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A STUDY OF CARDIOVASCULAR MANIFESTATIONS IN HYPOTHYROIDISM PATIENTS

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Abstract

Aim: To detect cardiovascular manifestation in patients with Hypothyroidism by ECG and ECHO in Mandya institute of medical sciences, Mandya.

Introduction: Hypothyroidism and their cardiac manifestations are rarely investigated appropriately despite them being very common. Hypothyroidism has significant cardiovascular manifestations. Overt and sub clinical hypothyroidism both are associated with cardiovascular dysfunction and with an increased risk of cardiovascular disease. This study was done to recognize cardiovascular changes associated with newly detected hypothyroid patients.

Methods: This was a prospective study, conducted on 70 patients in Mandya Institute of Medical Sciences, Mandya who presented from January 2018 to December 2018. Based on the symptoms, clinical examination and hormonal assay, newly detected hypothyroid patients were subjected to detailed cardiovascular examination, blood tests, electrocardiography and echocardiography.

Results: Hypothyroidism was newly diagnosed more in females and maximum in age group of 41 to 50 years, mean age group of 38.3%, with female preponderance of 84.3 %. Out of 70 patients ,The most common of the symptoms included weight gain (38.6%), menstrual symptoms (32.9%) ,followed by easy fatigability (22.9) ,dry skin (14.3%),cold intolerance (8.6%),low mood (1.4%) , On general examination most common findings are weight gain and dry skin found in around 38.6% and 14.3% of patients respectively. Goitre was found in 14.1% of patients, bradycardia was found in 14.3% patients.

ECG findings: ECG was normal in (70.4%) newly detected hypothyroidism patients ,sinus bradycardia was seen in (11.3%), low voltage complexes in (4.2%) ,bradycardia and low voltage complexes in (4.2%) RBBB in (4.2%), STT changes in (2.8%), and prolong PR interval in 1.4%.

ECHO findings: Structural changes in chambers, valves are normal, 15.7% people had pericardial effusion, mild diastolic dysfunction was seen in 8.57% and no systolic dysfunction .

Conclusion: Hypothyroidism is common in females, maximum between age group of 41 to 50 years, mean age of 38.3 %. Majority of the patients did not have any cardiovascular changes. Observed cardiovascular changes were ECG abnormalities, pericardial effusion. Systematic study was done to know the early effects of hypothyroidism on cardiovascular

system. The identification of patients with hypothyroidism is an important individual and public health issue. Hence, early detection and initiation of hormone replacement therapy can minimize associated cardiovascular changes.

Introduction

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, which results in widespread organ-specific effects.[1] Hypothyroidism with onset in adulthood causes diminished calorigenesis and oxygen consumption; impaired cardiac, pulmonary, renal, gastrointestinal, and neurological functions and deposition of glycosaminoglycans in intracellular spaces, particularly in skin and muscle, producing in extreme cases the clinical picture of myxedema. [1]

The prevalence of hypothyroidism was documented in ~4%–5% of population in the developed world, while in Indian population it was reported in around one in ten adults. [2] An estimated 108 million people suffer from endocrine and metabolic disorders in a population of 1.21 billion. Of these 108 million, 42 million suffer from thyroid disorders. According to the survey done by the Indian Government the prevalence of hypothyroidism is 5.4% [3]

Hypothyroidism is manifested by impaired ventricular contraction, bradycardia, and increased peripheral resistance, resulting in diminished cardiac output. [2] The electrocardiogram (ECG) may reveal low voltage of QRS complexes and P and T waves, with improvement in response to therapy.

Thyroid hormone causes direct cellular effects on almost all tissues of the body. It causes multi-organ dysfunction secondary to deranged metabolism. The cardiac dysfunction can range from functional systolic/diastolic dysfunction to overt failure and coronary artery disease. This is as a result of the direct effect of the disease. Cardiac enlargement may occur, due to interstitial edema, nonspecific myofibrillary swelling, and left ventricular dilation, as well as non-hemodynamically significant pericardial Effusion[1]

Thyroid hormone is necessary for normal cardiovascular function, so when not enough thyroid hormone is present neither in the heart nor the blood vessels function normally. In hypothyroidism, the heart muscle is weakened in both contraction phase and also in the relaxation phase. This indicates that the heart cannot pump as forcefully as it should, and the amount of it ejects with each heart beat is reduced. In addition, because heart muscle does not relax normally in between heartbeats, diastolic dysfunction may result. This Study is aimed to study the cardiovascular manifestations with the thyroid hormone levels of the hypothyroid patients. [4, 5]

Methods

A Cross sectional clinical study consisting of 70 new cases of hypothyroidism is undertaken to study the cardiac manifestations by ECG and ECHO

Information was collected through prepared proforma from each patient. All patients / their relatives was interviewed as per the prepared proforma. A detailed enquiry was made about age, sex, occupation, chief complaints, and risk factors like smoking, hypertension, diabetes mellitus, and family history of hypothyroidism. A detailed systemic examination was done.

All newly diagnosed hypothyroid patients and old hypothyroid patients who were on thyroxine supplements for < 4 months were included for the study.

Patients with known cardiac diseases, other endocrine disorders and those who are on medications which alter the thyroid function like beta blockers, lithium, OCP's, steroids and alcohol were excluded from the study,

All patients were subjected to all routine investigations with thyroid function tests, ECG and Echocardiography.

The thyroid function was categorized based on TSH levels to 5 to 20 μ IU/ml, 20 to 50μIU/ml and >50 μIU/ml TSH and ECG and ECHO findings were co related. By using ECHO each case was specially screened for systolic and diastolic dysfunction and pericardial effusion.

