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ORIGINAL RESEARCH

Correlation of Mean Platelet Volume with Subclinical Hypothyroidism at Tertiary Care Hospital

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ABSTRACT

Background:Subclinical hypothyroidism (SH) is defined as elevated serum levels ofTSH with normal levels of free T4 (fT4) and free T3 (fT3). The prevalence of SH has been reported to be 4–10% in general population. Since it is generally asymptomatic, these patients are mostly identified through routine screening or evaluation of non specific symptoms. About 2–5% of patients progress to overt hypothyroidism annually.

Objectives: To study the mean platelet volume in patients with subclinical hypothyroidism and to study the association between MPV and CAD in patients with subclinical hypothyroidism.

Material &Methods:We studied 89 subclinical hypothyroid subjects and estimated theirMean platelet volume and their cardiovascular function by ECG and 2D ECHO and then analyzed the data.

Results:MPVwas high (>11fl) in 75.3% of subclinical hypothyroid and MPV has significant positive correlation with TSH Values. 70.8% subclinical hypothyroid subjects had LVDD. ECG changes suggestive of IHD and RWMA in 2D ECHO was present in 48.3% and 37.1% of the subjects respectively.

Conclusion:In our study we found that subclinical hypothyroidsubjects have significant elevation in MPV. It is also associated with left ventricular diastolic dysfunction. Hence it is necessary to screen and treat high risk group for subclinical hypothyroidism and its adverseoutcomes to minimize serious complications.

Keywords: Subclinical hypothyroidism; Mean Platelet Volume; Regional wall motion Abnormality, left ventricular diastolic dysfunction

INTRODUCTION

Subclinical hypothyroidism (SCH) is defined by elevated serum levels of thyrotropin (TSH), with normal levels of free T3 and T4. SCH prevalence ranges between 4 and 10% in the general population and between 7 and 26% in the elderly. SCH may progress to overt hypothyroidism, may cause symptoms or may be a risk factor for cardiovascular disease. About 2–5% of patients progress to overt hypothyroidism annually. (1)

One of the myths that surround subclinical hypothyroidism is that the laboratory profile of an elevated serum TSH and normal free thyroid hormone levels really represents compensated hypothyroidism. The reasoning behind this idea is that, since the circulating levels of thyroid hormones are within the normal range with only the serum TSH being elevated, the affected

ISSN 2515-8260 Volume 09, Issue 03, 2022

subject is really euthyroid because the increased TSH is stimulating and driving the thyroid gland to produce normal thyroid hormone levels. Certainly, elevated serum TSH levels do stimulate even a diseased thyroid gland to produce and release more thyroid hormone. However, as long as the serum TSH level remains elevated, the thyroid hormone levels are not truly normal for that individual. The clearance kinetics of thyroid hormones and TSH from the circulation actually make such a conclusion inescapable. Because the half-life of T4 is 7 days and that of T3 is 1 day, the serum TSH, which has a half-life of less than 1 hour, would certainly be expected to return to normal if thyroid hormone levels were, indeed, normal for that individual. An elevated TSH in a patient, thus, means that the circulating thyroid hormone concentrations are insufficient, with a few rare exceptions (TSH-secreting tumors, thyroid hormone resistance syndromes). Subclinical hypothyroidism represents mild thyroid failure and is a clinically important disorder that has adverse clinical consequences and that should be treated in most, if not all, cases. (2)

SCH also has adverse effects on systolic and diastolic function, peripheral vascular resistance and serum lipid and coagulation profile. (3) Although the Whickham survey did not observe any association between SCH and coronary heart disease, in the Rotterdam study SCH was found to be associated with increased prevalence rate of atherosclerosis.(4) On the other hand, coronary heart disease is the leading cause of death in developed countries.(5) Changes in the size, density and reactivity of platelets may be involved in the natural history of vascular disease. Mean platelet volume (MPV) is the accurate measure of platelet size and is a marker of platelet function. (6) Larger and functionally more reactive platelets increase propensity to thrombosis. (7) Elevated MPV volume have been found in coronary heart disease. (8)This study mainly focuses on Mean Platelet Volume and Coronary artery disease in subjects with subclinical hypothyroidism in our hospital.

