0.89 (0.34, 2.36)
Causes of hyperthyroidism	Grave's disease	73(94.8)	4(5.2)	1	1
	Multinodular goiter	145(79.2)	38(20.8)	4.78(1.64, 13.92)	2.19(0.64, 7.43)
	Others	46(79.3)	12(20.7)	4.76(1.45, 15.65)	4.61(1.21, 17.54)
pattern/ degree of Hyperthyroidism	Euthyroid	243(91.7)	22(8.3)	1	1
	Hyperthyroid	21(39.6)	32(60.4)	16.83(8.34, 33.98)	13.09(4.70, 36.41)*
Time taken to achieve Euthyroid	< 6 months	120(96.0)	5(4.0)	1	1
	≥ 6 months	144(74.6)	49(25.4)	8.17(3.15, 21.15)	2.93(0.76, 11.28)
Duration of hyperthyroidism	< 1 year	225(85.6)	38(14.4)	1	1
	≥ 1 year	33(70.2)	14(29.8)	2.51(1.23, 5.13)	0.94(0.30, 2.91)
Duration of treatment	< 6 months	182(89.7)	21(10.3)	1	1
	≥ 6 months	80(70.8)	33(29.2)	3.58(1.95, 6.56)	4.95(2.05, 11.99)*
Having hypertension	No	177(86.3)	28(13.7)	1	1
	Yes	87(77.0)	26(23.0)	1.89(1.05, 3.42)	0.65(0.23, 1.79)
Having Diabetes mellitus	No	228(85.1)	40(14.9)	1	1
	Yes	36(72.0)	14(28.0)	2.22(1.10, 4.48)	1.45(0.40, 5.25)
Having Asthma	No	260(86.4)	41(13.6)	1	1
	Yes	4(23.5)	13(76.5)	20.61(6.41, 66.28)	7.63(1.55, 37.52)*
Type of Medication	PTU	64(85.3)	11(14.7)	1	1
	Beta blocker(s) and PTU	126(78.3)	35(21.7)	1.62(0.77, 3.39)	3.49(1.11, 11.02)*
	Others	74(90.2)	8(9.8)	0.63(0.24, 1.66)	0.93(0.22, 3.86)
Having dyslipidemia	No	242(84.3)	45(15.7)	1	1
	Yes	22(71.0)	9(29.0)	2.20(0.95, 5.09)	0.95(0.23, 3.89)

AOR: Adjusted Odds Ratio, COR: Crude Odds Ratio, * Significant association

dyslipidemia [COR=2.20, 95% CI (0.951, 5.09)], duration of hyperthyroidism [COR=2.51, 95% CI (1.23, 5.13)], type of medication (taking Beta blocker(s) and PTU [COR=1.62, 95% (0.77, 3.39)], duration of treatment >6 months [COR=3.58, 95% CI (1.95, 6.56)], being diabetic [COR=2.22, 95% CI (1.10, 4.48)], and being hypertensive [COR=1.89, 95% CI (1.05, 3.42)] were selected to fit the multivariable logistic regression model. After controlling the effect of potential confounding variables, Marital status (not married) [AOR=2.37, 95% CI (1.03, 5.44)], pattern of hyperthyroidism [AOR=13.09, 95% CI (4.70, 36.41)], having asthma [AOR=7.63, 95% CI (1.55, 37.52)], type of medication [AOR=3.49, 95% CI (1.11, 11.02)] and duration of treatment [AOR=4.95, 95% CI (2.05, 11.99)] were significantly associated with the dependent variable (cardiac abnormality).

In this study, likelihood of developing heart abnormality was more than double among non-married patients than married patients [AOR=2.37, 95% CI (1.03, 5.44)]. Likewise, patients who have Asthma as a comorbidity were nearly eight times more likely to develop cardiac abnormality than their counterparts [AOR=7.63, 95% CI (1.55, 37.52)]. Regarding the pattern/degree of hyperthyroidism, patients with hyperthyroid state during the study were 13 times more likely to have heart abnormality as compared with euthyroid state [AOR=13.09, 95% CI (4.70, 36.41)]. Additionally, participants who stayed on treatment for six months and above were nearly five times more likely to develop cardiac abnormality than those who were taking the treatments for less than six months [AOR=4.953, 95% CI (2.05, 11.99)]. Moreover, patients who were under Beta blocker(s) and PTU treatment regimen were more than three folds more likely to have cardiac abnormality than those who were taking PTU alone (Table 4).

Discussion

This study was aimed to assess magnitude of thyro-cardiac abnormality and its associated factors among patients with hyperthyroidism on follow up at TASH, Addis Ababa, Ethiopia. Accordingly, the overall prevalence of heart failure among hyperthyroid patients was 17.0% (95% CI=13.0, 21.6). More than half (52.7%) and one third (33.2%) of the participants had abnormal electrocardiographic and echocardiographic cardiac findings respectively. The commonest abnormal Electrocardiographic findings were Sinus tachycardia (32.2%) followed by Atrial fibrillation / flutter (12.9%).

