HYPOTHYROIDISM AND AGEING EFFECT ON PULMONARY ARTERY SYSTOLIC PRESSURE

Umesh Ramachandra Bilagi[1], Vinal J. Shah[2], Krathan Krishna Shetty[3]

[1]Associate Professor, Department of Cardiology, Karnataka Institute of Medical Sciences, Hubli, Karnataka.
[2]Postgraduate, Department of General Medicine, Karnataka Institute of Medical Sciences, Hubli, Karnataka.
[3]Postgraduate, Department of General Medicine, Karnataka Institute of Medical Sciences, Hubli, Karnataka.

ABSTRACT

BACKGROUND

Hypothyroidism is a cause of pulmonary artery hypertension. Increased BMI also contributes to pulmonary artery hypertension. Increasing age in healthy people is associated with increasing pulmonary artery pressures.

MATERIALS AND METHODS

We studied 30 subjects of hypothyroidism and 50 healthy controls; mean age was 39.53 ± 14.97 and 38.82 ± 14.65 years respectively. 27 females and 3 males were hypothyroid. 44 females and 6 males were controls.

RESULTS

Pulmonary artery systolic pressure (PASP) was significantly more in hypothyroid individuals as compared to controls, p-value 0.01, mean PASP in hypothyroid individual was 25.83 ± 6.30 mmHg and in controls it was 23.12 ± 2.97 mmHg. Effect size by r square 0.08.

Higher BMI was associated increased PASP in hypothyroid individual. P value 0.01. Effect size by r square 0.11, mean BMI was 24.54 ± 3.95 kg and mean PASP was 25.83 ± 6.30 mmHg.

Increasing age was associated with increased PASP in controls. P value 0.01, effect size by r square 0.38; mean age was 38.82 ± 14.65 years and mean PASP was 23.12 ± 2.97 mmHg.

CONCLUSION

Hypothyroidism is associated with increase in pulmonary artery systolic pressure. Increased BMI of hypothyroid has more effect on increased pulmonary artery systolic pressure than hypothyroidism alone. In healthy subjects, pulmonary artery systolic pressure increases with age.

KEYWORDS

BMI, Hypothyroidism, Pulmonary Hypertension.

HOW TO CITE THIS ARTICLE: Bilagi UR, Shah VJ, Shetty KK. Hypothyroidism and ageing effect on pulmonary artery systolic pressure. J. Evid. Based Med. Healthc. 2019; 6(3), 139-142. DOI: 10.18410/jebmh/2019/28

BACKGROUND

Association of thyroid disease with pulmonary artery hypertension is known; thyroid disease is considered as aetiology of pulmonary hypertension by clinical classification of pulmonary hypertension established at the consensus meeting held in 2003 in Venice, Italy.[1] But there are no studies which have looked for occurrence of pulmonary artery hypertension in patients of hypothyroidism[1], of course there are studies of cases of pulmonary hypertension, where the increased occurrence of hypothyroidism is present.[2,3] So in this current study, we evaluated occurrence of pulmonary artery hypertension in patients of hypothyroidism.

Association of pulmonary artery hypertension and autoimmune disease is postulated, and thus hypothyroidism which is autoimmune disease and pulmonary artery hypertension can be correlated.[4] Association of Raynaud's phenomenon and idiopathic pulmonary artery hypertension is known, and there is link between thyroid disease and Raynaud's phenomenon.[2] Increased BMI, hypoventilation and hypoxia are associated with hypothyroidism and this can influence pulmonary artery pressure.

Financial or Other, Competing Interest: None.
Submission 03-01-2019, Peer Review 05-01-2019,
Acceptance 12-01-2019, Published 21-01-2019.
Corresponding Author:
Dr. Umesh Bilagi,
#11, Sanskruti Apartment,
Near to Pilley School, Shanti Colony,
Vishweshnagar, Hubli- 580022, Karnataka.
E-mail: umeshbilagi@gmail.com
DOI: 10.18410/jebmh/2019/28

Aims and Objectives

1. To evaluate increased pulmonary artery systolic pressure in patients of hypothyroidism.
2. To correlate increased BMI of hypothyroid patients with pulmonary artery systolic pressure.
3. To correlate increased pulmonary artery systolic pressure with increasing age in healthy controls.

MATERIALS AND METHODS

Study Design- This was a hospital based prospective study.

Study Participants and Sample Size- 30 patients of hypothyroid and 50 healthy controls were included, during the study period from January 2013 to December 2013. For

the purpose of convince subjects with hypothyroidism and healthy controls were labelled as conditions.

Study Variables- Pulmonary artery systolic pressure was estimated by echocardiography. Peak Tricuspid jet velocity was used for calculation. RA pressure of 5 mmHg was added to TR jet velocity to derive pulmonary artery systolic pressure. All patients of hypothyroid underwent blood test for T3, T4, TSH and BMI estimation.

Statistical Analysis- SPSS version 17 and G power software were used to evaluate the study. P value was set to less than 0.05 to prevent alpha error. Power required was set to be more than 80% to prevent beta error. Means were expressed as mean ± standard deviation. Effect size was expressed by r square value 0.01 to 0.08 small, 0.09 to 0.24 considered medium more than 0.25 large effect.