MATERIALS & METHODS

This Descriptive Study among 89 subjects attending K.R.Hospital attached to Mysore Medical College & Research Institute, Mysore who met inclusion criteria was taken up for study during the study period from December 2018 to December 2019. Permission for the study was obtained from the College authorities prior to commencement.

Information was collected through a pre tested and structured proforma for each subject The study was carried out on subjects with diagnosis of subclinical hypothyroidism. Qualifying patients underwent detailed history, clinical examination and relevant investigations.

INCLUSION CRITERIA

Subjects with subclinical hypothyroidism with

1) Normal thyroid hormone levels
2) TSH (>5 mIU/L and <10 mIU/L)

EXCLUSION CRITERIA

Familial hyperlipidemias, coagulation disorders, severe systemic disease, overt hypothyroid patients, systemic arterial hypertension, type I and type II diabetes mellitus, renal failure, underlying known cardiac disorder, pregnancy, malignancy

INVESTIGATIONS CARRIED OUT

1. T3,T4,TSH, fT3,fT4
2. Routine Blood Investigations
3. ECG
4. MPV
5. Lipid profile

ISSN 2515-8260 Volume 09, Issue 03, 2022

6. 2D-ECHO

METHOD OF SAMPLE ANALYSIS

Laboratory data consisted of blood sugar, blood urea, serum creatinine,T3, T4 ,TSH , and fasting lipid profile, T3 ,T4 and TSH were measured by IMMULITE 1000 immunoassay

STATISTICAL ANALYSIS

Data was entered into Microsoft excel and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 18.0; SPSS Inc, Chicago). Descriptive statistics such as mean and standard deviation (SD) for continuous variables, and frequency and percentage for categorical variables were determined.

The chi-square test and fisher's exact test (when appropriate) was used to show the associations between predictor and outcome variables. The level of significance was set at 0.05. The factors which were significant by chi-square test were selected and subjected to Multi-variate analysis.

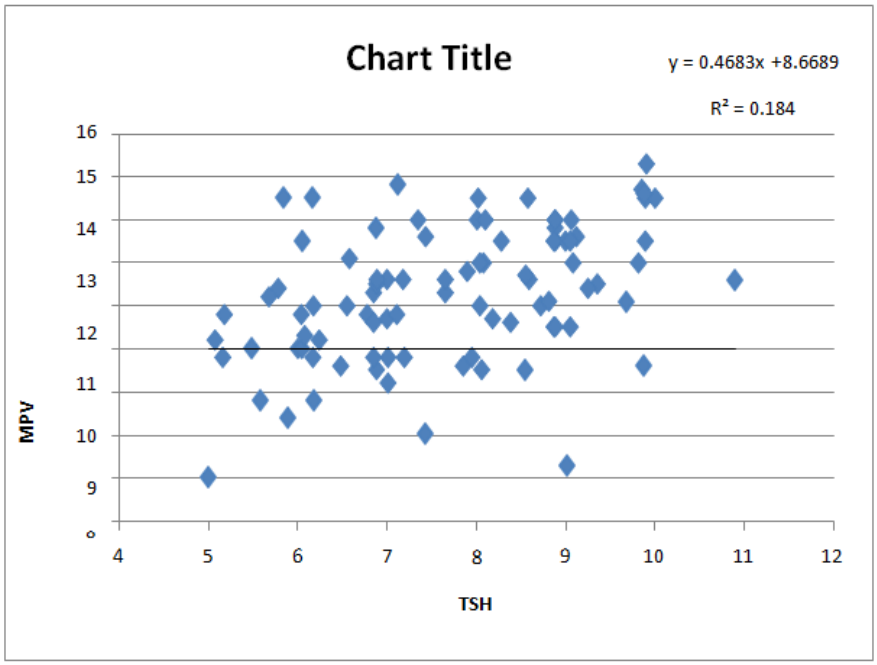
Factors associated with left ventricular dysfunction of patients were determined by using multivariate logistic regression analysis. Adjusted odds ratio along with 95% confidence intervals were calculated for each variable.