Results

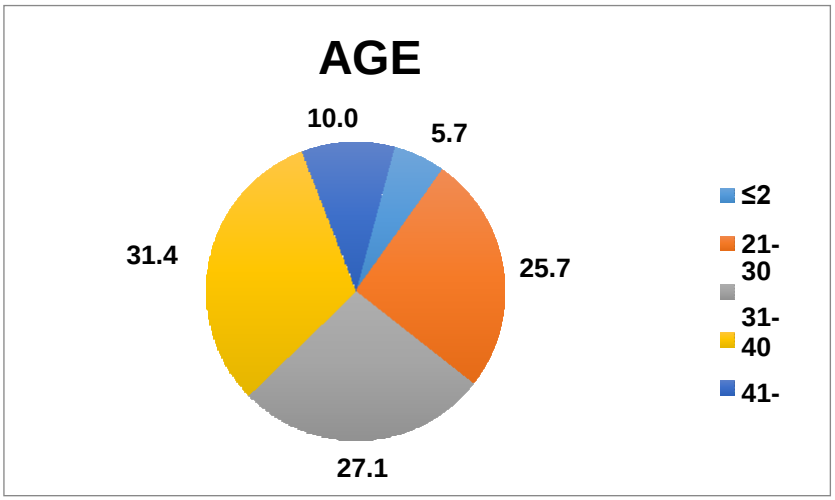
A total of 70 patients are taken, who are newly diagnosed hypothyroid patients coming to Mandya Institute of Medical Sciences, Mandya. They included 11 males and 59 females.

Table 01: Distribution of cases according to Age

AGE(YRS)	Number	%
18 -20	4	5.7
21-30	18	25.7
31-40	19	27.1
41-50	22	31.4
51-60	7	10
TOTAL	70	100

SD	Descriptive Statistics	RANGE	Mean
10.9	AGE (Yrs)	18-60	38.5

Figure 01: Distribution of cases according to Age

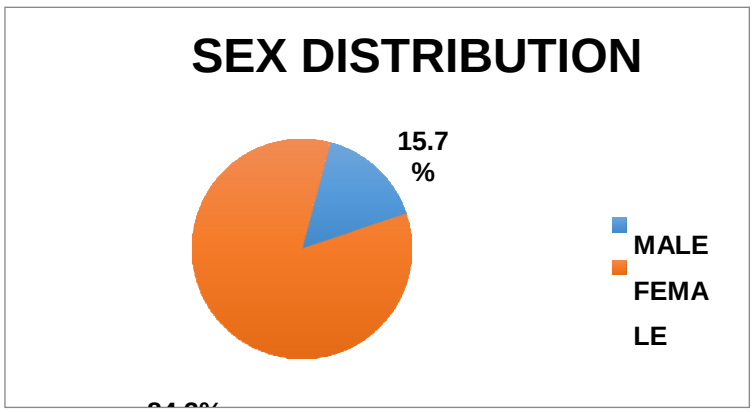


Most hypothyroidism cases were in age group of 41 to 50 years, mean age 38.5 years

Table 02: Distribution of cases according to Sex

GENDER	Number	%
MALE	11	15.7
FEMALE	59	84.3
TOTAL	70	100

Figure 02: Distribution of cases according to Sex



The female hypothyroidism patients constituted about 84.3%, there was overall female

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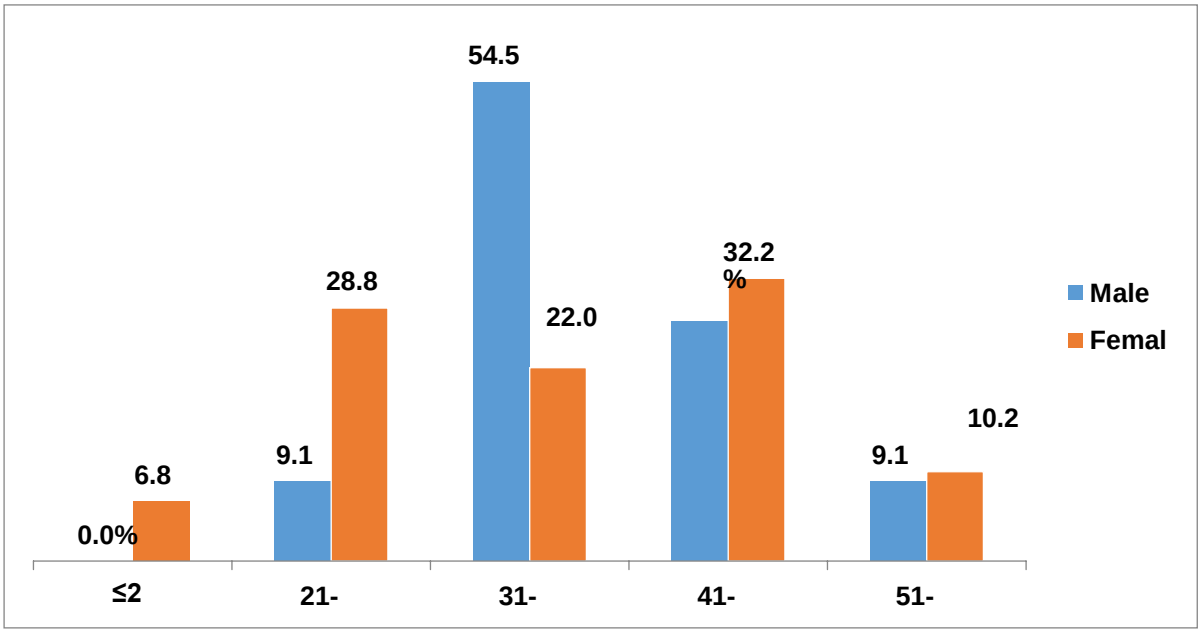
preponderance, male patients with hypothyroidism were 15.7 %.