The magnitude of thyro-cardiac abnormality reported by the current study was higher as compared with the study conducted in Denmark [17] and Caritas Medical Centre, China [18] which reported the prevalence of cardiac abnormality among hyperthyroid patients were 8.3% and 6.9% respectively. The possible reason for the

observed variation might be due to the difference in study population and operational definition. The study conducted in Denmark [17] was a community based study while the current study was a hospital based study, which may overestimate the cardiac abnormalities. The other important reason might be difference in operational definition of the outcome variable and time variation; the above studies detected only atrial fibrillation or flutter within ± 30 days from the diagnosis of hyperthyroidism. However, our study was identified any echocardiographic or electrocardiographic abnormalities at any period of time after the diagnosis of hyperthyroidism.

On the other hand, the finding from this study was lower as compared with the figure reported by Sawin et al [19], Bernadette B and George J. K [20] Mayank P. et al. [11] which showed that 28%, 10–28% and 40.4% of patients with hyperthyroidism developed cardiac abnormalities or echocardiographic changes respectively. Another similar study conducted at St. Paul's Hospital endocrine clinic, Addis Ababa, Ethiopia reported that thyrocardiac disease was detected in 46.6% of hyperthyroidism patients [21]. This finding was higher than the report from the current study.

In line with the current study, majority of the studies found that sinus tachycardia and atrial fibrillation or flutter were the most frequently diagnosed abnormal Electrocardiographic findings [17–19]. In this study patients with overt hyperthyroid state during the study were 13 times more likely to have heart abnormality as compared with their counterparts. This finding is supported by the studies conducted in United State [22, 23]. This might be due to the direct action of thyroid hormone on the heart and blood vessels (peripheral vasodilation, reduction in peripheral resistances, increase in myocardial contractility, increase in heart rate, increase in stroke volume and cardiac output). As a result patients with actual hyperthyroid state may be more likely to have prominent cardiac abnormality than those with reversed euthyroid state [24].

Moreover, participants who stayed on treatment for six months and above were nearly five times more likely to develop cardiac abnormality than those who were taking the treatments for less than six months. However, we didn't get any previously conducted study illustrating this finding. The possible justification for the observed association might be due to the fact that patients stayed on treatment for prolonged time may have persistent exposure to hormonal effects. Consequently, increased exposure may end up with increased the probability of developing cardiac abnormality in advance. Patients who were under Beta blocker(s) and PTU treatment regimen were more than three folds more likely to have cardiac abnormality than those who were taking PTU alone. This might be due to the synergistic effect of the two

medication; i.e. both medications can slow the heart rate, leading to bradycardia (a heart rate that is too slow). This can be particularly dangerous in patients with underlying heart conditions [25].

Hyperthyroid patients who have Asthma as a comorbidity were nearly eight times more likely to develop cardiac abnormality than their counterparts. Hyperthyroid patients with asthma may be at a higher risk of developing cardiac abnormalities due to a combination of factors including: increased sympathetic nervous system activity (both hyperthyroidism and asthma can lead to increased activity of the sympathetic nervous system, which can elevate heart rate, blood pressure, and the risk of arrhythmias, medication interactions, and chronic inflammation, which can damage tissues, including the heart and lungs [26].

In this study, likelihood of developing heart abnormality was more than double among non-married patients than married patients. We did not found biological or physiological evidence to justify this association. Probably this might related with stress, social support, and access to healthcare, which might be correlated with marital status.

The finding from this study implies that Ethiopians who have hyperthyroidism were more likely to develop heart failure (HF), a potentially fatal illness that is also a leading cause of death globally. In turn high prevalence of heart failure (HF) among hyperthyroid individuals become a major public health concern in Ethiopia, particularly the study area. As a result hyperthyroid patients may sustain severe morbidity and mortality, making it a crippling condition in countries with fragile health facilities like Ethiopia. Moreover, person's quality of life may be significantly reduced by the symptoms of these comorbidities, which can also make daily tasks challenging.

Limitation of the study

This study has the following limitations: since it is a cross sectional study, it may not show the exact cause and effect relationship. Inevitably, recall biases, social desirability bias and lack of temporality may threaten this study findings. We also collected the data from a single health facility (hospital), the generalizability of the findings to the national level may not be possible.

Conclusion

A significant portion of hyperthyroid patients overburdened by cardiac comorbidities. Being unmarried, overt hyperthyroid, Asthmatic, long stay on treatment and type of treatment were significantly associated with cardiac abnormality. Hence, attention should be given for cardiac abnormalities while treating hyperthyroid patients. Moreover, it would have better outcome if health professionals and policy makers implement a due intervention

to prevent cardiac morbidity and its mortality especially for patients with overt hyperthyroid state, asthmatic patients and stay longer on treatments.

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Author contributions

BHM, SGA, TAA: involved in conceptualization of the idea; BHM, SGA, NK, YT, SN, FDB: addressed methodological issues BHM, SGA, TAA, NK, YT, SN, FDB participated during the execution, acquisition of data, analysis and interpretation of the result BHM, YT, SN, FDB worked on drafting, reviewing articles and manuscript preparation BHM, SGA, TAA, NK, YT, SN, FDB approval of the manuscript version for publication.

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Data availability

The datasets generated and analyzed during the current study are not publicly available due to confidentiality issue but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

A formal ethical approval letter was obtained from the institutional review board, College of Health Sciences, Addis Ababa University. Informed consent was obtained from each study participant before the interview. Anonymity, privacy and confidentiality of the information were maintained throughout the study. All the research processes were carried out in accordance with Helsinki's ethical principle to conduct a study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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