Inclusion and Exclusion Criteria

Subjects included were newly diagnosed cases of hypothyroid during the study period and also the cases of hypothyroid diagnosed or on treatment within six months duration.

Cases of hypothyroid diagnosed and on treatment for more than 6 months were excluded from study. Patients of Chronic obstructive pulmonary disease, known cases of connective tissue diseases and underlying cardiac diseases like cardiomyopathy, valvular heart disease were excluded from the study.

50 cases of healthy controls were also included.

Baseline Characteristics of Subjects

In hypothyroid group of 30 subjects, 27 were females and 3 were males, and among control group, 44 were females and 6 were males. See Table 1.

		Hypothyroid	Control	Total
Sex	Female	27	44	71
	Male	3	6	9
Total		30	50	80

Table 1. Table Showing Sex and Condition Distribution

Independent t test was done to evaluate baseline difference between controls and hypothyroids with respect to age. It was not significant, p value was 0.83, for hypothyroids mean of age was 39.53 ± 14.97 years and for controls mean of age was 38.82 ± 14.65 years. Age range in both groups was from 18 to 67 years see Table 2.

Condition	Mean of Age	N	Std. Deviation	Minimum	Maximum	Range	p-value
Hypothyroid	39.53	30	14.97	18	67	49	0.83
Control	38.82	50	14.65	18	67	49	

Table 2. Baseline Age Distribution

RESULTS

PASP between Hypothyroids and controls.

Pulmonary artery systolic pressure (PASP) was significantly more in patients of hypothyroid as compared to controls, P value was 0.033, mean PASP in hypothyroid individuals was 25.83 ± 6.30 mmHg and in controls it was 23.12 ± 2.97 mmHg.

Effect size by r square was 0.08 so it had small effect see table 3.

Parameter	Condition	N	Mean	Std. Deviation	Std. Error Mean	t- value	p-value
2D Echo PASP value (mmHg)	Hypothyroid	30	25.83	6.303	1.151	2.215	0.033 significant
	Control	50	23.12	2.974	0.421		

Table 3. Table Showing Mean PASP in Hypothyroid and Controls

BMI and PASP in Hypothyroids

Correlation of BMI with PASP in hypothyroid patients by non-parametric bivariate analysis was significant. P value was 0.01. Effect size by r square was 0.11 so it had medium effect. Mean BMI was 24.54 ± 3.95 kg and mean PASP was 25.83 ± 6.30 mmhg see table 4 and figure 1.

Parameter	N	Mean	Std. Deviation	Karl Pearson's Correlation Coefficient r- Value	p- Value
BMI	30	24.54	3.959	0.638	P<0.01, Significant
2D Echo PASP value (mm Hg)	30	25.83	6.303		

Table 4. Table showing Non-Parametric Correlation of PASP with BMI

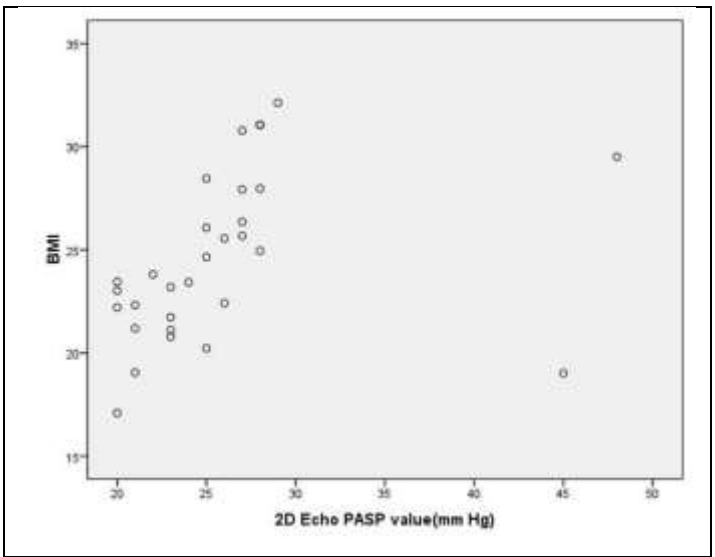

Figure 1. Scattered Diagram showing BMI with PASP

PASP and Age in Controls

We also did Karl Pearson Correlation for age and PASP in healthy controls. It showed significant correlation with PASP with age. P value was 0.01 see Table 5 and Figure 2, effect size by r square value was 0.38 it was large effect. Mean age was 38.82 ± 14.65 years and mean PASP was 23.12 ± 2.97 mmHg.