Table 03: Association between Age and Sex

AGE (Yrs)	MALE		FEMALE	
	N	%	N	%
18 -20	0	0.0%	4	6.8%
21-30	1	9.1%	17	28.8%
31-40	6	54.5%	13	22.0%
41-50	3	27.3%	19	32.2%
51-60	1	9.1%	6	10.2%
Total	11	100.0%	59	100.0%

Figure 03: Association between Age and Sex

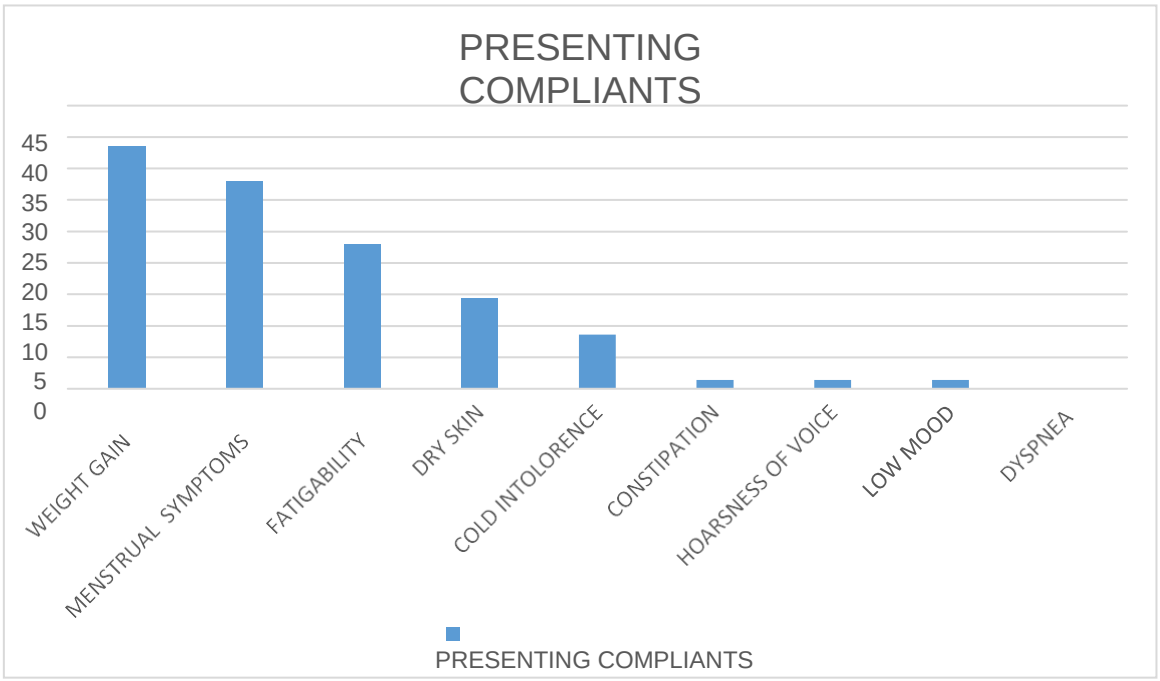


In males the preponderance of age was 31 to 40 years and females the preponderance of age was 41 to 50 years in our study

Table 04: Distribution of cases according to presenting complaints

PRESENTING COMPLIANTS	Number	%
WEIGHT GAIN	27	38.6
MENSTRUAL SYMPTOMS	23	32.9
FATIGABILITY	16	22.9
DRY SKIN	10	14.3
COLD INTOLORENCE	6	8.6
CONSTIPATION	1	1.4
HOARSNESS OF VOICE	1	1.4
LOW MOOD	1	1.4
DYSPNEA	0	0

Figure 04: Distribution of cases according to presenting complaints



Most common presenting complaint was weight gain constituting about 38.6%,followed by menstrual symptoms (32.9%) ,fatigability (22.9%),dry skin (14.3%),cold intolerance(8.6%),constipation ,low mood ,and hoarseness of voice constituted about (1.4%) each .

Table 05: Distribution of cases according to general examination

GENERAL EXAMINATION	Number	%
PALLOR	14	19.7
EDEMA	13	18.3
CYANOSIS	0	0
ICTERUS	0	0
CLUBBING	0	0
LYMPADENOPATHY	0	0
AFEBRILE	70	100
GOITRE	10	14.1
DRY SKIN	0	0

Figure 05: Distribution of cases according to general examination

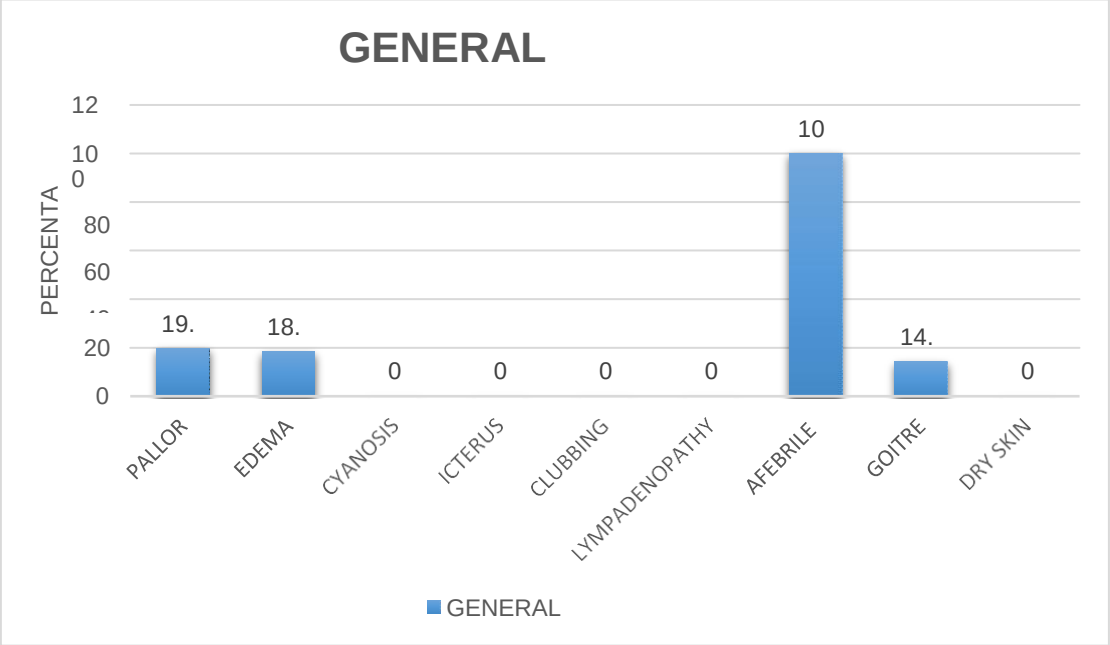


Table 06: Distribution of cases according to systemic examination

SYSTEMIC EXAMINATION		MALE		FEMALE		Total		p value
		N	%	N	%	N	%	
CVS	DHS	1	9.1%	6	10.2%	7	10.0%	0.909
	CM	0	0.0%	1	1.7%	1	1.4%	
	S1S2 heard	10	90.9%	53	89.8%	63	90.0%	
RS	NVBS	11	100.0%	59	100.0%	70	100.0%	-
CNS	DJ	4	36.4%	13	22.0%	17	24.3%	0.309
	NAD	7	63.6%	46	78.0%	53	75.7%	
PA	NAD	11	100.0%	59	100.0%	70	100.0%	-
Total		11	100.0%	59	100.0%	70	100.0%	