RESULT

In this study out of 89 participants only 20 were above 60 years and above attributing to 25%. Rest of subjects were less than 60 year's attributing to 75%. Their age ranged from 25 to 85 years and mean age was 47.58 years. Out of 89 subjects 40 were males, almost 44.9% and 49 were females amounting to 55.1% Mean age of males were about 54.8±9.12 and females were about 44.8± 11.97. In our study of subclinical hypothyroid subjects, 33 had RWMA, around 37.1%. In our study 43 subjects had ECG changes suggestive of IHD, amounting to 48.3%.

In our study 63 of the subjects has LVDD (70%) and 26 has normal Diastolic function (29.2%). Out of the those with LV diastolic dysfunction 30 had Grade 1 LVDD (33%), 28 of them have Grade 2 (31.5%)..Mean platelet volume in the study has positive correlation with TSH which is statistically significant with p <.0001 and pearson coefficient 0.429. fig 1

Figure1: Correlation of MPV Withtsh



ISSN 2515-8260 Volume 09, Issue 03, 2022

Mean TSH value correlate with severity of LV dysfunction. Mean TSH increases with LVDD, Grade 2 LVDD with highest mean TSH of 8.4757 and normal LV Diastolic function with mean TSH of 7.1881 Table 1

Table 1: Association of TSH with LV diastolic dysfunction(LVDD)

LVDD	N	Mean TSH	
NORMAL	26	7.1881	
GRADE1	30	7.6200	
GRADE 2	28	8.4757	
GRADE 3	5	6.4200	
Total	89	7.6956	P value =<.001

Mean MPV value correlate with severity of LV dysfunction as Mean MPV increases with LVDD, Grade 2 LVDD with highest mean MPV of 13.5179 and normal LV Diastolic function with mean MPV of 10.79 Table 2

Table 2: Association of MPV with LV diastolic dysfunction (LVDD)

	N	Mean	P value
NORMAL	26	10.7962	
GRADE1	30	12.3300	
GRADE 2	28	13.5179	
GRADE 3	5	12.6400	
Total	89	12.2730	<.000

The mean TSH of patients with ECG changes suggestive of IHD is 8.0942 which is higher compared to no IHD changes in ECG which was 7.3230, which was statistically significant. Table 3

Table 3: Association of IHD changes in ECG with TSH values

	ECG IHD Change	N	Mean	P value
TSH	Yes	43	8.0942	< .009
	No	46	7.3230	

The mean TSH of patients with RWMA is 8.0135 which is higher compared to those without RWMA which was7.4977, proving increased systolic dysfunction in those with high TSH. Table 3, 4

Table 4: Association of RWMA with TSH values

	RWMA	N	Mean	P value
TSH	Yes	33	8.0315	.087
	No	56	7.4977	

Incidence of IHD changes in ECG in the study is associated with increased mean MPV having mean MPV of 13.2424 compared to 11.537 in those with no ECG changesTable 5

Table 5: Association of IHD changes in ECG with MPV

	ECG IHD Change	N	Mean	
MPV	**Yes**	**43**	**13.0605**	**P <.001**
	No	**46**	**11.5370**	

Incidence of RWMA in the study is associated with increased mean MPV with those with RWMA having mean MPV of 15.2424 compared to 13.7018 in those with no RWMA Table 6

ISSN 2515-8260 Volume 09, Issue 03, 2022

Table 6: Association of RMWA with MPV

	RWMA	N	Mean	
MPV	Yes	33	15.2424	P <.000
	No	56	13.7018	

DISCUSSION

Out of 89 subjects age distribution was between 25 to 75 years. About 21 (23.5%) of subjects aged more than 60 years and 68 (76.5%) were aged less than 60 years. Out of 89 subjects ,49 were females and 40 were males. In our study 63 of 89 subjects had LV Diastolic Dysfunction and 26 had normal Diastolic function. Out of 89 subjects 33 of them had RWMA and 56 had no Regional Wall motion Abnormality. Out of 89 ,43 subjects had ECG changes suggestive of IHD and 46 had no changes suggestive of IHD.