Parameter	N	Mean	Std. Deviation	Karl Pearson's correlation coefficient r- value	p-value
Age	50	38.82	14.648	0.614	<0.01 significant
2D Echo PASP value (mm Hg)	50	23.12	2.974		

Table 5. Table Showing Karl Pearson Correlation for Age and PASP in Controls

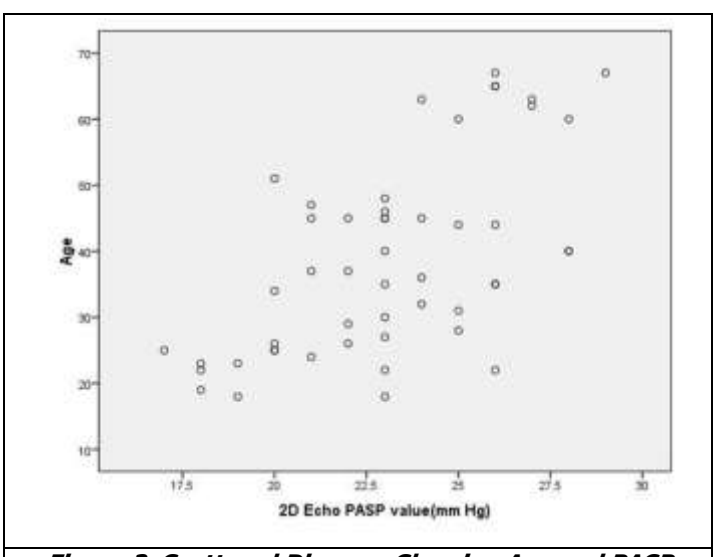

Figure 2. Scattered Diagram Showing Age and PASP

DISCUSSION

To our best knowledge, this study was first of its kind to evaluate pulmonary artery systolic pressure in hypothyroid patients. Pulmonary artery systolic pressure was significantly more in hypothyroid subjects as compared to healthy controlled subjects. But the effect size (r square) was small i.e. 0.08. this is in accordance from predication from study by Curnock A et al,[2] but Curnock AL studied, patients of pulmonary artrey hypertension and looked for occurance of hypothyroidism. It was retrospective study of 41 patients of pulmonary hypertension, of them 22.5% had evidence of hypothyroidism, which was significantly more compared general population. So they suggested to check thyroid profile in patients of pulmonary hypertension.

High BMI is suggested as cause of pulmonary hypertension. In patients of hypothyroidism increased BMI is estabilised fact. We evaluvated effect size of BMI in hypothyroid subjects, it was medium i.e. 0.11, as compared

to small effect size 0.08 of hypothyrodism. So we hypothesized in hypothyroid patient it is increased BMI, responsible for increase in pulmonary artery systolic pressure, rather then direct hypothyroidism itself. Ofcourse this hypothesis needs further study.

Otherwise normal subjects, systemic systolic pressure is known to increase with age. Likewise pulmonary artery systolic pressure also increases with age.[5] To check this hypothesis we evaluvated our helathy control group for age wise increase in pulmonary artery systolic pressure. It was found to positively associated with large effetc size 0.38. This was in accordance with study by Carolyn S.P et al.[5] That was prospective study of healthy subjects followed up for 9 years. Among 1413 subjects (69%) with measurable PASP (age, 63±11 years; 43% male), median PASP was 26 mm Hg (25th to 75th percentile, 24 to 30 mm Hg) and increased with age ($r=0.31$, $P<0.001$). Those with increased PASP had higher mortality. In anthor study of 322 subjects mean pulmonary artery pressures increased progressively with age: 16.7 ± 4.6, 17.9 ± 6.4 and 20.6 ± 8.0 mm Hg for those aged less than 45 years ($n = 50$), 45 to 64 years($n = 238$) and more than 65 years ($n = 34$), respectively ($p = 0.020$).[6]

CONCLUSION

Hypothyroidism is associated with increase in pulmonary artery systolic pressure. Increased BMI of hypothyroid has greater effect on increased pulmonary artery systolic pressure than hypothyroidism alone. In healthy subjects, pulmonary artery systolic pressure increases with age.

Limitation

We did not evaluate effect of BMI on pulmonary artery systolic pressure in healthy controls. At baseline post hoc power of t test done for control versus hypothyroids with regard to age did not reach sufficient power; so we need further study with larger sample.

REFERENCES

[1] Silva DR, Gazzana MB, John AB, et al. Pulmonary arterial hypertension and thyroid disease J Bras Pneumol 2009;35(2):179-185.

[2] Curnock AL, Dweik RA, Higgins BH, et al. High prevalence of hypothyroidism in patients with primary pulmonary hypertension. Am J Med Sci 1999;318(5):289-292.

[3] Li JH, Safford RE, Aduen JF, et al. Pulmonary hypertension and thyroid disease. Chest 2007;132(3):793-797.

[4] Badesch DB, Wynne KM, Bonvallet S, et al. Hypothyroidism and primary pulmonary hypertension: an autoimmune pathogenetic link? Ann Intern Med 1993;119(1):44-46.

[5] Lam CS, Borlaug BA, Kane GC, et al. Age-associated increases in pulmonary artery systolic pressure in the general population. Circulation 2009;119(20):2663-2670.

[6] Ghali JK, Liao Y, Cooper RS, et al. Changes in pulmonary hemodynamics with aging in a predominantly hypertensive population. Am J Cardiol 1992;70(3):367-370.