Figure 06: Distribution of cases according to systemic examination

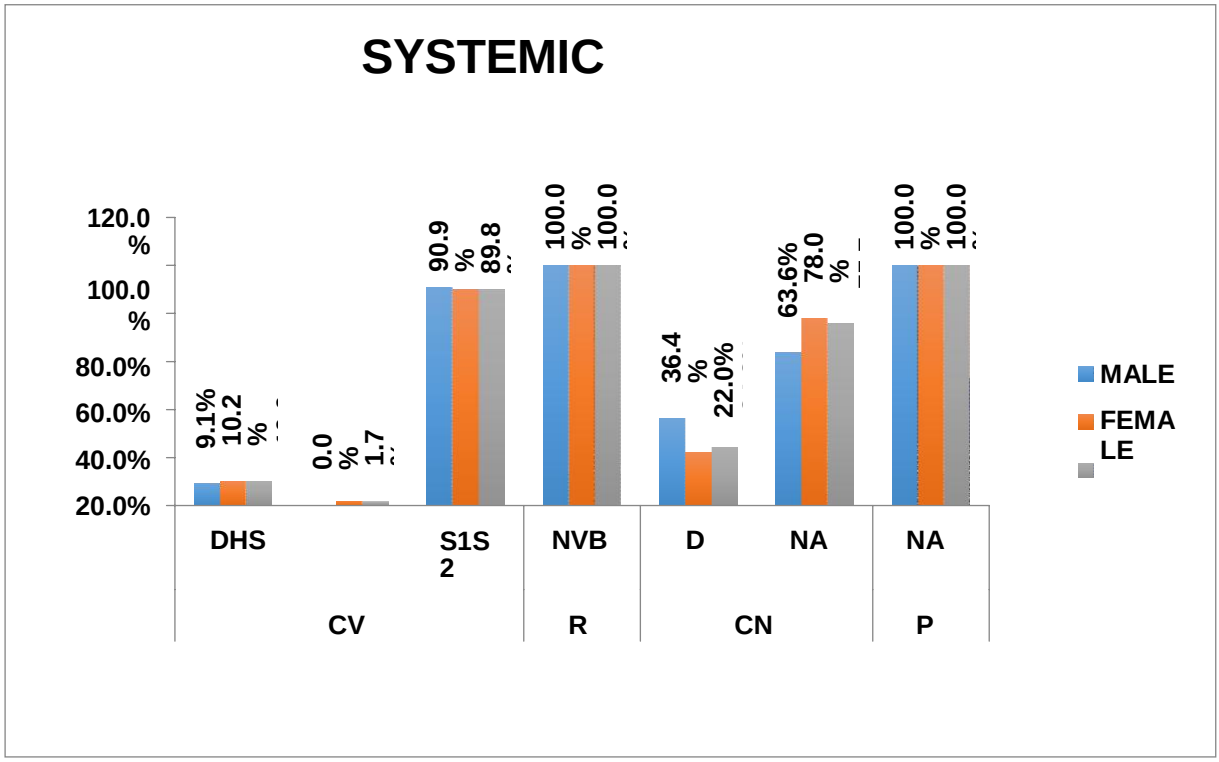
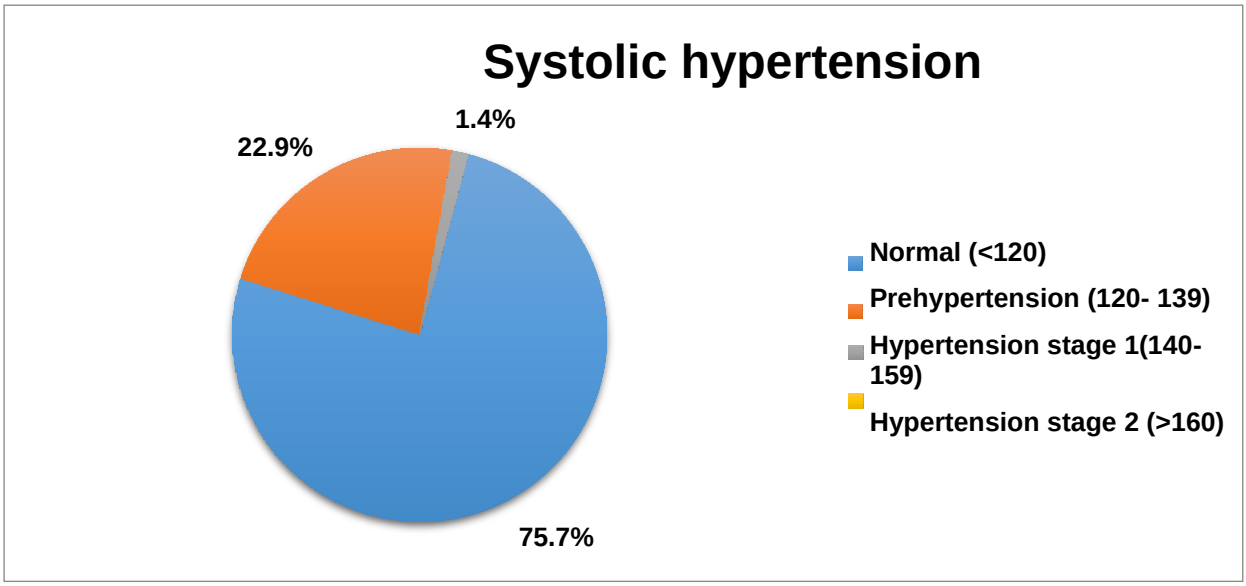