Out of 89 subjects, 56 of them has raised MPV > 11fl (75.31%).Mean platelet volume in our study is found to have positive correlation with TSH values p<.001 with Pearson correlation coefficient 0.429.

LVDD is found to have positive association with TSH values with increasing TSH associated with increasing severity of LV diastolic dysfunction except for grade 3 LVDD which may be because of less no subjects with grade 3 LVDD, and this was statistically significant with p value <0.001. MPV was also found to have positive correlation with severity of LVDD, except for Grade 3 LVDD which may be because of less no subjects with Grade 3 LVDD

Mean TSH in 33 of the Patients with RWMA is found to 8.03 when compared with 56 of the subjects with no RWMA who has mean TSH of 7.49

Mean MPV value in 33 of the subjects with RWMA is found to be 15.24 fl compared to 56 subjects with no RWMA having mean MPV value of 13.537 statistically significant with p<.0001

Mean MPV value in 43 of the subjects with ECG changes suggestive of IHD is found to be 13.050 fl compared to 56 subjects with no ECG changes suggestive of IHD having mean MPV value of 11.537 which is statistically significant with p<.0001.

A similar study done by HAMIYET YILMAZ et al Department of Endocrinology, Ayden State Hospital, Aydn,2010 total 60 subjects with subclinical hypothyroidism with just 4 males and 56 females. Study reported significant increase in MPV in subjects with subclinical hypothyroidism. (9)

Erkan Coban et al conducted study with 36 subjects with subclinical hypothyroidism and 16 :20 male to female ratio. The level of MPV was significantly higher in the subclinical hypothyroid group than in the euthyroid group (9.9±0.9 fl vs. 9.2±0.7 fl, p<0.05). (3)

Erikci et al, conducted study on 47 patients with subclinical hypothyroidism and 30 euthyroid healthy controls. The mean ages of patients with subclinical hypothyroidism and control group were 44.59 +/-12.98 and 45.97 +/-12.51, respectively. None of the patients were on thyroid hormone replacement therapy. Reported increased MPV values in subclinical hypothyroidism cases.(10)

A similar Indian study done by T K Mishra in SBC medical college Cuttack, Orissa on 32 subclinical hypothyroid subjects also had high incidence of LVDD and was significant (P value <0.05). (11)

Subclinical hypothyroidism was significantly positively associated with the prevalence of ischemic heart disease after adjustment for age and sex in all subjects [odds ratio (OR) 2.6; 95% CI, 1.2–5.6; P 0.02] and after adjustment for age in men (OR 3.7; 95% CI, 1.4–10.2; P 0.01). (12)

Muscari et al. found a direct association between an MPV + 8.4 fl (the high tercile of its distribution) and ischemic ECG changes. (13)

ISSN 2515-8260 Volume 09, Issue 03, 2022

Endler et al. reported that regardless of the extent of the coronary lesions among patients with coronary artery disease, those with higher MPV values had been found to have a greater risk of acute myocardial infarction than those with lower MPV14. Pizzulli et al. reported higher MPV values in patients with documented coronary artery disease than that in controls106.

CONCLUSION

It was concluded that RWMA and ECG changes suggestive of IHD was present in 37.1% and 48.3% of the subjects respectively and was associated with increase in TSH indicating subclinical hypothyroid subjects are at high risk for cardiovascular morbidity. Mean platelet volume in our study is found to have positive correlation with TSH values p<.001 with Pearson correlation coefficient 0.429. TSH value is found to have positive correlation with severity of LVDD except for grade 3 LVDD which may be because of lesser no of subjects with grade 3, and this was statistically significant with p value <.001. The correlation with MPV and LVDD was measured with Pearson correlation coefficient and was proved to be positively correlated with a coefficient of 0.858 and with a p- value of <0.001 proving the test to be statistically significant. In the present study increased value of MPV was associated with severity of diastolic dysfunction in the echocardiography except for grade 3 LVDD which may be because of lesser no of subjects with grade 3 LVDD. However further studies are needed to confirm the increased risk of cardiovascular complications in SCH subjects with raised Mean platelet volume.

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CONFLICT OF INTEREST

None to declare.

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ISSN 2515-8260 Volume 09, Issue 03, 2022

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