Table 07: Distribution of cases according to systolic hypertension

Systolic hypertension	N	%
Normal (<120)	53	75.7
Prehypertension (120- 139)	16	22.9
Hypertension stage 1(140- 159)	1	1.4
Hypertension stage 2 (>160)	0	0
Total	70	100

Figure 07: Distribution of cases according to systolic hypertension

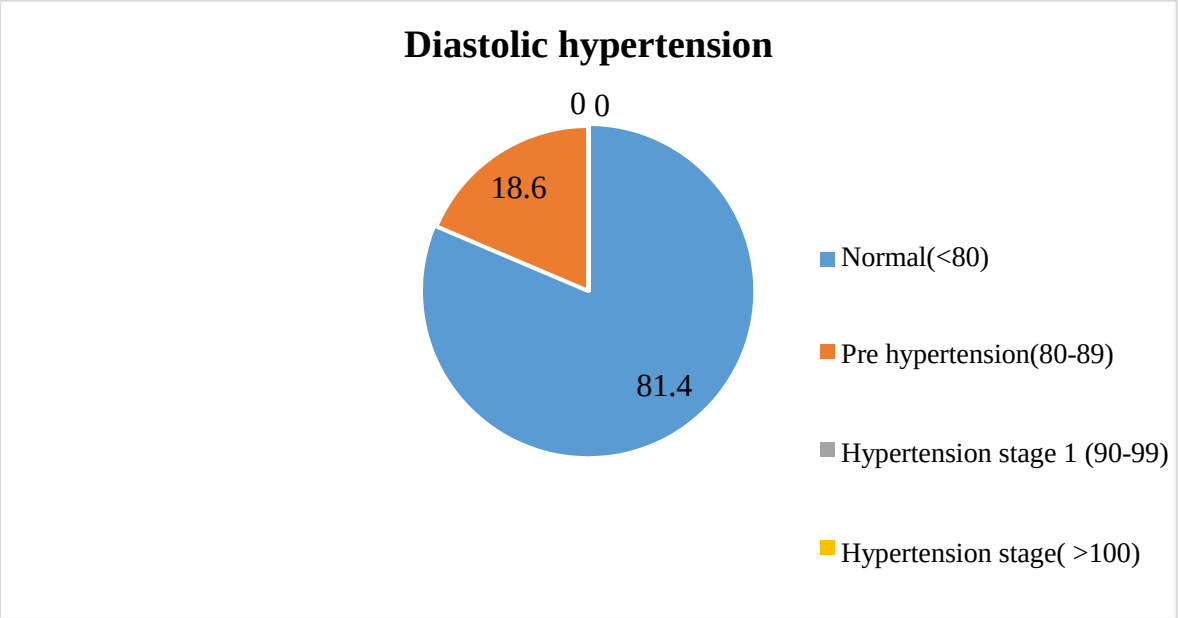


Normal blood pressure was seen in 75.7% ,Prehypertension (systolic) was present in 16 people who constituted about 22.9%.,hypertension stage 1,was in 1.4 %

Table 08: Distribution of cases according to diastolic hypertension

Diastolic hypertension	N	%
Normal (<80)	57	81.4
Prehypertension (80- 89)	13	18.6
Hypertension stage 1(90- 99)	0	0
Hypertension stage 2 (>100)	0	0
Total	70	100

Figure 08: Distribution of cases according to diastolic hypertension

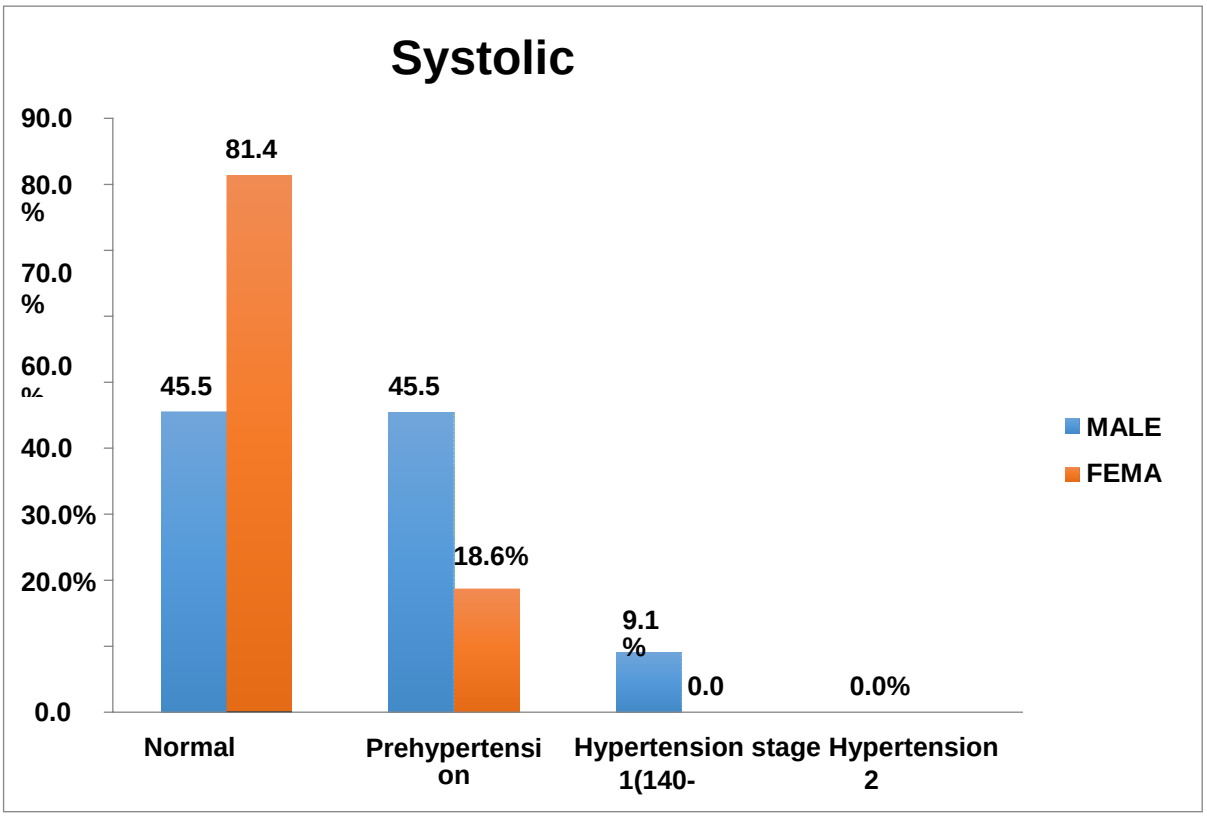


Normal blood pressure was seen in 81.4%, prehypertension (diastolic) was 18.6% , no stage 1 or stage 2 hypertension was seen .

Table 09: Distribution of systolic hypertension cases according to sex

Systolic hypertension	MALE		FEMALE		p value
	N	%	N	%	
Normal (<120)	5	45.5%	48	81.4%	0.007*
Prehypertension (120- 139)	5	45.5%	11	18.6%	
Hypertension stage 1(140- 159)	1	9.1%	0	0.0%	
Hypertension stage 2 (>160)	0	0.0%	0	0.0%	
Total	11	100.0%	59	100.0%	

Figure 09: Distribution of systolic hypertension cases according to sex

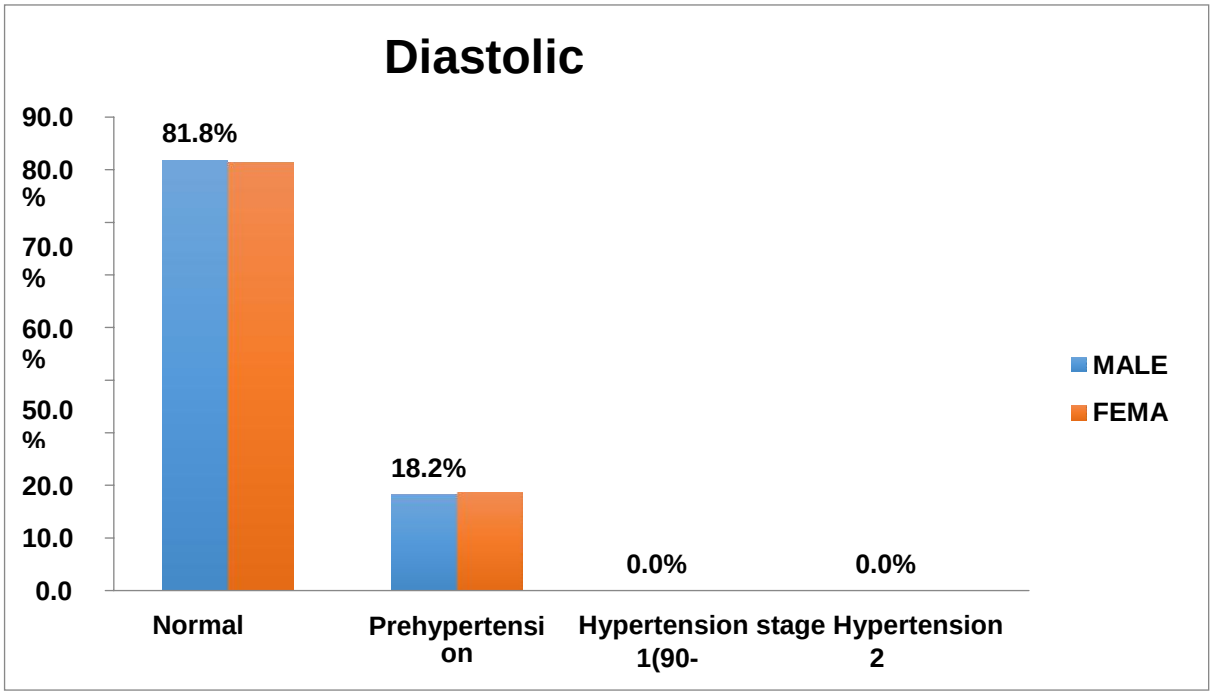


Normal BP in males is 45.5% compared to females 81.4%, prehypertension (systolic) was seen in 45.5% of males compared to 18.6 % in females, hypertension stage 1 was seen in % of males compared to 0% in females.

Table 10: Distribution of diastolic hypertension cases according to sex

Diastolic hypertension	MALE		FEMALE		p value
	N	%	N	%	
Normal (<80)	9	81.8%	48	81.4%	0.971
Prehypertension (80- 89)	2	18.2%	11	18.6%	
Hypertension stage 1(90- 99)	0	0.0%	0	0.0%	
Hypertension stage 2 (>100)	0	0.0%	0	0.0%	
Total	11	100.0%	59	100.0%	

Figure 10: Distribution of diastolic hypertension cases according to sex

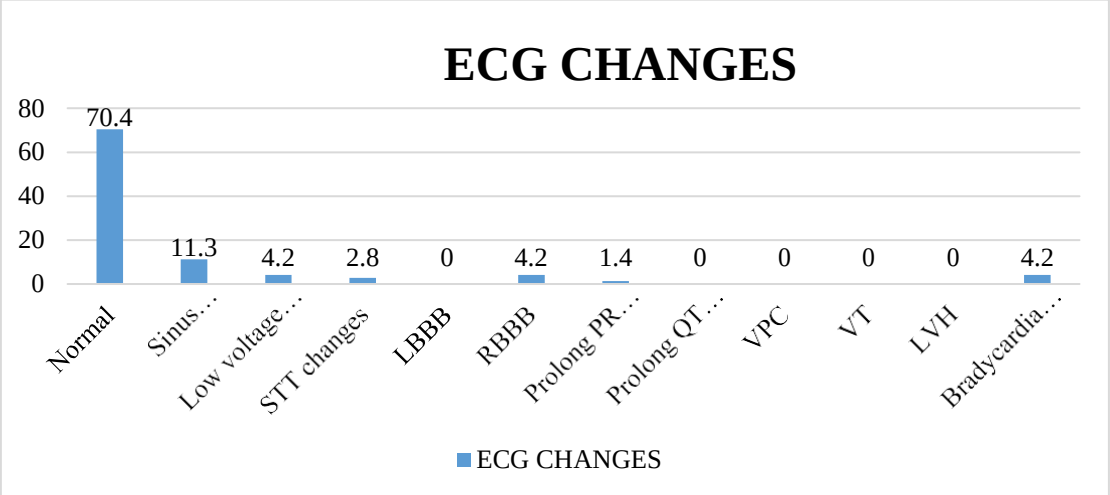


Normal BP in males 81.8% compared to females 81.4%, prehypertension (diastolic) was seen in 18.2% compared to 18.6 % in females, hypertension stage 1 and stage 2 was not seen in both sex

Table 11: Distribution of ECG changes found in hypothyroidism cases

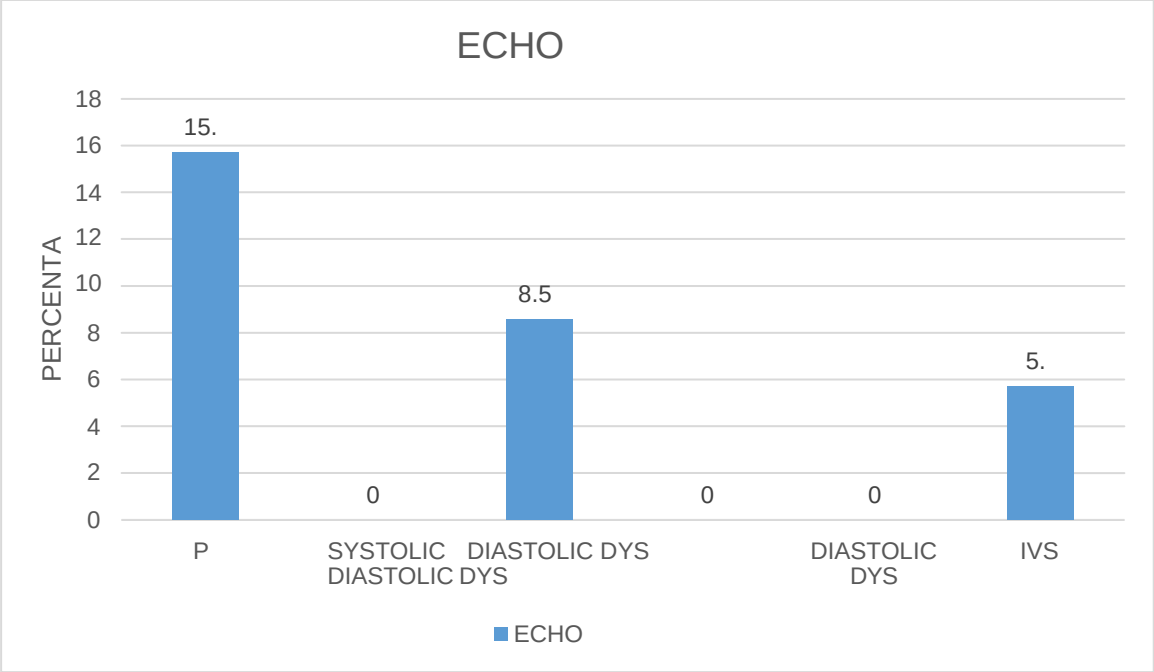
ECG CHANGES	Number	%
Normal	50	70.4
Sinus Bradycardia	8	11.3
Low voltage complexes	3	4.2
STT changes	2	2.8
LBBB	0	0
RBBB	3	4.2
Prolong PR Interval	1	1.4
Prolong QT interval	0	0
VPC	0	0
VT	0	0
LVH	0	0
Bradycardia and low voltage complexes	3	4.2

Figure 11: Distribution of ECG changes found in hypothyroidism cases



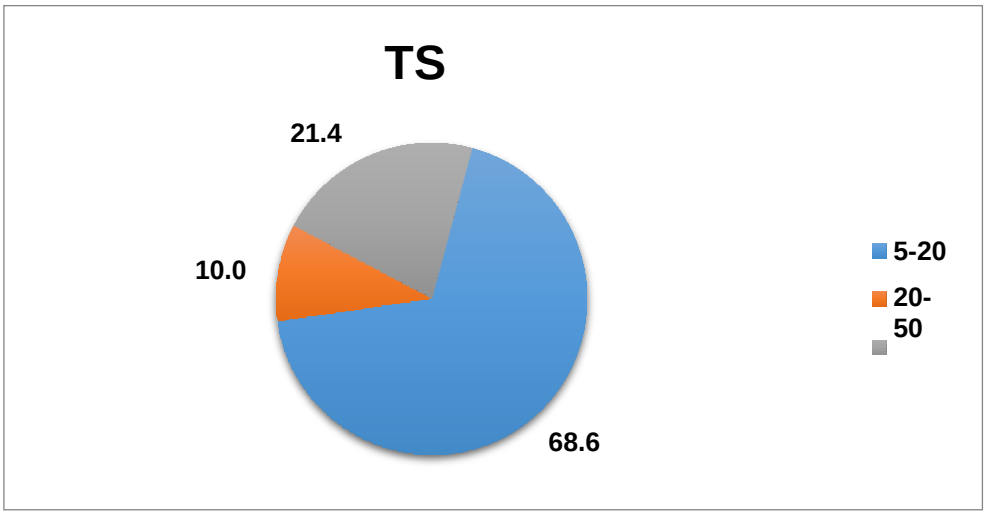
Normal ECG was found in 70% of cases, sinus bradycardia was seen in 11.5% ,low voltage complexes was seen in 4.2 %, combination of bradycardia and low voltage complexes was seen 4.2 %, RBBB pattern seen in 4.2 % of hypothyroidism patients.

Figure 12: ECHO findings in hypothyroidism cases



Pericardial effusion was seen in 15.7% patients, mild diastolic dysfunction seen in 8.57% patients and no systolic dysfunction in our study.

Figure 13: Distribution of cases according to TSH



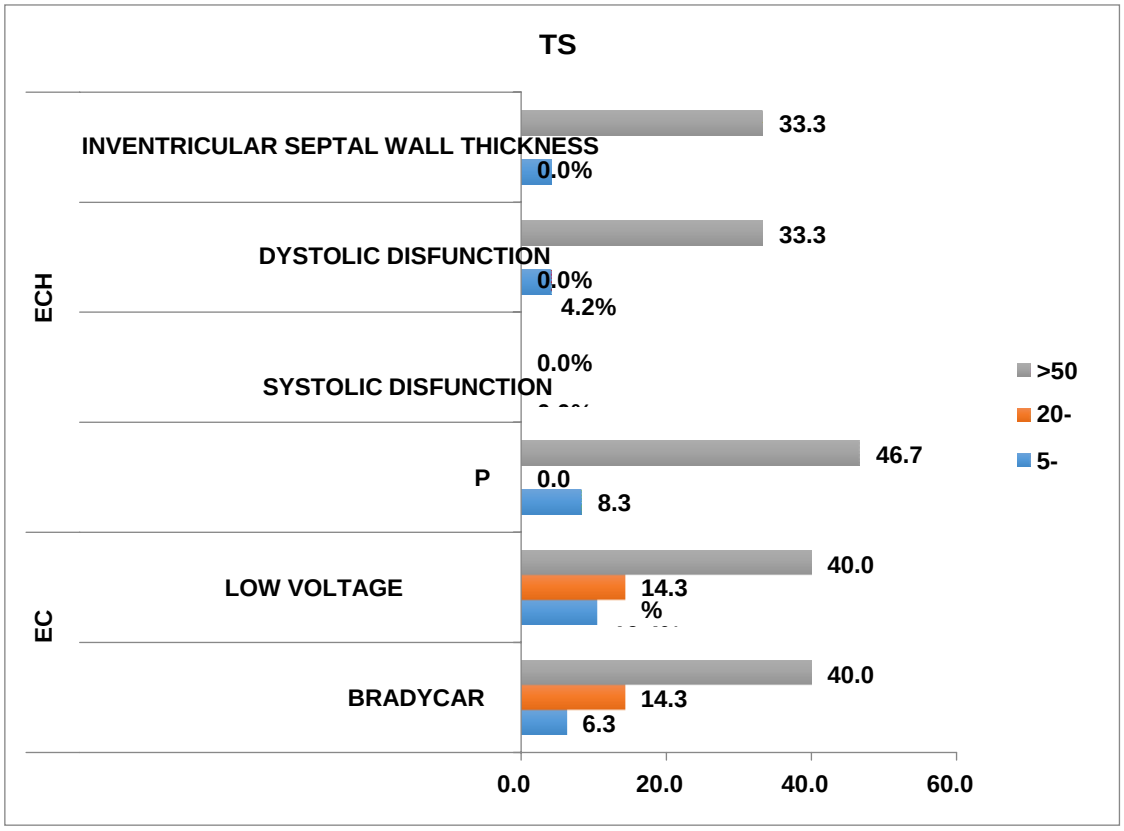
The hypothyroidism was made into three categories based on TSH, 5-20 µIU/ml constituted about 68.6%, 20 to 50 µIU/ml about 10.0 % and >50 µIU/ml in about 21.4%.

Table 12: Distribution of ECG and ECHO parameters according to TSH levels

Parameters		TSH						p value
		5-20		20-50		>50		
		N	%	N	%	N	%	
ECG	Bradycardia	3	6.3%	1	14.3%	6	40.0%	0.010*
	Low voltage complexes	5	10.4%	1	14.3%	6	40.0%	
ECHO	PE	4	8.3%	0	0.0%	7	46.7%	0.001*
	Systolic dysfunction	0	0.0%	0	0.0%	0	0.0%	-
	Diastolic dysfunction	2	4.2%	0	0.0%	5	33.3%	0.003*
	Intraventricular septal wall thickness	2	4.2%	0	0.0%	5	33.3%	0.003*

Pericardial effusion was seen in 46.7% of patients with TSH more than 50 µIU/ml, compared to 8.3% of patients with TSH value of 5 to 20 µIU/ml.

Figure 14: Distribution of ECG and ECHO parameters according to TSH levels



Discussion:

The observations made in 70 new cases of hypothyroidism that presented to Department of Medicine, Mandya Institute of Medical Sciences, Mandya January 2018 to December 2018 is discussed here and results have been compared with other similar studies.

Patients were evaluated with special reference to the pattern of ECG and Echocardiography findings.

Table 13: Comparison of present study with other studies

Description	Behera B K et al [6]	Preshant Srivastava et al [7]	Present study
Age	17 – 47 yrs	-	18 – 60yrs
Mean age	42.45 yrs	-	38.5 yrs
Sex	-	Female 90%	Females 84.3%

Description		Ramesh et al [8]	Present study
Most common Symptoms	**Weight gain**	72.5 %	38.6 %
	Fatigability	65 %	22.9 %
	Dry skin	62.5 %	14.3 %
	Constipation and Hoarseness of Voice	50 %	1.4 %

On general examination in our study most common findings are pallor was seen in 19.7 %, edema was seen in 18.3%, Goitre was found in 14.1% of patients.

On systemic examination in our study Delayed relaxation of the ankle jerk was seen in 36.4% in males and 22% in females. On cardiovascular examination cardiomegaly was found in 1.4% in female and none in males, diminished heart sounds in 9.1% of males and 10.1% offemales.

Table 14: Comparison of present study with other studies

ECG changes	Behera B K et al [6]	Preshant Srivastava et al [7]	Present study
Sinus bradycardia	-	35.5%	11.4 %
Low voltage complexes	60 %	16.7 %	4.2 %

Echo findings & hypothyroidism.

In present study, 2 D echo showed no Structural changes that is normal chambers ,normal valves, pulmonary artery and aorta were noted all patients , there was no regional wall motion abnormality. Pericardial effusion was seen in 15.7% patients, mild diastolic dysfunction seen in 8.57% patients and no systolic dysfunction seen in our study.

Conclusion:

In this study comprising of 70 new hypothyroidism patients common ECG finding was bradycardia and low voltage complexes .pericardial effusion was common finding in Echocardiogram.

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